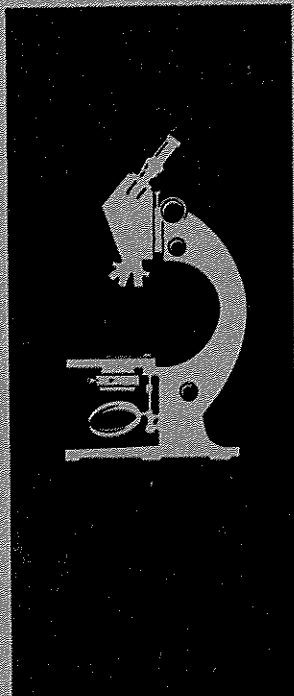


DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD



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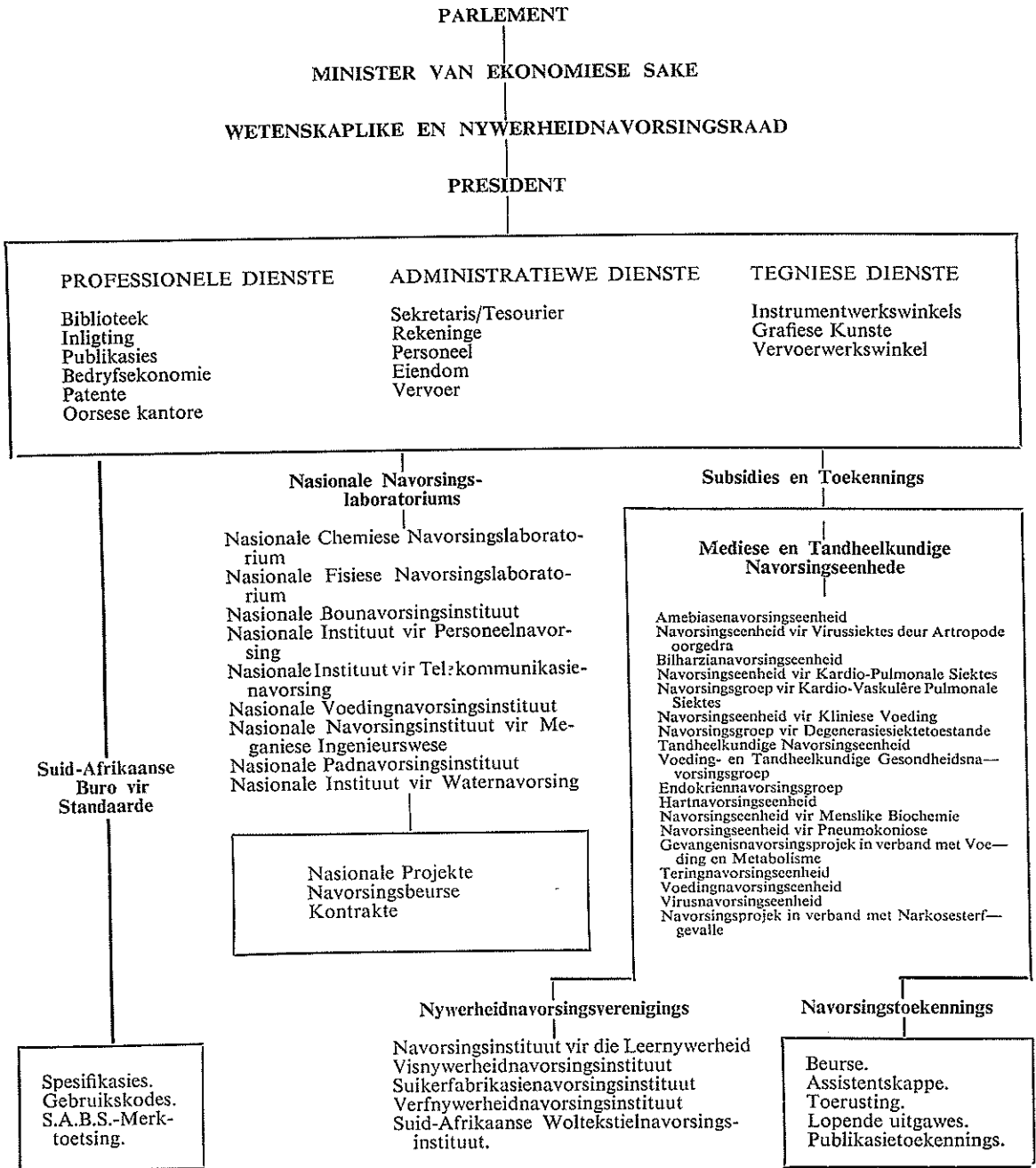
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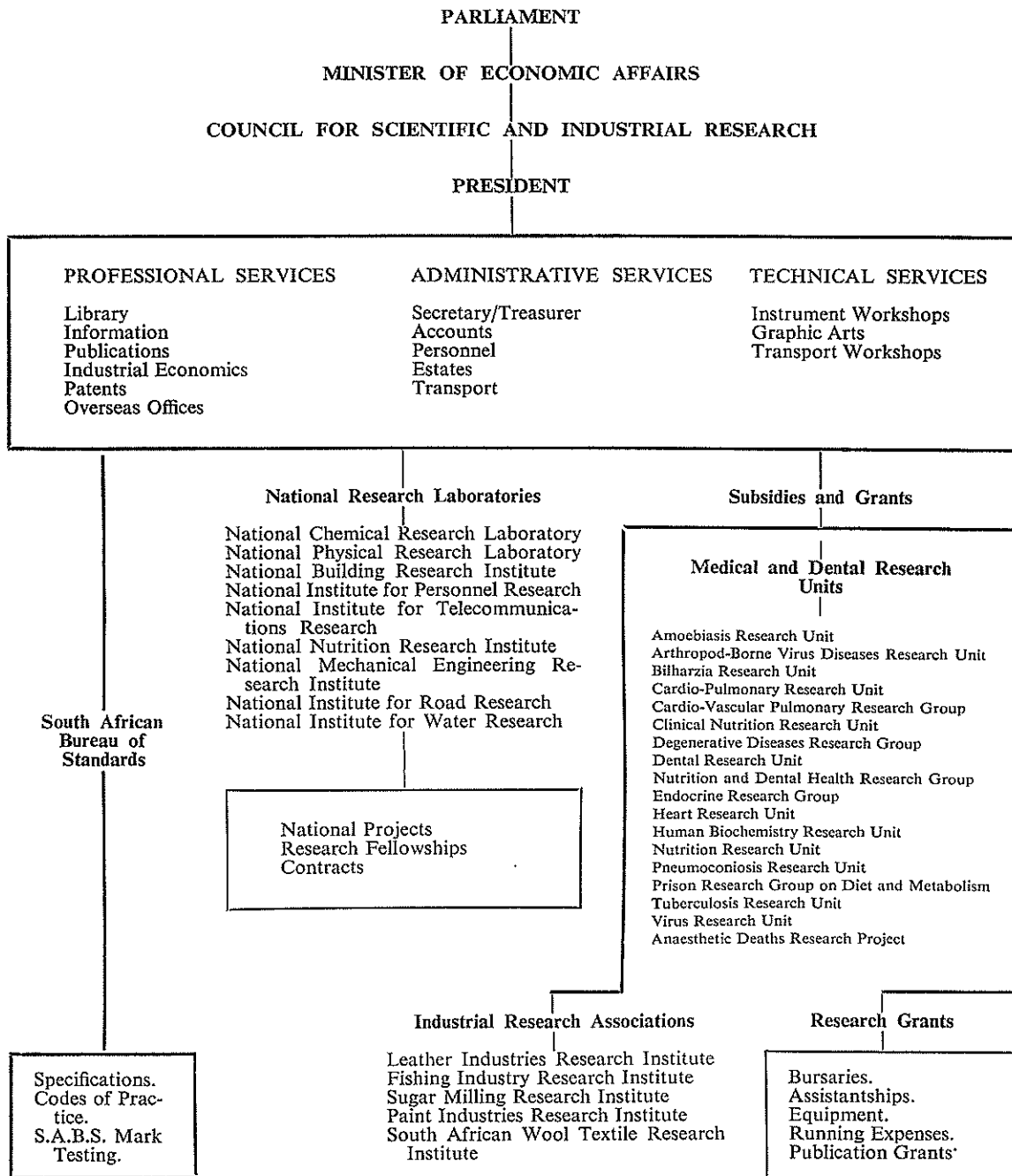
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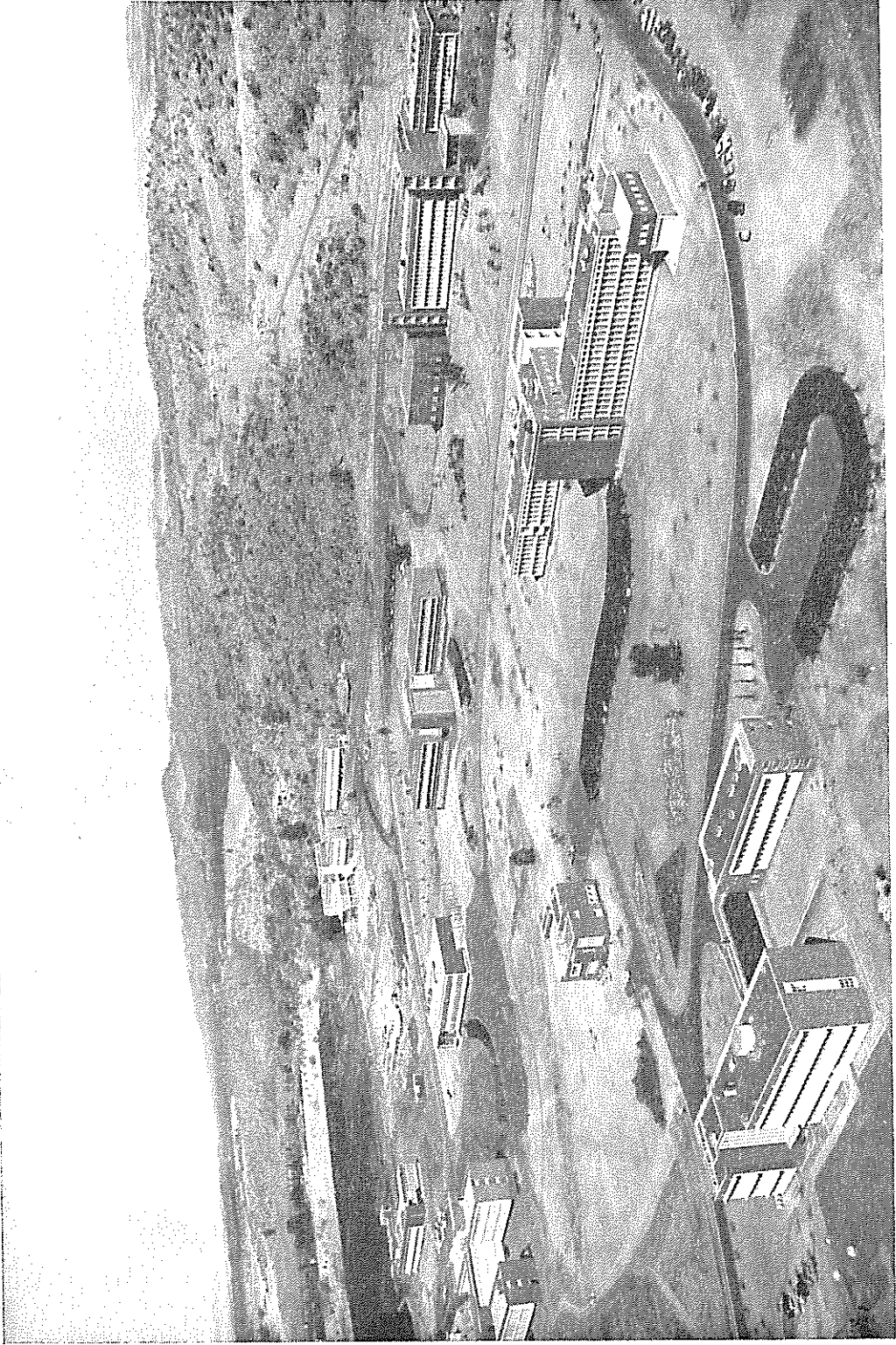
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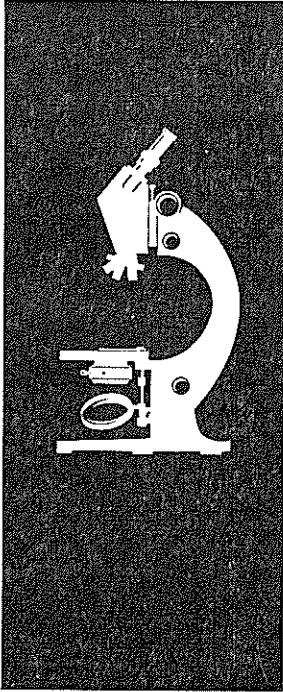
Die Lugopname van Scientia, die W.N.N.R. se nuwe wetenskapsentrum digby Pretoria.

(foto: Dotman Pretorius)

An aerial view of Scientia, the new C.S.I.R. science centre near Pretoria.

(photo: Dotman Pretorius)

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD



VEERTIENDE JAARVERSLAG

1958 - 1959

FOURTEENTH ANNUAL REPORT

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

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1st April 1959

Sir,

I have pleasure in presenting to you the Fourteenth Annual Report of the Council for Scientific and Industrial Research. This Report covers the period from the 1st April, 1958, to the 31st March, 1959, which coincides with the end of the Council's financial year.

Balance sheets and statements of income and expenditure for the financial year ended 31st March, 1959, certified by the Controller and Auditor-General, are included.

I have the honour to be,

Sir,

Your obedient servant,

S. M. NAUDÉ

PRESIDENT: COUNCIL FOR SCIENTIFIC
AND INDUSTRIAL RESEARCH

The Hon. dr. N. Diederichs
Minister of Economic Affairs
Paul Hof
Minnaar Street
PRETORIA

Posbus 395
PRETORIA
1 April 1959

Waarde Heer,

Met genoëë lê ek die Veertiende Jaarverslag van die Wetenskaplike en Nywerheidsnavorsingsraad aan u voor. Hierdie verslag dek die tydperk van 1 April 1958 tot 31 Maart 1959, wat met die einde van die Raad se boekjaar saamval.

Hierby gaan die balansstaat en die staat van inkomste en uitgawe vir die boekjaar geëindig 31 Maart 1959, deur die Kontroleur en Ouditeur-generaal gesertifiseer.

Dienswillig die uwe,

S.M. NAUDÉ

PRESIDENT: WETENSKAPLIKE EN
NYWERHEIDNAVORSINGSRAAD

Sy Edele dr. N. Diederichs
Minister van Ekonomiese Sake
Paulhof
Minnaarstraat
PRETORIA

W.N.N.R. SE JAARVERSLAG

Die Jaarverslag van die Suid-Afrikaanse Wetenskaplike en Nywerheidsnavorsingsraad word in die volgende dele gepubliseer:

- I. Algemene Oorsig.
- II. Die Suid-Afrikaanse Buro vir Standaarde.
- III. Die Nasionale Chemiese Navorsingslaboratorium.
- IV. Die Nasionale Fisiese Navorsingslaboratorium.
- V. Die Nasionale Bounavorsingsinstituut.
- VI. Die Nasionale Instituut vir Personeelnavorsing.
- VII. Die Nasionale Instituut vir Telekommunikasie-navorsing.
- VIII. Die Nasionale Voedingnavorsingsinstituut.
- IX. Die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese.
- X. Die Nasionale Padnavorsingsinstituut.
- XI. Die Nasionale Instituut vir Waternavorsing.
- XII. Mediese Navorsing.
- XIII. Inligting en Spesiale Dienste.
- XIV. Gesubsidieerde Nywerheidsnavorsingsinstitute.

Die afsonderlike dele kan op versoek verkry word van:

Departement Inligting en Spesiale Dienste
W.N.N.R.
Posbus 395
PRETORIA
Unie van Suid-Afrika

C.S.I.R. ANNUAL REPORT

The Annual report of the South African Council for Scientific and Industrial Research is published in the following parts:

- I. General Review.
- II. The South African Bureau of Standards.
- III. The National Chemical Research Laboratory.
- IV. The National Physical Research Laboratory.
- V. The National Building Research Institute.
- VI. The National Institute for Personnel Research.
- VII. The National Institute for Telecommunications Research.
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- IX. The National Mechanical Engineering Research Institute.
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- XI. The National Institute for Water Research.
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The separate parts are available on request from:

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DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL I

ALGEMENE OORSIG

PART I

GENERAL REVIEW

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. BOX 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)

OPSPRAAKWEKKENDE W.N.N.R. UITVINDING / REVOLUTIONARY C.S.I.R. INVENTION



'n W.N.N.R.-uitvinding, die Tellurometer, wat tans in meer as vyftig lande gebruik word. Dit is 'n rewolusionêre afstandmetingsinstrument. Die Tellurometer is deur die Nasionale Instituut vir Telekommunikasie-navorsing ontwikkel. Dit word onder meer deur die V.S.A. se leer gebruik.

(foto: Charles Field)

A C.S.I.R. invention which is now used in more than fifty countries: the Tellurometer, a revolutionary instrument for the measurement of distance. The Tellurometer was developed by the National Institute for Telecommunications Research. Among its users is the United States Army.

(photo: Charles Field)

LEDELYS EN VERGADE- RINGS VAN DIE RAAD

Lede van die Raad op 31 Maart 1959, was:

| | |
|--------------------------------|--|
| Dr. S. M. Naudé | <i>President.</i> |
| Dr. F. J. de Villiers .. | <i>Organiserende Direkteur van Nywerheidsontwikkeling, Departement van Naturelesake.</i> |
| Dr. P. J. du Toit, F.R.S. | <i>Voorsitter van die Raad vir Wetenskaplike Navorsing in Afrika Besuide die Sahara en voormalige President van die W.N.N.R.</i> |
| Dr. T. Alty | <i>Prinsipaal en Vise-kanselier van die Rhodes-universiteit.</i> |
| Dr. B. Gaigher | <i>Kontroleur van In- en Uitvoer en Nywerheidsadviseur van die Departement van Handel en Nywerheid.</i> |
| Mnr. F. G. Hill | <i>Tegniese Bestuurder, Rand Mines Ltd.</i> |
| Dr. H. O. Mönnig | <i>Besturende Direkteur, Agricwa Laboratoria, Beperk, Voorsitter van die Adviserende Raad vir Wetenskaplike Beleid.</i> |
| Prof. S. F. Oosthuizen .. | <i>Voorsitter, S.A. Mediese Raad.</i> |
| Brig. J. H. Rauch | <i>Geneesheer-generaal, Unieverdedigingsmag.</i> |
| Mnr. P. E. Rousseau | <i>Besturende Direkteur, S.A. Steenkool-, Olie- en Gas-korporasie Beperk.</i> |
| Dr. G. C. Scully | <i>Direkteur, Union Whaling Co. Ltd., en die Dundee Coal Co. Limited.</i> |
| Prof. W. G. Sutton | <i>Prinsipaal, Universiteit van die Witwatersrand.</i> |
| Dr. H. J. van Eck | <i>Voorsitter en Besturende Direkteur, Nywerheidsontwikkelingskorporasie.</i> |
| Dr. R. W. Wilcocks | <i>Voorsitter van die Universiteitsadviesraad en voormalige Rektor van die Universiteit van Stellenbosch.</i> |
| Mnr. J. E. Worsdale | <i>Voorsitter en Besturende Direkteur, White's S.A. Portland Cement Co. Limited.</i> |
| <i>Sekretaris/Tesourier</i> .. | Mnr. A. J. Miller-Smit, B.A., M.Com. |

In die onderhawige tydperk is vier Raadsvergaderings gehou.

MEMBERSHIP AND MEET- INGS OF THE COUNCIL

Membership of the Council on 31st March, 1959, was:

| | |
|-------------------------------|---|
| Dr. S. M. Naudé | <i>President</i> |
| Dr. F. J. de Villiers .. | <i>Organizing Director of Industrial Development, Department of Native Affairs.</i> |
| Dr. P. J. du Toit, F.R.S. | <i>Chairman of the Council for Scientific Research in Africa South of the Sahara and former President of the C.S.I.R.</i> |
| Dr. T. Alty | <i>Principal and Vice-Chancellor of Rhodes University.</i> |
| Dr. B. Gaigher | <i>Controller of Imports and Exports and Industrial Adviser to the Department of Commerce and Industries.</i> |
| Mr. F. G. Hill | <i>Technical Manager, Rand Mines Ltd.</i> |
| Dr. H. O. Mönnig | <i>Managing Director, Agricwa Laboratoria Ltd., Chairman of the Advisory Council on Scientific Policy.</i> |
| Prof. S. F. Oosthuizen .. | <i>Chairman, S.A. Medical Council.</i> |
| Brig. J. H. Rauch | <i>Surgeon-General, Union Defence Force.</i> |
| Mr. P. E. Rousseau | <i>Managing Director, S.A. Coal, Oil and Gas Corporation Ltd.</i> |
| Dr. G. C. Scully | <i>Director, Union Whaling Co. Ltd. and the Dundee Coal Co. Ltd.</i> |
| Prof. W. G. Sutton | <i>Principal, University of the Witwatersrand.</i> |
| Dr. H. J. van Eck | <i>Chairman and Managing Director, Industrial Development Corporation.</i> |
| Dr. R. W. Wilcocks | <i>Chairman of the University Advisory Council and former Rector of the University of Stellenbosch.</i> |
| Mr. J. E. Worsdale | <i>Chairman and Managing Director, White's S.A. Portland Cement Co. Ltd.</i> |
| <i>Secretary/Treasurer</i> .. | Mr. A. J. Miller-Smit, B.A., M.Com. |

During the period under review four meetings of the Council were held.

Ledelys en Vergaderings van die Uitvoerende Komitee
Onderstaande was op 31 Maart 1959 lede van die Komitee:

Dr. S. M. Naudé (Voorsitter)
Dr. F. J. de Villiers, Dr. P. J. du Toit (met mnr. Worsdale, prof. H. O. Mönnig, prof. S. F. Oosthuizen en prof. W. G. Sutton as plaasvervangende lede sowel vir dr. De Villiers as vir dr. Du Toit).

Die Uitvoerende Komitee het ses vergaderings gehou.

Navorsingsadviesliggame

Navorsingsadvieskomitees is aangestel vir Mediese en Tandheelkundige Navorsing, Lugvaartkundige Navorsing, Bounavorsing, Chemiese Navorsing, Navorsing in verband met Inligting en Spesiale Dienste, met Meganiese Ingenieurswese, met Voeding, met Personeel, Fisiese Navorsing, en Pad-, Telekommunikasie- en Waternavorsing, benewens die Standaarderaad. Die Raad wil sy dank betuig aan die talle wetenskaplikes, ingenieurs en nyweeraars wat hul tyd opgeoffer het om in hierdie nasionale advieskomitees te dien en tot die leiding in verband met hul werksaamhede by te dra.

Membership and Meetings of the Executive Committee

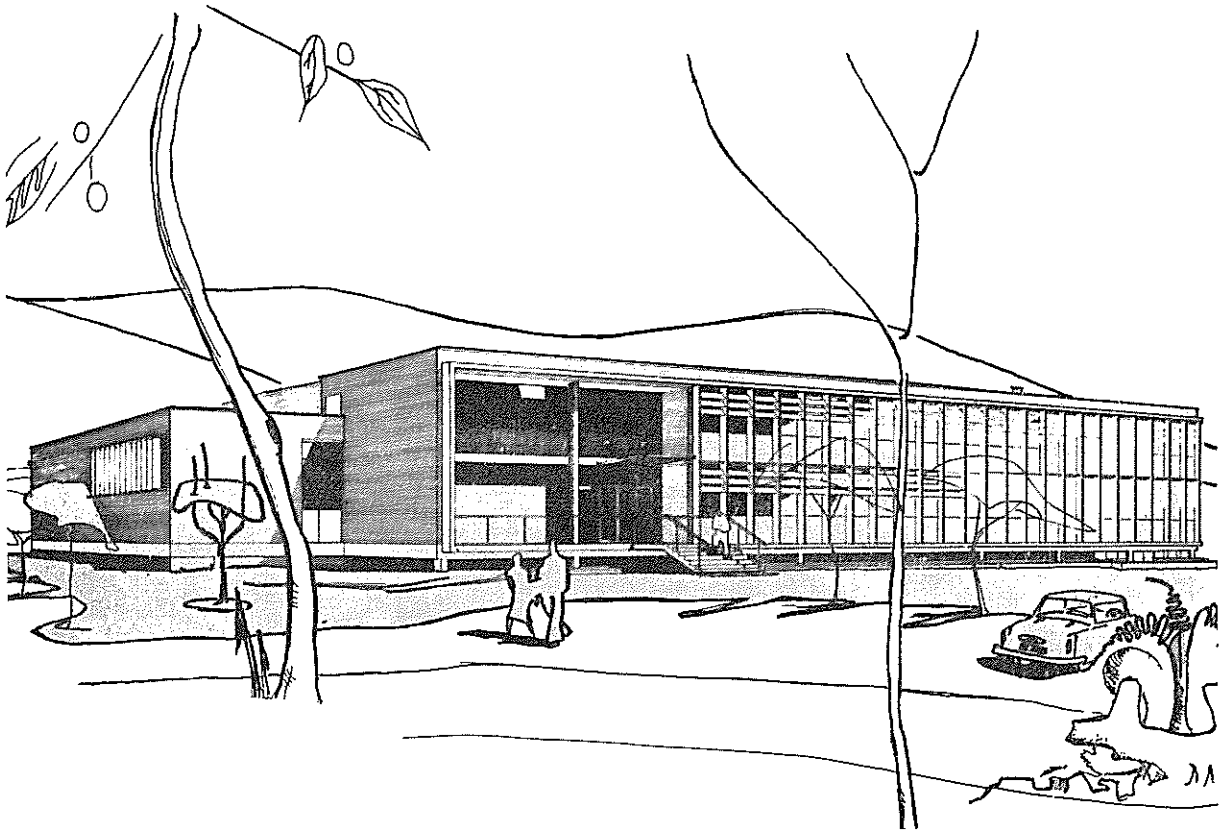
The membership of the Committee on 31st March 1959, was:

Dr. S. M. Naudé (Chairman)
Dr. F. J. de Villiers, Dr. P. J. du Toit (with Mr. Worsdale, Prof. H. O. Mönnig, Prof. S. F. Oosthuizen and Prof. W. G. Sutton as floating alternates to both Drs. de Villiers and du Toit).

The Executive Committee held six meetings.

Research Advisory Bodies

Research Advisory Committees were appointed for Medical and Dental Research, Aeronautical, Building, Chemical, Information and Special Services, Mechanical Engineering, Nutrition, Personnel, Physical, Road, Telecommunications and Water Research, in addition to the Standards Council. The Council wishes to express its thanks to the large number of scientists, engineers and industrialists who gave up their time to serve on these national advisory bodies and helped to guide their activities.



Scientia: Die Biblioteek

Scientia: The Library

ALGEMENE OORSIG

INLEIDING

In die vorige jaarverslag is gesê dat, hoewel veel reeds bereik is, nog meer gedoen kon gewees het as daar voldoende personeel beskikbaar was. Hierdie probleem bly voortbestaan; maar daarby kom nou nog 'n jaarlikse begroting wat al hoe ontoereikender word om die Unie in staat te stel om met oorsese neigings in die ontwikkeling en toepassing van die wetenskap tred te hou. Dit sou begryplik wees as die navorsing slegs kwaliteitsverbetering—miskien in luukse artikels, wat die land nouliks kon bekostig,—tot gevolg gehad het. Dit het egter geblyk dat die werk aan die W.N.N.R. nie alleen verbeterings nie, maar keer op keer ook besparings meebring, wat selfs die navorsingskoste oortref.

Omdat die voordele wat daaruit voortspruit, op menige gebied indirekte resultate lewer, kan geen balansstaat voorgelê word wat die volle omvang van hierdie besparing presies weergee nie. Volgens uiters konserwatiewe berekenings blyk egter dat die werklike bedrae wat as gevolg van die werk van die nasionale navorsings- en standaardlaboratoriums bespaar is, meer as die totale uitgawe in die afgelope 14 jaar aan die W.N.N.R. bestee, met ingebrip van die koste van sy geboue en toerusting, gedek het. Aangesien hierdie besparings grotendeels binne die afgelope paar jaar tot stand gebring is na mate die nuwe laboratoriums resultate begin afwerp het—die W.N.N.R. is een van die jongste navorsingsorganisasies in die wêreld—kan daar verwag word dat hulle in die jare wat voorlê, die jaarlikse onderhoudskoste van die W.N.N.R. ver sal oortref. *Daar word trouens geskat dat die berekenbare besparings vir ons land in die volgende boekjaar 'n paar keer die bedrag van die regeringstoekening sal behoop.*

Intussen kom sowel die regering as die nywerheid tot die besef dat die wetenskap vir hulle nie bloot 'n hulp is nie, maar dat dit reeds onontbeerlik geword het. Diegene wat vandag die onmisbaarheid van wetenskaplike kennis en tegniek wil betwis, word in 'n wêreld wat besig is om ongeduldig sy ontwikkelingstempo te verhaas, noodwendig agtergelaat. Te dikwels word aangevoer dat Suid-Afrika hom kan verlaat op navorsingsresultate wat uit die buiteland ingevoer word. Dit is 'n dwaalbegrip: ons plaaslike toestande is te verskillend. As ons ons nasionale vooruitgang op dieselfde peil as dié van die res van die wêreld wil hou, sal ons die wetenskaplike programme hier te lande moet versnel; en so 'n versnelling kan alleen deur 'n vermeerdering van ons geldmiddele en personeel bewerkstellig word.

Baie van die W.N.N.R. se bedrywighede bespaar sowel die regering as die nywerheid ontsaglike bedrae aan geld. Die besparings sal wel voortgaan, maar Suid-

GENERAL REVIEW

INTRODUCTION

In the last annual report it was stated that, though much had been achieved, more could have been done had sufficient staff been available. This problem continues; but to it must be added now an annual budget which is increasingly inadequate to ensure that the Union keeps pace with overseas trends in the development and application of science. This would be understandable were research to result in quality improvements only—in luxuries, perhaps, which the country was ill able to afford. It has been shown, however, that work at the C.S.I.R. effects not only improvements but, time and again, savings more substantial than the cost of the research itself.

Because of the many fields where benefits accrue as indirect results, it is not possible to present a balance sheet which shows, exactly, the full extent of this economy. The most conservative calculations, however, indicate that actual savings brought about as the result of work done in the national research and standards laboratories have more than covered the total amount spent over the past fourteen years on the C.S.I.R., including the cost of buildings and equipment. As these savings have been brought about for the most part within the last few years as results began to flow from the newly-established laboratories—the C.S.I.R. is one of the youngest research organizations in the world—it can be expected that in future years they will far exceed the annual costs of running the C.S.I.R. *Indeed, it is estimated that during the next financial year the measurable savings to the country will be several times the parliamentary grant.*

Meanwhile, both Government and Industry are discovering that science is no longer a matter of mere assistance to them—it has become an essential. Today, those who dispute the indispensability of scientific knowledge and techniques are inevitably left behind in a world of impatient ever-quickening development. Too often it is suggested that South Africa can rely on research results imported from overseas. This is a fallacy: local conditions differ too widely. Only by accelerating local scientific programmes can we hope to maintain sufficient national progress to keep up with the rest of the world. Only by increasing the wherewithal and staff can that acceleration be realized.

Many activities of the C.S.I.R. are saving both the Government and Industry an immense amount of money. These will continue, but South Africa cannot

Afrika kan nie verwag om die volle voordeel uit die wetenskap te trek terwyl sy begroting nie op die wins wat hom hopelik nog kan toeval nie, maar soos tans, op die uitgawes van vorige jare, gegrond word.

NAVORSING AAN DIE UNIVERSITEITE

Hierdie gebrek aan fondse is hoegenaamd nie tot die W.N.N.R. beperk nie: ook by die universiteite is daar 'n onvermoë om al die navorsing te finansier wat hulle behoort te doen as die huidige tekort aan opgeleide navorsers nie nog gevoeliger as tans moet word nie.

Moontlik is die voortdurende tekort aan begaafde jong wetenskaplikes gedeeltelik te wyte aan 'n onderwysstelsel wat self dringend hersien behoort te word. Dit word nog vererger deurdat talle van Suid-Afrikaanse gegradueerdes in die wetenskap deur beter beloning en die dikwels vir die wetenskaplike meer stimulerende toestande in ander dele van die wêreld, weggelok word. Sulke gegradueerdes gaan vir ons verlore en beter salarisse is nodig om hulle in Suid-Afrika te hou en miskien meer van hulle te werf.

Die W.N.N.R. word verantwoordelik gehou vir die toekenning van die fondse wat die Parlement elke jaar vir navorsing aan die universiteite stem. Die fondse aldus toegesê, het gestadig gestyg sedert die oprigting van die Raad in 1945, toe hy die Navorsingstoekenningsraad as die regering se vernaamste middel ter steuning van navorsing op die gebied van die natuurwetenskappe vervang het. In die afgelope jare het die Raad egter so in die verleentheid geraak dat hy al hoe meer aansoeke om steun vir verdienstelike navorsingsprojekte aan die universiteite weens gebrek aan fondse van die hand moes wys.

Gedurende die jaar is 'n bedrag van sowat £90,800 beskikbaar gestel om aan navorsers aan universiteite, museums, die S.A. Instituut vir Mediese Navorsing en 'n paar onafhanklike werkers toe te ken. Dit behels £19,400 vir navorsing op die gebied van die geneeskundige wetenskappe en £10,380 wat spesifiek vir werk in verband met die program van die Internasionale Geofisiese Jaar onderneem is. Daarbenevens is £230,900 aangewend om mediese navorsings-eenhede, wat meesal aan die universiteite werksaam is, te steun.

Die W.N.N.R. hoop om deur middel van hierdie toekennings te verseker dat senior wetenskaplikes van beproefde bekwaamheid in die geleentheid gestel word om op doeltreffende wyse navorsing voort te sit. Verder is sy doelwit 'n voldoende aantal jong manne en vroue wat in die navorsingstegniek opgelei, en met geesdrif vir navorsingswerk as loopbaan besiel is. Aan senior wetenskaplikes word hulp verleen om lopende uitgawes te dek en tegniese assistente in diens te neem. Soms word spesiale toerusting voorsien wat nie normaalweg in 'n universiteitslaboratorium te vinde is nie. Verskeie klasse beurse vir nagraadse

hope to reap the full benefits from science so long as its research budget is related not to the financial returns which are expected to accrue but, as at present, to expenditure in previous years.

RESEARCH IN THE UNIVERSITIES

This shortage of funds is by no means confined to the C.S.I.R.: the universities too find themselves unable to finance all the research they ought to be doing if the present shortage of trained research workers is not to become even more acute than it is at present.

It is possible that the continued shortage of gifted young scientists is due, in part, to an educational system which itself needs urgent revision. It is increased by the large proportion of South African science graduates who are attracted by better rewards and often more stimulating conditions available to scientists in other parts of the world. Such graduates are being lost and better salaries are needed to enable South Africa to retain them and, possibly, recruit more.

The C.S.I.R. is responsible for allocating the funds voted each year by Parliament in support of research in the Universities. Funds made available in this way have risen steadily since the establishment of the Council in 1945, at which time it superseded the Research Grant Board as the Government's principle instrument for the support of research in the natural sciences. In recent years, however, the Council has found itself in the embarrassing position of having to reject increasing numbers of applications for support of worthy research projects in the universities through lack of funds.

An amount of approximately £90,800 was available during the year for distribution to research workers at universities, museums, the S.A. Institute for Medical Research and a few independent workers. This included £19,400 for research in the medical sciences and £10,380 for grants awarded specifically for work undertaken under the International Geophysical Year Programme. In addition, £230,900 was applied to the support of medical research units, most of which operate at universities.

Through these grants, the C.S.I.R. hopes to ensure that senior scientists of proven ability are given the opportunity to continue research effectively. It also aims at an adequate supply of young men and women trained in research techniques and imbued with an enthusiasm for research as a career. Assistance to senior scientists is given to cover running expenses and to employ technical assistants. Special equipment, not normally available in university laboratories, is sometimes provided. Various categories of post-

navorsing is jaarliks aan jonger wetenskaplikes toegeken. Hierdie beurse word vir navorsing aan sowel Suid-Afrikaanse as buitelandse universiteite beskikbaar gestel.

Beurse vir oorsese studie word gewoonlik toegeken op voorwaarde dat die beurshouers na afloop daarvan na die Unie terugkeer. Veral interessant is 'n stelsel van beurse vir voorgeskrewe navorsing, wat die Raad in 1952 ingestel het. By sulke beurstoekennings het die Raad bepaalde gebiede gekies juis omdat hulle tot nog toe in Suid-Afrika oor die hoof gesien is en daar dus nie genoeg opgeleide navorsers was nie. So hoop die Raad om sy al te skamele wetenskaplike mannekrag in Suid-Afrika oor die belangrikste afdelings van die gebied van die wetenskap eweredig te versprei.

Met die groeiende belangstelling in die wetenskap wat hom tans aan Suid-Afrikaanse universiteite begin openbaar, word die bedrae wat die Raad tot hulle beskikking kan stel al hoe ontoereikender om hulle ontwikkeling te laat tred hou met die land se behoeftes en die ontwikkeling van navorsing aan die universiteite in die buiteland.

Die Raad wil aan die lede van die Subkomitee vir Navorsingstoekennings sy dank uitspreek vir hulle hulp by die toekenning van navorsingsbeurse op die gebied van die Fisika, Chemie, Biologie, Ingenieurswese (met inbegrip van Landmeting en Argitektuur), Geologie en Argeologie en die Geneeskundige Wetenskappe.

INTERNASIONALE BETREKKINGE TEN OPSIGTE VAN DIE WETENSKAP

In algemene sin bestaan die vooruitgang van die wetenskap in 'n toenemende voorkeur vir beproefde feite bo onbevoegde menings. Die al hoe groter rol wat die wetenskap in volksake speel, bring geleidelik redeliker denke en gesonder optrede mee. Ofskoon dit belangrik is om 'n besef van die al hoe belangriker rol wat die wetenskap in die alledaagse lewe speel, aan te wakker, is dit ook gebiedend dat dit op internasionale gebied ten volle erken word.

Ooglopende wetenskaplike prestasies word algemeen aangeneem as uitwendige teken van 'n volk se vooruitgang. Sulke ontwikkelings is egter geen logiese rede, soos sommige mense wil voorgee, waarom een land voorrang bo 'n ander geniet nie. In elk geval behou hy die voorrang slegs totdat soortgelyke ontdekkings elders gemaak word. Hoe groter die samewerking tussen volke en hoe groter hulle toewyding aan die wetenskap binne hulle landsgrense, hoe vinniger sal dergelyke ontdekkings gemaak word. Só sal die hele wêreld tot die grootste mate van stabiliteit geraak. Op dieselfde wyse werk die wisseling van gedagtes en vooruitgang op internasionale voet 'n vinniger ontwikkeling van beter, doeltreffender middels tot die aanpak van die alledaagse werk in die hand, en verminder dit die tyd wat verkwis word weens oorvleueling

graduate research bursaries have been awarded annually to younger scientists. These bursaries are available for research both at South African Universities and overseas.

Bursaries tenable overseas normally carry the proviso that the recipients return to the Union at the end of their tenure. Of particular interest is a system of directed research bursaries instituted by the Council in 1952. Under this scheme particular fields were selected by the Council because they had hitherto been neglected in South Africa and there were insufficient numbers of trained research workers. In this way the Council hopes to achieve a more balanced distribution of South Africa's all too slender resources in scientific manpower over the more important fields of science.

With the quickening interest in research which is now arising in South African universities, however, the sums which the Council can make available to them is becoming increasingly inadequate for them to develop in tune with the country's needs and the growth of research in universities overseas.

The Council expresses its appreciation to the members of the Research Awards Sub-Committees for their assistance in deciding on the allocation of research grants in the fields of Physics, Chemistry, Biology, Engineering (including Surveying and Architecture), Geology and Archaeology and the Medical Sciences.

INTERNATIONAL RELATIONS IN SCIENCE

Broadly speaking, the advance of science is the growth of preference for proven fact over that for unqualified opinion. Its increasing rôle in national matters is steadily producing more rational thinking and sounder action. While it is important to promote an increasing recognition for science in everyday affairs, it is imperative also that its potentialities in the international sphere be fully appreciated.

The more obvious scientific achievements are universally accepted as the outward sign of a nation's progress. But such developments are not, as some would have us think, logical reasons for the superiority of one country over another. Such superiority can, in any event, last only to the point where similar discoveries are reached elsewhere. The more co-operation there is between nations and the greater devotion to science within them, the faster such discoveries will be made. Thus will maximum stability be realized throughout the world. In the same way, the international exchange of ideas and progress permits the speedier development of better and more efficient means for tackling everyday tasks, and reduces time wasted through duplication of work anywhere in the world.

van werk op enige plek in die wêreld. Terselfdertyd moet die gees van samewerking en 'n gemeenskaplike doel noodwendig die goeie gesindheid en internasionale betrekings versterk.

Die W.N.N.R. word reeds meer as twaalf jaar lank sowel in Londen as in Washington deur wetenskaplike skakelbeampies verteenwoordig, wat ook as wetenskaplike adviseurs vir die hoofde van Suid-Afrikaanse diplomatieke sendings in dié sentrums optree. Sedert 1956 is nog 'n wetenskaplike skakelkantoor aan die Suid-Afrikaanse Ambassade in Keulen werksaam. Hy sorg vir algemene wetenskaplike skakelwerk met Sentraal-Europa.

Miskien is nog die vernaamste aspek van die jaar se bedrywighede in die kantoor te Washington die talle sake, sowel wetenskaplik as staatkundig van aard, wat dikwels oor kwessies van hoë politiek gegaan het, en gewoonlik noue samewerking met die Unie se diplomatieke verteenwoordigers in Noord-Amerika vereis het. Daar was, onder andere sake soos die aanname van beurse waarvoor die International Cooperation Administration of the U.S. State Department die geld voorsien; 'n uitnodiging aan die regering van die Verenigde State om 'n deskundige te stuur om die ontwikkeling van waterontsouting in Suid-Afrika te bestudeer; die verreikende ontwikkelings in die Verenigde State se wetenskaplike beleid wat gedurende die jaar plaasgevind het, soos byvoorbeeld die instelling van 'n Federal Council for Science and Technology; sake in verband met die voortsetting van die I.G.J.; toekomstige navorsing in Antarktika en ander sake in verband daarmee; sake aangaande die aanstelling van 'n wetenskaplike komitee vir Afrika suid van die Sahara deur die Verenigde State; die implikasies van kontraknavorsing in Suid-Afrika vir die Verenigde State se leër; die aanstelling van wetenskapsattachés vir die Verenigde State in die buiteland; bedrywighede in verband met beskermmiddels teen atoomenergie; die uitbreiding van die ooreenkoms met die V.S.A. ten opsigte van satellietwaarneming en die voorgestelde oprigting van 'n waarnemingspos vir ruimtevaartuie in verband daarmee. Altesaam is sowat honderd en vyftig tegnieke navrae en projekte gedurende die jaar behandel. Op dieselfde manier het die Raad se Londense kantoor 'n belangrike rol gespeel om samewerking in verband met wetenskaplike sake tussen die lande van die Gemenebes te vergemaklik.

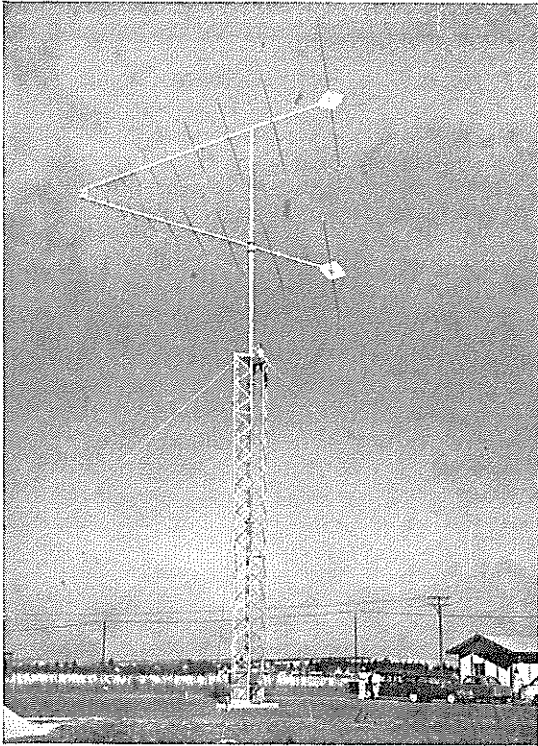
Daar is op feitlik elke gebied van die wetenskap 'n internasionale unie wat verkeer tussen deskundiges van verskillende lande vergemaklik en bevorder. Merendeels werk hierdie internasionale unies, in teenstelling met hulle politieke teenhangers, so glad en vriendelik saam, dat hulle selde of ooit in die koerant vermeld word, maar hulle maak nietemin heilsame middels tot internasionale samewerking uit. Suid-Afrika trek voordeel uit sy lidmaatskap van baie van hierdie unies deur bemiddeling van die W.N.N.R.,

At the same time, the spirit of co-operation and common purpose must, inevitably, strengthen goodwill and international relations.

The C.S.I.R. has been represented for over twelve years in both London and Washington by scientific liaison officers, who also act as scientific advisers to the heads of the South African diplomatic missions in those centres. Since 1956, a further scientific liaison office has operated at the South African Embassy in Cologne. This is responsible for general scientific liaison in central Europe.

Perhaps the most significant feature of the year's activities in the Washington office was the number of matters handled which were both scientific and political in character, often involving questions of high policy, and generally requiring close collaboration with the Union's diplomatic representatives in North America. Included in these are such matters as the acceptance of fellowships financed by the International Cooperation Administration of the U.S. State Department; an invitation to the U.S. Government to send an expert to study water demineralization developments in South Africa; the far-reaching developments which have taken place during the year in U.S. scientific policy such as the setting up of a Federal Council for Science and Technology; questions concerning the continuation of the I.G.Y.; future research in and other questions and matters involving the Antarctic; matters relating to the appointment of a U.S. scientific committee on Africa south of the Sahara; the implications of contract research in South Africa for the U.S. Army; the appointment of U.S. science attachés abroad; a number of activities concerning atomic energy safeguards; the expansion of the satellite tracking agreement with the U.S. and the proposed erection of a space-vehicle tracking station in association therewith. A total of about one hundred and fifty technical enquiries and projects were dealt with during the year. Similarly, the Council's London Office played a significant part in facilitating co-operation in scientific matters between Commonwealth Countries.

In almost every branch of science there is an international union which facilitates and fosters intercourse between specialists of different nations. For the most part these international unions, unlike their political counterparts, operate so smoothly and amicably that they rarely break into the news, but they are nevertheless effective instruments of international co-operation. South Africa benefits from its membership of a number of these unions through the agency of the C.S.I.R. which has set up a number of national committees and provides the necessary secretarial services. Of particular importance to South Africa are the Council for Scientific Research in Africa South of the Sahara (C.S.A.) and its political counterpart, C.C.T.A. (Commission for Technical Co-operation in Africa).



*Ontvangsantennes vir telemetriese seine van satelliete
Receiver aerial system for satellite telemetry signals*

wat 'n aantal nasionale komitees in die lewe geroep het en die nodige sekretariële diens verskaf. Besonder belangrik vir ons land is die Raad vir Wetenskaplike Navorsing in Afrika Besuide die Sahara (C.S.A.) en sy staatkundige teëhanger, C.C.T.A. (Kommissie vir Tegniese Samewerking in Afrika).

Die Internasionale Geofisiese Jaar

Die W.N.N.R. het 'n belangrike rol gespeel in die Internasionale Geofisiese Jaar wat in Julie 1957 begin het. Hy het die sekretariaat vir die Suid-Afrikaanse Nasionale Komitee voorsien en twee van sy laboratoriums het regstreeks deelgeneem aan die wêreld-program vir navorsing op die gebied van oseanografie en die studie van die ionosfeer. Die regering het toegestem dat £275,000 aan die Internasionale Geofisiese Jaar bestee word. Hiervan is die grootste gedeelte namens departemente deur inrigtings soos die Weerburo bestee, maar die Raad was behulpsaam met die toekenning van die fondse wat vir navorsing deur die universiteite in verband met die program gereserveer is, veral op die gebied van ionosferiese fisika, oseanografie en kosmiese strale. Die Raad verleen ook belangrike steun by die program vir satellietwaarneming.

The International Geophysical Year (IGY)

The C.S.I.R. was significantly involved in the International Geophysical Year which commenced in July, 1957. It provided a secretariat for the South African National Committee, and two of its laboratories participated directly in the world programme for research in the fields of oceanography and the study of ionosphere. The Government agreed to the expenditure of £275,000 on the International Geophysical Year. Most of this was spent departmentally by institutions such as the Weather Bureau, but the Council assisted in the allocation of the funds set aside for research undertaken by the universities in connection with the programme, particularly in the fields of ionospheric physics, oceanography and cosmic rays. The Council also provided major support for the satellite tracking programme.



Internasionale Geofisiese Jaar: die Transantarktiese Ekspedisie van die Statebond—die Suid-Afrikaanse verteenwoordiger en 'n lid van die Amerikaanse basis by die Suidpool

(Foto: Die Transantarktiese Ekspedisie)

International Geophysical Year: Commonwealth Trans-Antarctic Expedition—the South African Representative and a member of the American base at the South Pole

(Photo: The Trans-Antarctic Expedition)

Die vyfde vergadering van C.S.A.G.I. (*Comité Scientifique Année Geophysique Internationale*—Die Wetenskaplike Komitee vir die Internasionale Geofisiese Jaar) het besluit dat die werk van die I.G.J. nog 'n jaar lank, op soveel terreine as moontlik voortgesit word. Hierdie besluit is aangeneem deur die Internasionale Raad van Wetenskaplike Unies op sy vergadering in September 1958 in Washington gehou, waarop die Suid-Afrikaanse Wetenskaplike Skakelbeampte in Washington teenwoordig was.

Op aanbeveling van die Reëlingskomitee van die Suid-Afrikaanse Nasionale Komitee vir die I.G.J. word die grootste projekte van die Suid-Afrikaanse program, wat tydens die I.G.J. op tou gesit is, nog 'n jaar lank onder beskerming van die Internasionale Geofisiese Samewerking (1959) voortgesit.

Voortspruitende uit die I.G.J., het die Internasionale Raad van Wetenskaplike Unies vier organisasies ingestel om vir 'n onbepaalde tydperk met die werk in verband met sekere aspekte van geofisiese navorsing voort te gaan.

Suid-Afrika is een van twaalf ledevolke van die Spesiale Komitee vir Suidpoolnavorsing (SCAR). Sy doelwit is die voortsetting van navorsing op uitgebreide skaal in die Suidpoolstreek na die I.G.J. 'n Nasionale Komitee is onder voorsitterskap van die Direkteur van die Weerburo geskep. Twee Suid-Afrikaanse afgevaardigdes het die vergadering van SCAR in Canberra in Maart 1959 bygewoon en twee Suid-Afrikaanse weerkundiges was in November 1958 vir 'n tydperk van een jaar aan die Royal Society se Suidpoolbasis te Halleybaai verbonde.

Die Komitee vir Ruimtenavorsing (COSPAR) is geskep om ruimtenavorsing te koördineer. Suid-Afrika is gekies om drie jaar lank in die komitee te dien. Die Direkteur van die Nasionale Instituut vir Telekommunikasie-navorsing het in Maart 1959 'n vergadering van COSPAR in Den Haag bygewoon.

Die Spesiale Komitee vir Oseanografiese Navorsing (SCOR) is ingestel om oseanografiese navorsing op internasionale peil te koördineer en om veral 'n groot-skaalse opname van die Indiese Oseaan in 1961-62 te organiseer. Tot nog toe bestaan SCOR alleen uit wetenskaplike lede maar geen ledevolke nie.

STREEKSAANGELEENTHEDE

In Port Elizabeth het die hoof van die S.A.B.S. se takkantoor die sekretarisskap oorgeneem van die Streeksnavorsingskomitee van die Middellande, wat tans ook die Grensgebied verteenwoordig. Die komitee het nog steeds met ywer die plaaslike reëlings waargeneem om persoonlike kontak tussen die Raad se personeellede en plaaslike belange te bewerkstellig.

In Durban het die Natalse Streeksnavorsingskomitee hom op nuwe terrein begewe met die instelling

The Fifth Reunion of CSAGI (*Comité Scientifique Année Geophysique Internationale*—The Scientific Committee for the International Geophysical Year) resolved that I.G.Y. work should be continued for a further year in as many fields as possible. This resolution was accepted by the International Council of Scientific Unions at its meeting held in Washington in September 1958, which was attended by the South African Scientific Liaison Officer in Washington.

On the recommendation of the Steering Committee of the South African National Committee for the I.G.Y. major projects of the South African programme initiated during the I.G.Y. are being continued for a further year under the auspices of International Geophysical Co-operation (1959).

Arising out of the I.G.Y., the International Council of Scientific Unions established four organizations to continue certain aspects of geophysical research for an indefinite period.

South Africa is one of twelve member nations of the Special Committee on Antarctic Research (SCAR). Its purpose is to continue research at an increased level in the Antarctic after the I.G.Y. A National Committee under the Chairmanship of the Director of the Weather Bureau has been set up. Two South African delegates attended the SCAR meeting in Canberra in March 1959 and two South African meteorologists were attached to the Royal Society Antarctic base at Halley Bay in November 1958 for a period of one year.

The Committee on Space Research (COSPAR) was set up to co-ordinate space research. South Africa was elected to serve on the committee for three years. The Director of the National Institute for Telecommunications Research attended a meeting of COSPAR at The Hague in March 1959.

The Special Committee on Oceanographic Research (SCOR) was set up to co-ordinate oceanographic research at the international level and, in particular, to organize a large scale survey of the Indian Ocean in 1961-62. As yet SCOR consists only of scientific members with no National membership.

REGIONAL REPRESENTATION

In Port Elizabeth the head of the S.A.B.S. branch office has taken over the secretaryship of the Midland Regional Research Committee, which is now representative of the Border area as well. The committee continued to be very active in local arrangements for personal contact between members of the Council's staff and local interests.

In Durban the Natal Regional Research Committee broke new ground in South Africa in setting up an

van 'n Nywerheidsinligtingsentrum aan die Universiteit van Natal in samewerking met die Durbanse Openbare Biblioteek. Sowat 70 Natalse nywerheids-ondernemings dra deur die Natalse Kamer van Nywerhede tot die sentrum se onderhoud by.

NAVORSING VIR DIE NYWERHEID

Die Raad was nog altyd 'n voorstander van 'n koöperatiewe benadering tot navorsing van die kant van die nywerheid. Daarom steun hy jaarliks tot 'n bedrag van sowat £80,000, vyf wetenskaplike navorsingsinstitute wat hulle vir die leer-, verf-, vis-, suiker- en woltekstielbedryf beywer.

Nie al die nywerhede in Suid-Afrika is egter groot genoeg of behoorlik georganiseer om 'n volwaardige navorsingsinstituut te onderhou nie. Om in sulke gevalle te voorsien, het die Raad 'n beurskema ontwerp waarvolgens 'n firma of groep firmas gesamentlik as opdraggewers 'n navorsingsprojek in die Raad se laboratoriums laat uitvoer. Hiervoor word spesiale personeel in diens geneem en word die werk onder toesig van senior lede van die Raad se eie navorsingspersoneel verrig. In elke geval word 'n behoorlike ooreenkoms aangegaan, maar in die reël is die groep opdraggewers verantwoordelik vir die salarisse van die spesiale personeel wat aangestel word, terwyl die W.N.N.R. as sy aandeel die laboratoriumruimte tot hulle beskikking stel en toesig hou. Op dié manier kan navorsing op klein skaal begin word, sonder die onkoste aan die oprigting van 'n laboratorium verbonde. In sommige gevalle, veral waar 'n fabrikantevereniging die beurs steun, kan hierdie skema die kern vorm waarom 'n toekomstige navorsingslaboratorium geleidelik opgebou kan word as die vordering in die navorsingswerk dit regverdig.

Nog 'n manier waarop die Raad die nywerheid van diens kan wees, is om vertrouelike kontraknavorsingswerk vir afsonderlike firmas te doen. Hierdie werk het in die jongste tyd aansienlik vermeerder en die opbrengs wat uit kontrakte en beurse verkry word, bedra ongeveer 'n kwart van die Raad se totale begroting.

Die Nywerheidsnavorsingsinstitute: Hierdie organisasies publiseer in hul eie jaarverslae uitvoerige beskrywings van hul werk. Opsommings word in Deel XIV van hierdie verslag en hoogtepunte hieronder gegee.

Die Visnywerheidsnavorsingsinstituut het sy werk aan die preservering en hantering van vars vis in ys voortgesit. Verdoë is gerig om die gebruik van antibiotika wettig te maak, aangesien daar bewys is dat dit bederf deur bakterieë heelwat vertraag. Fundamentele ondersoek na die velflora van die Suid-Afrikaanse stokvis is voortgesit, daar is aandag geskenk aan die geweldige hoeveelheid sout wat die nywerheid vir gerookte vis en soutvis verbruik, en navorsing is

Industrial Information Centre at the University of Natal in co-operation with the Durban Public Library. Some 70 Natal industrial concerns are subscribing to the centre through the Natal Chamber of Industries.

RESEARCH FOR INDUSTRY

The Council has always been a strong advocate of the co-operative approach to research by Industry. It thus supports financially, to the tune of some £80,000 per annum, five industrial research institutes serving the Leather, Paint, Fishing, Sugar Milling and Wool Textile Industries.

Not all the industries in South Africa are, however, large enough or suitably organized to support a fully fledged research institute. To provide for such cases the Council has evolved a fellowship scheme, whereby a firm or group of firms can jointly sponsor a research project in the C.S.I.R. national laboratories. For this purpose special staff is employed, and the work is carried out under the supervision of senior members of the Council's own research staff. Appropriate agreements are drawn up in each case but, in general, the sponsoring group is responsible for the salaries of the special staff appointed, while the C.S.I.R. makes available the laboratory space and supervision as its contribution. In this way research can be started on a small scale without the expense of setting up new laboratories. In some cases, particularly where the fellowship is supported by an association of manufacturers, this scheme may provide a nucleus around which a future industrial research institute could be built up gradually should the progress of the research warrant it.

Another way in which the Council is able to assist Industry is to undertake confidential research on contract for individual firms. This work has increased considerably in recent years and the proceeds from contracts and fellowships account for approximately one quarter of the Council's total budget.

The Industrial Research Institutes: These organizations publish detailed descriptions of their work in their own Annual Reports. Summarized versions appear in Part XIV of this report, and highlights are given below.

The Fishing Industry Research Institute continued work on the preservation and handling of fresh fish in ice. Representations were made to legalize the use of antibiotics, which have been shown to substantially retard spoilage by bacteria. Fundamental investigations into the bacterial flora of South African hake were continued, some attention was given to the vast quantities of salt which are consumed by the smoked and salt fish industries, and research was done into fish

gedoen in verband met die vermindering van die visreuk by die vismeelbedryf. Aan die Afdeling Visserye is heelwat hulp verleen met hulle beplande stelsels vir die opsporing van merkplaatjies.

Aan die Navorsingsinstituut vir die Leernywerheid is heelwat fundamentele werk verrig i.v.m. die struktuur van gekondenseerde tannien (met wattellooistof as hoofdoel) en belangrike vordering is gemaak. Ander basiese ondersoeke omvat werk in verband met oplosbare proteïene van huide en velle en die oorsake van die verslegting van chroomleer wanneer dit met plantaardige looistof herlooi word. 'n Handboek vir die Suid-Afrikaanse huide- en vellenywerheid is voltooi; 'n leersoort wat lig in gewig is, is vervaardig om te konkurreer met die kunsstowwe vir skoensole en lugbagasie, en navorsing is gedoen in verband met die duursaamheid van mynwerkerstewels, veral in nat ondergrondse toestande. Die gebruik van die Instituut se „Liripuff“-proses vir die verstygwing van skoeneus en hak het hier te lande en in die buiteland uitgebrei en bring op sigself vir die verbruikers 'n groter besparing per jaar mee as die totale uitgawe aan navorsing van die N.I.L.N.

'n Uitgebreide werkprogram vir die uitwendige veroudering van verf aan die Verfnywerheidsnavorsingsinstituut het nou die ontledingstadium bereik, en die resultate word vergelyk met dié van die vasgestelde laboratoriummetode vir versnelde veroudering. Daar word ondersoek ingestel na die verbleik van pastelkleure en ook na die uitwerking van die jaargetye op die verslegtingstempo by verf.

Die belangrikste onderwerpe wat aan die Suikerfabrikasiënavorsingsinstituut bestudeer is, was die afsak van sap met kalk en verwarmede gemengde sap, die gehalte van die Natalse ru-suikersoorte, die verbetering van analitiese metodes en die verwydering van die kleur uit ru-suikeroplossings.

Die werk aan die S.A. Woltekstielnavorsingsinstituut is veral gekonsentreer op die spesiale prosesserings-eienskappe van die plaaslike wolskeersel; aandag is egter ook gewy aan die was van wol, die korrelasie van verwerking met spesifieke eienskappe van die ru-wol en vloeistowwe vir die merk van skape.

OORSIG VAN DIE RAAD SE NASIONALE NAVORSINGSLABORATORIUMS

(Uitvoering verslae word in Deel III-XI opgeneem)

Chemie

Suid-Afrikaanse navorsing in verband met waterontsouting deur elektrodialise het heelwat belangstelling in die buiteland gaande gemaak. 'n Groep mynmaatskappye laat in Welkom 'n installasie oprig, wat ontwerp is na aanleiding van die navorsing wat die Nasionale Chemiese Navorsingslaboratorium uitgevoer het, om daeliks drie miljoen gelling mynwater te

odour abatement in the fish meal industry. Considerable assistance was given to the Division of Fisheries in the recovery systems of their fish-tagging project.

At the Leather Industries Research Institute, much fundamental work was done on the structure of condensed tannins (with the wattle tannins as the main theme) and a major breakthrough was achieved. Other fundamental investigations included work on soluble proteins of hides and skins, and the causes of deterioration in chrome leather when retanned with vegetable tannins. A handbook for the South African hides and skins industry was completed, a light weighing leather was produced for competition with synthetics in shoe soles and air luggage, and research was done on the durability of miner boots, particularly under wet underground conditions. Use of the Institute's "Liripuff" process for stiffening toes and heels expanded locally and overseas and is by itself saving the consumer more per annum than the total expenditure of L.I.R.I. on research.

An extensive programme of work on the exterior ageing of paints at the Paint Industries Research Institute reached the analysis stage, and results are being compared with the established method of accelerated ageing in the laboratory. The fading of pastel shades is being investigated, as is the effect of the seasons on the deterioration rate of paint.

The principal subjects of study at the Sugar Milling Research Institute were the settling of limed and heated mixed juice, the quality of Natal raw sugars, the improvement of analytical methods and the removal of colour from raw sugar solutions.

At the South African Wool Textile Research Institute, work centred mainly around the special processing characteristics of the local clip, but attention was also given to the scouring of wool, the correlation of weathering with specific properties of the raw wool, and sheep branding fluids.

REVIEW OF ACTIVITIES IN THE COUNCIL'S NATIONAL RESEARCH LABORATORIES

(Detailed Reports are contained in Parts III-XI)

Chemistry

A great deal of overseas interest has been aroused by South African research into water demineralization by electro dialysis. At Welkom, a group of mining companies is commissioning a plant designed on the basis of research carried out by the National Chemical Research Laboratory to desalt three million gallons of minewater daily. Small modifications are being made

ontsout. Geringe wysigings word aangebring en wanneer die werk binnekort begin, sal dit as eerste betroubare leidraad dien tot die uitvoerbaarheid van elektrodialise op werklik groot skaal. Te Luderitz, waar die gemeenskap op die oomblik van gedistilleerde water afhanklik is, is daar omtrent ewe ver gevorder met 'n eenheid wat ontwerp is om drinkwater uit die see te verskaf. Die Administrasie van Suidwes finansier die projek.

In samewerking met die Departement van Landbou word 'n inrigting om brak water te ontsout by Upington geïnstalleer. Die plan is om daar te bepaal op watter punt die soutgehalte van water die lewe van die vee-stapel begin aantast. Die ontwikkelings op die ontsoutingsgebied het aanleiding gegee tot 'n hele aantal patente. Onder ander belangrike bysake is 'n metode om grafitelektrodes te maak, noemenswaardig.

'n Nuwe proses om spore van sesium te verwyder, is gepatenteer. Vir die atoomenergie-bedryf is dit van groot potensiele belang omdat radioaktiewe sesium by uraansplitsing gevorm word en, as dit verwyder kan word, kan dit as stralingsbron gebruik word. Ontwikkeling van die proses op groter skaal word met die Atomic Energy Research Establishment te Harwell, Engeland bespreek.

Navorsing na plantgif, wat in samewerking met die Departement van Landbou uitgevoer word, het tot gevolg gehad die isolering van chemiese stowwe wat „gousiekte” in skape veroorsaak. Daar word nastig gesoek na die oorsaak van „geeldikkop” wat swaar verliese onder skape veroorsaak.

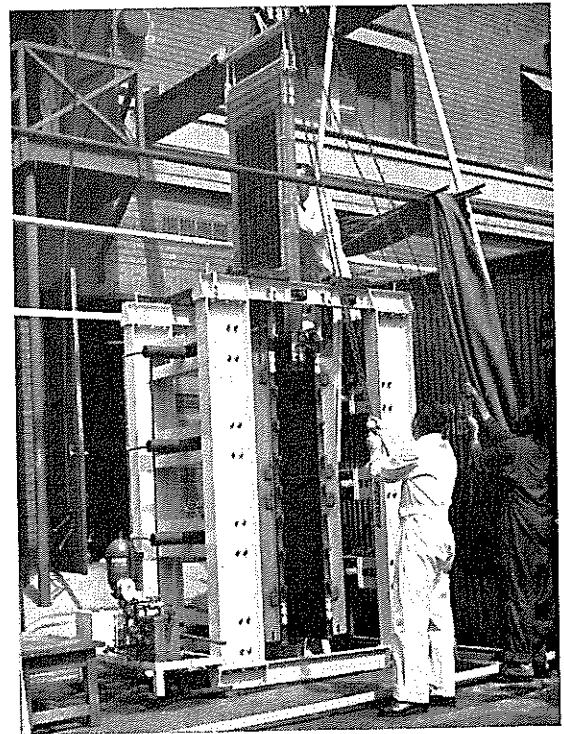
Pogings om chemiese navorsing in verband met so veel moontlik van die vernaamste produkte te doen wat die grondslag van die Suid-Afrikaanse nywerheid vorm, is steeds volgehou. Nuwe beurstoekennings wat ingestel is, was onder andere dié van 'n Amerikaanse farmaseutiese firma (om na stowwe te soek in Suid-Afrikaanse plante wat geneeskundige waarde het), dié van die Cape Distilling Merchants' Association (om probleme in verband met wyn en spiritualieë te bestudeer) en nog 'n beurs van die Superwhite Kaolin Corporation (om kaolienneerslae in die Kaapse en Noordwestelike gebiede te bestudeer).

Een van die uitstekende resultate wat uit reeds bestaande beurstoekennings voortgevloei het, was aanbevelings by munisipale bierbrouers in sake maatreëls vir kostebesparing waarby terselfdertyd beter kafferbier gemaak kan word. In gevalle waar hierdie maatreëls toegepas is, het hulle nie alleen prakties geblyk nie, maar ook goed geslaag.

and when operation commences shortly, it will provide the first reliable guide to the feasibility of electro-dialysis on a really large scale. A unit designed to provide drinking water from the sea is in a similar stage of development at Luderitz, where this community is at present dependent on distillation. The project is financed by the Administration of South West Africa.

In collaboration with the Department of Agriculture, an installation to desalt brack water is being set up at Upington, where it is intended to determine the point at which saltness of water affects the life of stock. Developments in the desalting field resulted in a number of patents. Notable among side-issues is a method for making graphite electrodes.

A new process for removing traces of caesium was patented. This is of great potential interest to the atomic energy industry, as radioactive caesium is formed in the fission of uranium and, if removed, can be used as a source of radiation. Larger scale development of the process is the subject of discussions with the Atomic Energy Research Establishment at Harwell, England.



Nasionale Chemiese Navorsingslaboratorium: Voorlopige montering van Elektrodialise-apparaat vir die ontsouting van seewater te Luderitz

National Chemical Research Laboratory: Preliminary assembly of Electro-dialysis Plant for Sea Water Desalting at Luderitz

In die studie van die mikrobiologiese chemie van wyn, is daar goed gevorder met die vasstelling van die oorsake van troebelheid in wyn in bottels.

Fisika

Suid-Afrikaanse wetenskaplike ontwikkeling het 'n nuwe mylpaal bereik met die installering van die nuwe elektroniese rekenoutomaat *Zebra* in die Nasionale Fisiese Navorsingslaboratorium. Die inrigting is hoofsaaklik bestem vir gebruik deur die W.N.N.R., maar dit word ook beskikbaar gestel vir gebruik deur buite-organisasies. Hopelik sal *Zebra* die kern vorm vir die opleiding van getalleanaliste en rekentegnoloë.

As gevolg van die ontwikkeling en navorsingswerk deur die Nasionale Fisiese Navorsingslaboratorium namens die Raad op Atoomkrag, moes daar radio-metriese middels ontwikkel word om 'n erts met 'n mengsel van uraan en torium, wat natuurlike uitloging ondergaan het, te analiseer. In die loop van die vyf-jarige kontrak wat nou afgeloo het, is metodes ontwikkel wat belangrike voordele bo die gewone radio-chemiese metodes bied.

Die laboratorium het spesiale pogings aangewend om die toepassing van radio-isotope in navorsing en die nywerheid aan te moedig en die Afdeling Radioaktiwiteit het heelwat vooruitgang gemaak.

Radioaktiewe neerslag weens proefontploffings is by sewe poste in Suidelike Afrika en Marioneiland gemeet. Die resultate dui aan dat die neerslag in vergelyking met straling wat in die natuur voorkom, uiters gering is. Hierdie werk is uitgevoer as deel van die program vir die Internasionale Geofisiese Jaar en word voortgesit omdat dit reeds sulke belangrike gegewens opgelewer het.

Om straling uit spektrochemiese ligbronne te bestuur, is 'n stelsel ontwikkel wat spektra op 'n tydsbasis indeel. Sekere aspekte van hierdie werk kan as baanbrekerswerk beskou word.

Uiters bevredigende resultate is verkry in verband met die ontwikkeling van metodes om glas vir spesiale lensstelsels te kies.

In noue samewerking met die Bernard Price Institute of Geophysics, het die N.F.N.L. se Geochronologiese Groep erkenning verwerf vir sy studie oor die ouderdom van geologiese stelsels in Afrika; daarmee lewer

Research into plant poisons, which is being carried out in collaboration with the Department of Agriculture, resulted in the isolation of chemical substances from plants responsible for "Gousiekte" in sheep. Concentrated efforts are being made to discover the cause of "Geeldikkop", which results in heavy sheep losses.

Consistent endeavours have been made to initiate chemical research into as many as possible of the main products upon which South African industry is based. New fellowships established included that of an American pharmaceutical firm (to search for substances of medicinal value in South African plants) one by the Cape Distilling Merchants' Association (to study problems concerned with wine and spirits) and another by the Superwhite Kaolin Corporation (to study kaolin deposits in the Cape and North Western areas).

Prominent among results in the older-established fellowships were recommendations to municipal brewers on ways to reduce cost and at the same time produce a better kaffir beer. In cases where these measures have been applied they have proved both practical and successful.

Studies on the microbiological chemistry of wine made considerable advances into the causes for turbidity in bottled wines.

Physics

A milestone in South African scientific development was reached when the new electronic computer *Zebra* was installed in the National Physical Research Laboratory. The unit is intended primarily for the use of the C.S.I.R., but will be available for use by outside organizations. It is hoped that *Zebra* will form the nucleus for the training of numerical analysts and computation technologists.

As a result of development and research work undertaken by the National Physical Research Laboratory on behalf of the Atomic Energy Board, it became necessary to evolve radiometric means for analysing mixed uranium—thorium ore which had undergone natural leaching. During the term of the five year contract, which has now been completed, methods were developed which have important advantages over conventional radiochemical procedures.

The Laboratory made special efforts to stimulate the application of radio-isotopes in research and industry, and much progress was made by the Division of Radioactivity.

Radioactive fall-out due to test explosions was measured at seven stations in Southern Africa and Marion Island, the results indicating that the fall-out is very slight in comparison with radiation which occurs in nature. This work was carried out as part of the programme for the International Geophysical Year and is being continued because of the important data yielded.

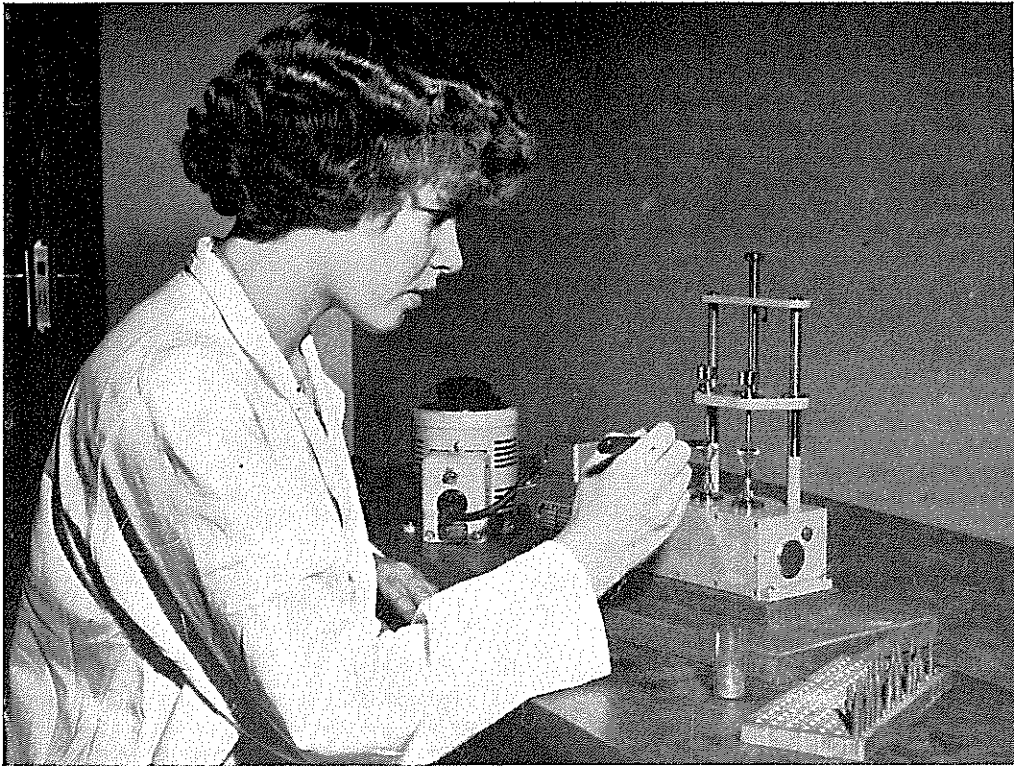
hy 'n belangrike bydrae tot die ontwikkeling van die geologiese wetenskap.

'n Personeelid het 'n uitnodiging ontvang om lid te word van 'n klein „Deskundige Komitee vir Omgewingsanitasie” en om een van die ses verslae wat voorgelê moet word, op te stel. Werk wat in samewerking met die gesondheidsafdelings van sekere groot stede uitgevoer is, het 'n onrusbarende mate van lugbesoedeling aan die dag gebring. Dit word nodig dat die owerhede betyds in verband hiermee optree.

To study radiation from spectrochemical light sources, a system was developed which divides spectra on a time basis. Certain aspects of this work can be regarded as pioneering.

Very satisfactory results have been achieved in developing methods of selecting glass for special lens systems.

Working in close co-operation with the Bernard Price Institute of Geophysics, the N.P.R.L. Geochronological Group gained recognition for its studies on the age of geological systems in Africa and is making a valuable contribution to the development of geological science.



Nasionale Fisiese Navorsingslaboratorium: Die „Elpac”-masjien wat in die laboratorium ontwikkel is om gepoeierde monsters in hol katodes in te pak vir spektrochemiese analise

National Physical Research Laboratory: The „Elpac” machine developed in the Laboratory for the packing of powdered samples in hollow cathodes for spectrochemical analysis

Telekommunikasies

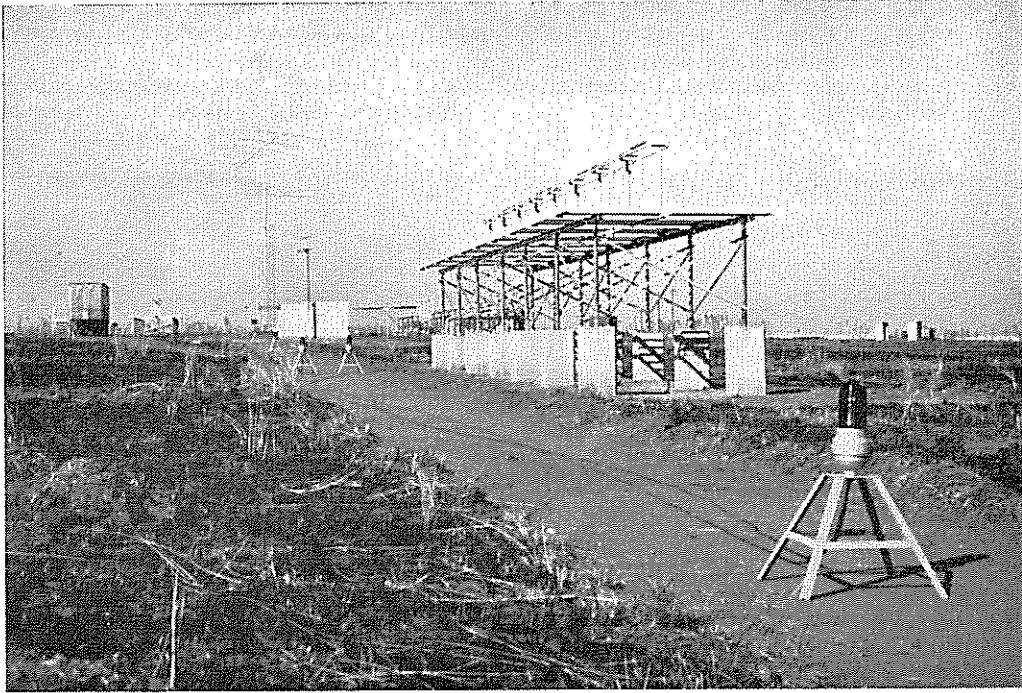
Navorsing van die kosmiese ruimte het in die jaar aansienlik uitgebrei en ruimtepeilings verteenwoordig 'n besondere stadium in wetenskaplike en tegnologiese ontwikkeling.

A member of staff was invited to become a member of a small “Expert Committee on Environmental Sanitation” and to prepare one of six reports on air pollution to be submitted to it. Work carried out in collaboration with the health departments of certain large cities revealed an alarming degree of air pollution. This will need timely attention from the authorities.

Danksy sy geografiese ligging, kon Suid-Afrika 'n belangrike rol in hierdie proewe speel. Optiese en radiowaarnemingstelsels is opgerig om die kunssatelliete sekuur te volg en seine daarvandaan deur afstandsmeting te registreer. Regverdiging vir deel-

Telecommunications

Research into cosmic space has increased considerably during the year and the launching of artificial satellites and space probes represents an outstanding stage in scientific and technological development.



*Nasionale Instituut vir Telekommunikasienavorsing:
„Minitrack”—pos vir satellietvolging*

*National Institute for Telecommunications Research:
“Minitrack” Satellite Tracking Station*

name aan hierdie werk is deels geleë in die praktiese langtermynaangeleenthede wat op die spel is en die ondervinding wat in verwante tegnieke opgedoen word en deels in die belange van internasionale samewerking in een van die grootste proefnemings van alle tye. Onder die langtermynaangeleenthede wat vir Suid-Afrika van besonder belang moet wees, is die uitstekende moontlikhede van interkontinentale verbinding en televisie wat ongetwyfeld mettertyd deur middel van satellietstasies moontlik gemaak sal word en die moontlikheid van wêreldwye weerkundige waarnemings wat van groot belang sal word wanneer die mens die vermoë bekom om die weer, en veral die reënval te wysig.

Die Nasionale Instituut vir Telekommunikasienavorsing was belas met die onderhoud en werking van 'n uiters presiese radiowaarnemingstelsel. Die stelsel

By virtue of its geographical situation, South Africa has been able to play an important part in these experiments. Optical and radio tracking systems were established for the precise tracking of the artificial satellites and for the recording of telemetered signals from the satellites. Justification for participation in this work lies partly in the long term practical issues at stake and in the experience gained in the associated techniques, and partly in the interests of international co-operation in one of the greatest experiments of all time. Among the long term issues which must be of particular interest to South Africa are the striking possibilities of intercontinental communication and television that will undoubtedly be made possible in due course by satellite relay stations, and the possibility of world wide meteorological observations which may become of great importance when man acquires the ability to modify the weather, in particular the rainfall.

staan bekend as Minitrack en is vroeg in 1958 te Esselenpark naby Johannesburg geïnstalleer. Die Verenigde State se Vlootnavorsingslaboratorium het die Minitrack ontwikkel. Dit is 'n uiters akkurate interferometerstelsel. Die pos te Esselenpark het 'n besonder belangrike rol in die eerste stadiums van die Verenigde State se satellietprogram gespeel, aangesien dit die eerste pos is waaroor die satelliete trek nadat hulle van Kaap Canaveral gelanseer word. Verder is dit een van slegs twee poste van hierdie tipe buite die vasteland van Amerika. Tot dusver is reeds ses satelliete gevolg en meer as 1,000 presiese waarnemings gedoen. Onlangs het verbeterde verbindings dit moontlik gemaak om satellietwaarnemings feitlik sonder versuim na die beheersentrum in Washington aan te stuur.

Gedurende die Internasionale Geofisiese Jaar het die Nasionale Instituut vir Telekommunikasienavorsing hom veral op die onderste lae van die atmosfeer toegelê. In 1958 is waarnemings van verskeie tipes ononderbroke gedoen. Op hierdie gebied is die bepaling van die mate van absorpsie wat radiogolwe in radiokommunikasie oor lang afstande ondervind, van besonder praktiese belang. Hierdie absorpsie kom feitlik uitsluitlik in die ionosfeer voor. Beter kennis van die omvang van hierdie uitwerking en die aard van die prosesse wat daarby betrokke is, en die vermoë om die omvang van hierdie uitwerking enigszins akkuraat te kan voorspel, sal die betroubaarheid van radioverbindings oor lang afstande verhoog. Meer doeltreffende beplanning in hierdie opsig sal bydra om die aantal beskikbare verbindingskanale te verhoog, veral daar die bestaande kanale al hoe drukker beset raak. Hierdie ophoping kan in die nabye toekoms ernstige beperkings op hoëfrekwensieradioverbindings lê omdat die aantal beskikbare verbindingskanale gedurende die eersvolgende sonvlekminimum (wat oor vyf of ses jaar ver wag word) deur natuurlike gevolge tans buite die mens se beheer heelwat verminder sal word.

'n Interessante gevolgtrekking uit die bestudeerde resultate is dat die absorpsie meestal baie naby die terugkaatsingshoogtepunt voorkom en nie in veel laer gebiede nie, soos daar geruime tyd reeds gemeen is.

Meganiese Ingenieurswese

Met die oog op 'n opname van die gieterysand wat in die Unie te verkry is en 'n ondersoek na die geskiktheid daarvan vir gietwerk is 'n beurs vir gieterysandnavorsing gestig in opdrag van die Institute of British Foundrymen (Suid-Afrikaanse tak) namens 39 bydraende gieterye. Die gieterybedryf het bewus geword van die behoefte om omvangryke gegewens oor grondstowwe uit Suid-Afrika afkomstig, in te win.

The National Institute for Telecommunications Research has been responsible for the maintenance and operation of a radio tracking system of very high precision. This system is known as Minitrack and was installed early in 1958 at Esselen Park near Johannesburg. Minitrack was developed by the United States Naval Research Laboratory and is an interferometer system of extreme accuracy. The Esselen Park station played a particularly important part in the early stages of the United States satellite programme as the station is the first over which satellites pass after launching from Cape Canaveral. In addition, it is one of only two stations of this type outside the continent of America. Six satellites have been tracked to date and over 1,000 precise observations have been made. Recently, improved communications have made it possible for the satellite observations to be passed with almost no delay to the control centre in Washington.

During the International Geophysical Year the National Institute for Telecommunications Research concentrated in particular on the lower regions of the atmosphere. Experimental observations of several different types were made on a continuous basis during 1958. Of particular practical importance in this field is the determination of the amount of absorption experienced by radio waves in long distance radio communications. This absorption is experienced almost entirely in the ionosphere. A better knowledge of the magnitude of this effect and the nature of the processes involved, and the ability to predict its magnitude with some accuracy, will increase the reliability of long distance radio communications. By more efficient planning it will help to increase the number of available communications channels, especially since existing channels are becoming increasingly more congested. This congestion may in the near future impose a very serious restriction on high frequency radio communications, because during the next sunspot minimum (which is expected in five or six years' time) the number of available communication channels will be greatly reduced by natural effects which are at present outside man's control.

An interesting conclusion from the results studied is that most of the absorption occurs very close to the height of reflection and not in much lower regions as was for some time generally believed.

Mechanical Engineering

To survey foundry sands available in the Union and to investigate their suitability as moulding materials, a foundry sand research fellowship was established, being sponsored by the Institute of British Foundrymen (South African Branch), on behalf of 39 subscribing foundries. The Foundry Industry has felt the need to obtain comprehensive data on raw materials of South African origin. The basic aim of this project is, therefore, the more efficient usage of local sands and

Die gronddoel van hierdie projek is dus die doeltreffender gebruik van ons land se eie sand- en materiaalsoorte vir gietvorms, met 'n daaropvolgende verbetering in die gehalte van die gietstukke wat gemaak word. Die werk word uitgevoer deur 'n beurshouer in die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese. Die jaarlikse koste van hierdie projek sal sowat £2,500 beloop.

Werk namens 'n fabrikant van draadtoe beoog die vaststelling van die relatiewe vermoeidheidsweerstand van verskillende draadtoeontwerpe. Aangesien korrosie, vermoeidheid en slytasie 'n belangrike probleem is waarvoor die mynbedryf te staan kom, sal die resultate wat verkry is uit 'n ondersoek na die vermoeidheid van draad en draadtoe, bydra tot groter betroubaarheid en veiligheid in mynwerk. Die totale koste van die navorsingswerk word op £20,000 geskat.

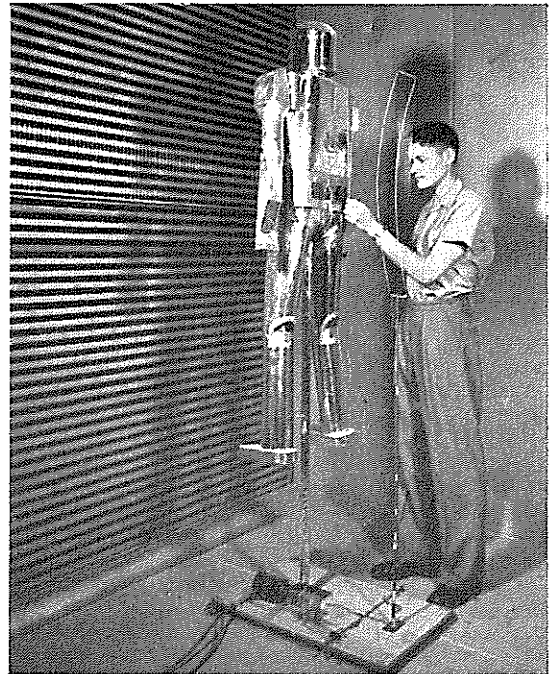
Navorsing word op die oomblik vir die Transvaalse en Vrystaatse Kamer van Mynwese onderneem om die meganisme van rotsbarstings in mynwerk vas te stel en middels te vind om die veelvuldige voorkoms en strafheid daarvan te verminder. Die belangrikheid van hierdie werk vir die verskillende produserende goudmyne spreek vanself. Rotsbarstings veroorsaak nie alleen oponthoud in die mynwerk en daardeur geldelike verlies nie, maar kan ook tot verlies aan lewens lei en 'n ongunstige uitwerking op die moreel van die mynwerkers hê.

'n Begin is gemaak met die werk aan die ontwikkeling van 'n gasturbine-stelsel wat Suid-Afrikaanse steenkool as brandstof gebruik. Aangesien Suid-Afrika 'n land met betreklik groot dor streke is, is die ontwikkeling van 'n gasturbine, met steenkoolbrandstof, as dryfwerktuig wat nie van watertoevoer afhanklik is nie, van groot belang, veral as die installerings- en onderhoudskoste laag is. As voorbeeld van die potensiele ekonomiese voordeel van die gasturbine kan genoem word die feit dat die brandstofkoste vir elektrisiteitsontwikkeling deur 'n dieselenjin in 'n installasie van 1,500 kilowatt sowat 1.28 pennie per kilowatt-uur beloop as dit bereken word teen 'n koste van 2 sjielings per gelling dieselbrandstof, in teenstelling met 0.27 pennie per kilowatt-uur wanneer 'n gasturbine met steenkoolbrandstof, teen 'n koste van 20 sjielings per ton, gebruik word. Aangesien dit skoon, rookloos, betreklik goedkoop en onafhanklik van watertoevoer sal wees, sal die gasturbine met steenkoolbrandstof ook vir lokomotiewe 'n uiters begerlike eenheid uitmaak.

moulding materials, with a consequent improvement in the quality of the castings produced. The work is being carried out by a fellow in the National Mechanical Engineering Research Institute. The annual costs of this project will amount to about £2,500.

Work on behalf of a wire rope manufacturer aims at establishing the relative fatigue strengths of various designs of wire ropes. Since the replacement of wire ropes because of corrosion, fatigue and wear, is an important problem with which the mining industry is faced, it is obvious that the results obtained from the fatigue investigation on wire and wire ropes will contribute towards greater reliability and safety in mining operations. The total cost of the research project is estimated at £20,000.

The object of research currently being undertaken for the Transvaal and Orange Free State Chamber of Mines is to establish the mechanism of rockbursts in mining and to find means of reducing their frequency and severity. The significance of this work to the various



Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese: 'n Pop op volle skaal, met al sy litte en op liggaamswarmte gebring, waarmee proewe gedoen word om die warmte wat die menslike liggaam deur konveksie aan die omgewing afgee, te bepaal

National Mechanical Engineering Research Institute: A full-scale, articulated, heated model of a man used to study the extent to which a body loses heat to its environment by convection

Die Suid-Afrikaanse Spoorweë en Hawens het hulle sterk belangstelling getoon deur 'n bedrag van £5,000 by te dra tot die ontwikkeling van so 'n eenheid.

Bounavorsing

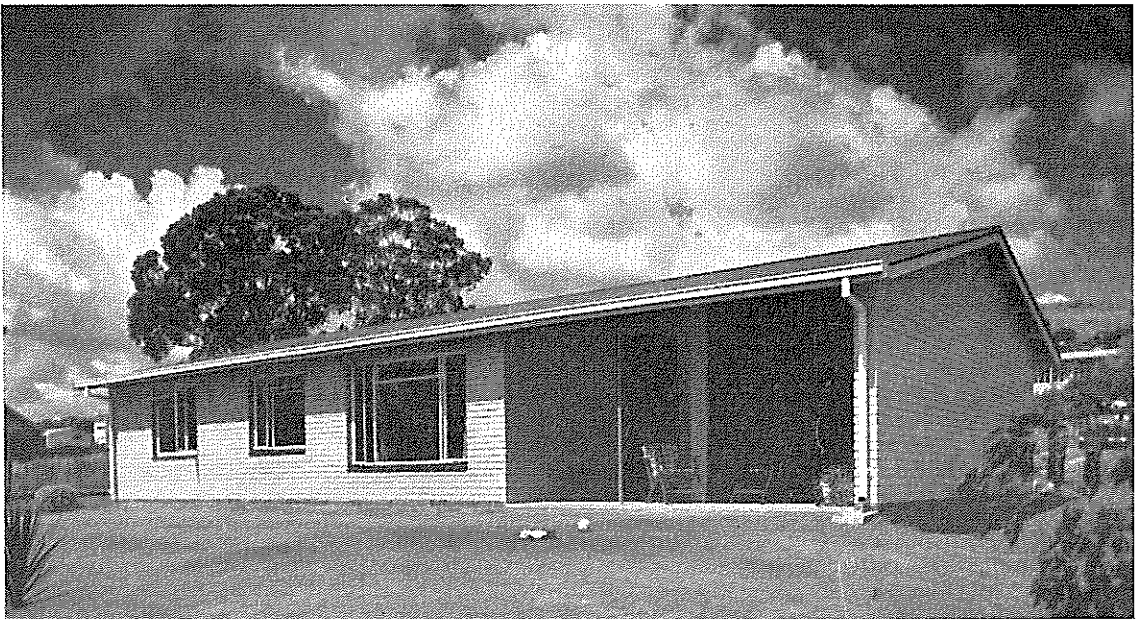
In alle dele van Afrika bly die voorsiening van toereikende behuising op groot skaal in goed beplande dorpe 'n groot probleem. Die Nasionale Bounavorsingsinstituut moedig nog steeds die vrye wisseling van kennis en sienswyses oor behuising aan, veral oor goedkoop behuising vir die toestande in Afrika. Hulp is verstrekkend in verband met die organisasie van die Interafrikaanse Konferensie oor Behuising en Dorpsbeplanning wat deur die Kommissie vir Tegniese Samewerking in Afrika suid van die Sahara (C.C.T.A.) gereël en gedurende Januarie 1959 in Nairobi gehou is. Elf personeellede het verhandelings voorgedra. Gunstige kommentaar is gelewer oor Suid-Afrika se prestasies ten opsigte van goedkoop behuising en veral oor die werk van die N.B.N.I. Dit het duidelik geblyk dat baie van die Instituut se werk 'n diepgaande invloed op die denke aangaande die boupraktyk in baie dele van Afrika uitgeoefen het. Uit korrespondensie het geblyk dat ander lande van die wêreld baie belang stel in die N.B.N.I. se behuisingnavorsing.

producing gold mines is obvious. Rockbursts not only cause delay in mining operations and hence financial losses, but may also lead to loss of life and hence produce an adverse effect on the morale of the miners.

Work on the development of a gas turbine combustion system using South African coal as fuel was started. Since South Africa is a country with relatively large arid areas, the development of a coal-burning gas turbine as a prime mover independent of water supply is of great importance, particularly as the installation and maintenance costs are low. To illustrate the potential economical advantage of the gas turbine it may be mentioned that the fuel costs for generating electricity by a diesel engine on a 1,500 kilowatts plant is of the order of 1.28 pence per kilowatt-hour based on a fuel cost of 2 shillings per gallon diesel fuel as against 0.273 pence per kilowatt-hour when employing a coal-burning gas turbine at a coal cost of 20 shillings per ton. Since it will be clean, smoke free, relatively cheap and independent of water supply, the coal-burning gas turbine also forms a very attractive unit for locomotives. The South African Railways and Harbours demonstrated their keen interest by donating a sum of £5,000 towards the development of such a unit.

Building

The provision of adequate housing on a large scale in well-planned towns remains a major problem in all



Nasionale Bounavorsingsinstituut: Proefwoning (drie slaapkamers) teen geringe boukoste, vir blankes, by Meyerspark, Pretoria

National Building Research Institute: Experimental low-cost house (three bedrooms) for Europeans, erected at Meyers Park, Pretoria

Behuisingsnavorsing is uitgebrei tot minimum huisontwerpe vir blankes, behuising vir oues van dae en goedkoop behuising geskik vir die Kleurlinggemeenskap in Kaapland en die Indiërgemeenskap in Natal. Die werk word in opdrag van die Nasionale Behuisingskommissie uitgevoer.

Onlangse neigings in die boubedryf wys op 'n arbeidstekort in die toekoms en gedurende die jaar het die Raad se Advieskomitee vir Bounavorsing 'n subkomitee aangestel om middels te oorweeg waardeur die arbeidsaangeleentheid verbeter kan word. Die belangrike probleme is werwing en opleiding vir die geskoolde bou-ambagte, die toevoer van ongeskoolde arbeiders en die onderlinge bedrywigheid van geskoolde en ongeskoolde arbeid met betrekking tot moderne neigings tot meganisasie.

Die moontlikhede van navorsing na die wegdoen met rioolvuil en afvalwater vir klein gemeenskappe het sowel in die Unie as in die Federasie van Rhodesië en Njassaland heelwat belangstelling gaande gemaak. Dit het geblyk uit 'n ondersoek wat aan die lig gebring het dat organisasies wat vir sulke opruimingskemas verantwoordelik is met baie probleme te kampe het en dat heelwat besparing deur 'n bevredigende oplossing daarvan tot stand gebring kan word. Daar is aanduidings dat die W.N.N.R. goeie geldelike steun ten opsigte van hierdie navorsing kan verwag.

Nuwe projekte op die gebied van grondmeganika behels onder andere die opstel van 'n handboek oor die

parts of Africa. The National Building Research Institute continues to encourage the free exchange of knowledge and views concerning housing, particularly low-cost housing for African conditions. Assistance was given in organizing the Inter-African Conference on Housing and Urbanisation arranged by the Commission for Technical Co-operation in Africa south of the Sahara (C.C.T.A.), which was held in Nairobi during January, 1959. Eleven papers by members of staff were presented. Very favourable comments were made on South African achievements in low-cost housing and the work of the N.B.R.I. in particular. It was evident that much of the Institute's work has had a profound influence on thinking in respect of building practice in many parts of Africa. Correspondence indicated that considerable interest is taken by other countries of the world in N.B.R.I. housing research.

Housing research was extended to include minimum house designs for Europeans, housing for the aged, and low-cost housing to suit the Coloured community in the Cape and the Indian community in Natal. This work is being sponsored by the National Housing Commission.

Recent trends in the building industry indicate a future shortage of labour and a special sub-committee was set up during the year by the Council's Building Research Advisory Committee to consider ways in which the labour position might be improved. The important problems are recruiting and training for the skilled building trades, the supply of unskilled labourers and the inter-action of skilled and unskilled labour in relation to modern trends towards mechanization.



Nasionale Bounavorsingsinstituut: Polikliniek, Saulsville—die tweede proefpolikliniek wat die Instituut ontwerp het

National Building Research Institute: Saulsville Poly-clinic—the second experimental polyclinic designed by the Institute

laboratoriumpraktyk in verband met grond vir Suid-Afrikaanse toestande en die stabilisasie van fondamentgrond. Een van verskeie belangrike ondersoeke was dié by die paaie na die Umbilo-Umhlatuzanakanaal se spoorwegbrug, waar die spoorlyn verhoog moes word.

Die Instituut het ook 'n ekonomiese metode aanbeveel vir die storting van oliegas- en growwe asafval wat uit die fabriek van die Suid-Afrikaanse Steenkool-, Olie-, en Gasmaatskappy kom. Die as word deur pype na die terrein gepomp as 'n suspensie in water en uitgestort in 'n dam, waarvan die oppervlak gedurig deur die neerslag verhoog word. Die opbou van 'n vaste afvalhoop word verseker deur die growwe as wat maklik gedreineer word om die buiterand van die dam, en die fyn as in die middel daarvan te stort. Die dam is sowat 'n $\frac{1}{4}$ myl in die vierkant, reeds 30 voet hoog, en dit blyk dat die konstruksie wel beantwoord en besparing meebring.

In opdrag van die South African Pre-stressed Concrete Development Group is 'n beurstoekenning ter waarde van £1,750 per jaar vir 'n tydperk van minstens drie jaar gereël om metodes vir verstandiger gebruik van voorgespanne beton in die Unie te ontwikkel. Volgens skatting word ongeveer £50 miljoen jaarliks aan betonbouwerk in die Unie bestee en met die oog op die talle van probleme wat met hierdie materiaal in sy talryke vorms ondervind word, kan die navorsingsresultate moontlik groot kostebesparings meebring of daarvoor sorg dat die beste waarde vir die kapitaal wat daarin belê is, verkry word.

Die vernaamste ondersoeke wat uitgevoer word, is:—

- (a) die aanwending van nie-verniëgende toetsmetodes om die gehalte, en veral die sterkte van die beton te bepaal;
- (b) die samestelling van betonmengsels om die gehalte te verbeter en die faktore te bepaal wat dié gehalte in toestande op die terrein beïnvloed;
- (c) die eienskappe van beton wat gemaak is van klipbrekersand, wat dikwels goedkoop van klipbrekerie verkry kan word;
- (d) die eienskappe van beton wat van 'n krimpemde toeslag gemaak is (die enigste soort klip wat in die meeste dele van die land maklik te kry is) en hoe dit die ontwerp van betonbouwerke beïnvloed;
- (e) die korrosie van beton deur chemiese aantasting en metodes om korrosie te weer.

Die kapitale beleggings in betonbouwerke wat aan bederf weens korrosie van die wapening onderworpe is, veral in kusstreke maar ook in sommige nywerheidsomgewings, beloop miljoene ponde. Ondersoeke na die meganisme van korrosie en doeltreffende metodes om

The possibilities of research into the disposal of sewage and waste waters for small communities aroused considerable interest both in the Union and the Federation of Rhodesia and Nyasaland. This results from an investigation which revealed that organizations responsible for such disposal schemes have many problems and that if satisfactory solutions could be found, they would result in considerable savings. There are indications that the C.S.I.R. can expect substantial financial support for this research.

New projects in the field of soil mechanics include the compilation of a manual of soils laboratory practice for South African conditions and the stabilization of foundation soils. One of the several important investigations was that at the approaches to the Umbilo-Umhlatuzana Canal railway bridge, where it was desired to raise the track.

The Institute also recommended an economic method for dumping waste fly-ash and coarse ash produced at the works of the South African Coal Oil and Gas Company at Sasolburg. The ash is pumped through pipes to the site as a suspension in water and deposited in a dam the level of which is continually raised by the deposit. A stable dump construction is ensured by depositing the free-draining coarse ash around the periphery of the dam and the fine ash in the middle. About $\frac{1}{4}$ mile square, the dam is already 30 ft. high and is proving to be both economic and efficient.

A fellowship to the value of £1,750 per annum for a minimum period of three years was arranged under sponsorship of the South African Pre-stressed Concrete Development Group, to develop methods for the more rational use of prestressed concrete in the Union. An estimated £50 million is spent annually on concrete construction in the Union and because of the many problems experienced with this material in its many different forms, it is possible that the results of research may effect considerable cost reductions or ensure that the best value is obtained for capital invested.

The more important investigations being undertaken are:—

- (a) the application of non-destructive methods of testing the quality, particularly the strength of concrete;
- (b) the design of concrete mixes to improve quality and the study of factors which influence concrete quality under site conditions;
- (c) the properties of concrete made from crusher sand which is often very cheaply available from stone crushing works;
- (d) the properties of concrete made with shrinking aggregates (the only type of stone readily available in most parts of the country) and how these influence the design of concrete structures;
- (e) the corrosion of concrete by chemical attack and methods of inhibiting corrosion.

hierdie korrosie te voorkom, het heelwat gevorder. Dit was reeds moontlik om maatreëls aan te beveel wat korrosie in nuwe bouwerke verminder en wat die gebruiksduur daarvan heelwat behoort te verleng, afgesien nog van die aansienlike besparings in die onderhoudskoste.

In Suid-Afrika kom verslegting van natuursteen, veral van sandsteen, in ernstige mate voor. Die navorsing in dié verband beoog hoofsaaklik die ontwikkeling van toetse wat tussen bevredigende en swak klip vir gebruik in bouwerk sal onderskei en die ontwikkeling van afdoende metodes en behandelings om die agteruitgang by bestaande geboue te verminder. In sowat 30 gevalle is reeds nuttige raad vir bestaande bouwerke gegee, wat vir sover ons kennis op die oomblik strek, die regte behandeling moontlik gemaak het.

Die Nasionale Bounavorsingsinstituut het aan nege tegniese konferensies, simposia en dergelike vergaderings deelgeneem—meer as in enige vorige jaar. Altesaam 28 verhandelings deur persoonelende is op die vergaderings voorgedra. Verder is nog 24 verhandelings in die tegniese pers gepubliseer.

Die Instituut het beurse, toekennings en kontrakte ter waarde van ongeveer £26,000 onder hande gehad. Daar is aan 91 kontrakte gewerk, waarvan 54 in die jaar aan hom opgedra is.

Die S.A. Buro vir Standaard het 'n aantal toetse vir die Durbanse Stadsraad uitgevoer in verband met huise wat as deel van 'n behuisingkema vir natuurlike gebou is. Proefnemings is gedoen met sybelastings op voltooi-de bouwerke om die uitwerking van winde van stormsterkte te ondersoek. Reënindringingstoetse op buitemure is uitgevoer wat swaar buie oor 'n lang tydperk nageboots het. Vir die Stadsraad van Pretoria het die Buro 'n ondersoek uitgevoer van die gehalte van die beton in die mure van 'n ronde reservoir van spanbeton van ses miljoen gelling inhoudsmaat, met behulp van betonkerns van vier duim deursnee wat met 'n diamantboor uitgeboor en getoets is.

Baie plaaslike besture het monsters van kalk en sand vir laboratoriumtoetse ingestuur en toon al hoe meer belangstelling in die Modelboueregulasies. Dit blyk uit navrae van die Durbanse Munisipaliteit, die Natalse Munisipale Vereniging, die Kaapse Provinsiale Administrasie en andere dat voorgestelde wysigings van plaaslike verordeninge beïnvloed word deur die inhoud van verskillende hoofstukke van die Modelboueregulasies. Soortgelyke navrae van verskeie Rhodesiese munisipaliteite en die Standards Institution of Rhodesia and Nyasaland is ontvang.

The capital investment in concrete structures subject to deterioration from corrosion of reinforcement, particularly in coastal but also in some industrial environments, runs into hundreds of millions of pounds. Substantial progress has been made in the investigations on the mechanism of corrosion and on effective methods of inhibiting this corrosion. It has already been possible to recommend measures to reduce corrosion in new structures which should substantially lengthen their life apart from considerable savings in maintenance costs.

Serious deterioration occurs in South Africa of natural stone, particularly of the sandstone type, used in building. Research undertaken is mainly aimed at developing tests to distinguish between satisfactory and poor stones for use in building and at developing satisfactory procedures and treatments for reducing deterioration on existing buildings. Appropriate advice has been given in some 30 cases for existing buildings, permitting effective treatment as far as present knowledge allows.

The National Building Research Institute took part in nine technical conferences, symposia and similar meetings—more than in any previous year. At these a total of 28 papers by members of staff were presented. In addition, 24 other papers were published in the technical press.

The Institute handled fellowships, grants and contracts to an approximate value of £26,000. Work was done on 91 contracts, of which 54 were commissioned during the year.

The S.A. Bureau of Standards carried out a number of tests for the Durban City Council on dwellings erected as part of a native housing scheme. To examine the effect of winds of gale force, lateral load tests were applied to completed structures. Rain penetration tests were carried out on external walls to simulate heavy downpours over a long period. For the Pretoria City Council, the quality of the concrete in the walls of a six million gallon circular prestressed concrete reservoir was investigated by diamond drilling and the testing of four inch diameter cores.

Many local authorities submitted samples of lime and sand for laboratory tests and showed an increasing interest in the Model Building Regulations. It is evident from approaches made by the Durban Municipality, the Natal Municipal Association, the Cape Provincial Administration, and others, that proposed amendments to local by-laws are being influenced by the contents of the various chapters of the Model Building Regulations. Enquiries of a similar nature have also been received from several Rhodesian municipalities and the Standards Institution of Rhodesia and Nyasaland.

Benewens die roetinetoetswerk in verband met materiaalsoorte, wat dwarsdeur die jaar voortgesit is, het die ondersoeke in verband met die eienskappe van hol betonboublokke ná die publikasie van die betrokke standaardspesifikasie vir hierdie eenhede toegeneem. Monsters is ook van handelsfirmas ontvang en toetse is uitgevoer op muurpaneel wat namens 'n regeringsdepartement in die buitelug opgerig is.

Paaie

Die Nasionale Padnavorsingsinstituut is besig met 'n ondersoek na die uitwerking van klimaat as oorheersende faktor by keuse van materiaal vir padfondamente. 'n Belangrike ontdekking is dat ontbonde doleriet, wat gewoonlik gebruik word, gewoonlik net beantwoord aan die westekant van 'n klimaatlyn wat van Port Alfred by Bloemfontein verby tot in Transvaal deurloop. Die regte keuse van fondamentmateriaal staan in noue verband met die uitgawe, daar die geslaagde gebruik van plaaslike materiaal die koste aansienlik kan verminder.

In addition to the routine testing of materials which continued throughout the year, the number of investigations into the properties of hollow concrete building blocks increased after the publication of the relevant standard specification for these units. Samples were also received from commercial firms, and tests carried out on wall panels erected in the open on behalf of a government department.

Roads

The effect of climate as a governing factor in the selection of road foundation material is being investigated by the National Institute for Road Research. An important finding is that decomposed dolerites, which are commonly used, are generally satisfactory on the west side only of a climatic line which runs from Port Alfred, passes Bloemfontein and continues through to the Transvaal. The correct choice of foundation material has a very close bearing on outlay, as the successful use of local material can substantially reduce costs.



Nasionale Padnavorsingsinstituut: Apparaat om die voggehalte en die digtheid van materiaal met radioisotope te meet

National Institute for Road Research: Apparatus for measuring the moisture content and density of materials, using Radioisotopes

Om voggehalte en digtheid vinnig buite by die werk te kan bepaal, is 'n eenvoudige, draagbare toestel met radio-isotope ontwerp en met behulp van 'n handelsfirma gebou. Na verwagting sal hierdie apparaat vir die padingenieur by kontroliering van padbouwerk en ook vir gebruik in baie ander opsigte by die aanleg van fondamente van groot nut wees.

'n Nuwe toetsmetode is ontwikkel om die intrinsieke kleefvermoë van bitumen aan klip te bepaal. Die voorlopige resultate dui daarop dat dit in groot mate die studie van bitumen wat plaaslik geraffineer word uit ru-olie uit die Midde-Ooste ingevoer, wat baie probleme skep, kan bevorder. As hierdie bitumen met welslae vir padbou en -onderhoud gebruik kan word, sou dit weens die veel hoër prys van ingevoerde geraffineerde bitumen vir Suid-Afrika van groot ekonomiese belang wees.

Water

Op 1 April 1958 is die status van die Afdeling Waterbehandeling van die Nasionale Chemiese Navorsingslaboratorium verhef om die Nasionale Instituut vir Waternavorsing te vorm en het hy terselfdertyd sy nuwe gebou te Scientia betrek.

Dit kan beskou word as aanduiding van die groeiende belangrikheid van water in die ontwikkeling van Suid-Afrika. Volgens skatting gebruik die Unie sowat 400 miljoen gelling per dag, waarvan sowat 190 miljoen in die groot dorpe en stede in die vorm van huishoudelike en nywerheidswatervoorsiening verbruik word. Die aanvraag styg daagliks en, aangesien Suid-Afrika se waterbronne geensins onbeperk is nie, is dit noodsaaklik dat hierdie bronne bewaar en op die doeltreffendste wyse gebruik word. Aan die Nasionale Waternavorsingsinstituut is die taak opgedra om in die nodige gegewens vir 'n wetenskaplike studie van alle aspekte van watervoorsiening, -behandeling en -gebruik te voorsien.

Dit is noodsaaklik om juiste besonderhede van die moontlike waterbronne in die Unie op te stel en dit is ook belangrik dat die beperktheid daarvan gedurig beklemtoon word. Wat ons wel nog te doen staan, is om maatreëls te beplan wat daarvoor sal sorg dat die voorrade wat wel bestaan, ten beste benut word. Navorsingswerk na die moontlikhede van gebruik en hergebruik van water vereis aansienlike agtergrondskennis. Onder andere sal uitgebreide opnames van die rivierstelsels nodig wees om onder andere die hoeveelheid en gehalte van die waters vas te stel en, in gevalle waar besoedeling voorkom, te bepaal of dit organies van aard of aan minerale toe te skryf is. Tot dusver is opnames gemaak van die Vaal- en die Bergrivier en van die waters wat in die Hartbeespoortdam vloei.

Natal is gelukkig dat sy riviere in enige jaargety betekelike groot volumes water afvoer. Hier sal opnames

To achieve rapid measurement of moisture content and density in the field, a simple, portable radio-isotope apparatus was designed and built in collaboration with a commercial firm. It is expected that this unit will prove of great value to the road engineer in the control of construction, and for many other purposes in foundation engineering.

A new test procedure was developed for the direct measurement of the intrinsic adhesive potential of bitumen to stone. Interim results suggest that this may prove of great assistance in the study of bitumens which are refined locally from imported Middle East crude oil, and which give rise to a number of problems. The successful use of these in road construction and maintenance would be of great economic importance to South Africa, due to the much higher cost of imported refined bitumen.

Water

On 1st April 1958 the Water Treatment Division of the National Chemical Research Laboratory was elevated in status to form the National Institute for Water Research, and at the same time moved into its new building at Scientia.

This can be taken as an indication of the growing importance of water in the development of South Africa. It has been estimated that the Union uses some 400 million gallons a day of which some 190 million are consumed in the major towns and cities in the form of domestic and industrial water supplies. The demand is increasing daily and, as South Africa's water resources are by no means unlimited, it is essential to ensure that these resources are conserved and used in the most efficient way. It is the task of the new National Institute for Water Research to provide the data necessary by the scientific study of all aspects of water supply, treatment and usage.

It is essential to compile exact information in respect of potential water resources in the Union, and it is also important that their limitations be constantly emphasized. It still remains, however, to devise a means for ensuring that the supplies which we do have are used to the best advantage. Research work into the possibilities for using and re-using water requires a considerable background knowledge. Extensive surveys of the river systems are needed to establish, *inter alia*, the quantity and quality of the waters and, in cases where pollution is encountered, whether this is of an organic or mineral character. Thus far, surveys have been made on the Vaal and Berg rivers, and on the waters which drain into the Hartbeespoort Dam.

Natal is fortunate in that its rivers convey comparatively large volumes of water during all seasons. Surveys here will, however, make it possible to detect possible sources of pollution and thus supply essential data for the proper positioning of future industries.



Nasionale Instituut vir Waternavorsing: 'n Proefinstallasie om die omsetting van stadsafval in kompos te bestudeer

National Institute for Water Research: A pilot plant to study the conversion of municipal wastes into compost

dit egter moontlik maak om moontlike besoedelingsbronne op te spoor en om aldus onontbeerlike gegewens te verstrek vir die behoorlike plasing van toekomstige nywerhede.

Sekere biologiese prosesse maak die hergebruik van rioolwater moontlik en hierdie beginsels vorm d'e grondslag van die tegniek wat in moderne suiweringsinstallasies vir rioolwater toegepas word. Die water wat daaruit afkom, is egter nie van 'n gehalte wat hoog genoeg vir onbeperkte gebruik is nie. Een van die Instituut se belangrikste funksies is om natuurlike metodes te ondersoek wat miskien alle beperkings op die gebruik van gesuiwerde rioolwater moontlik sal maak.

As die nywerheidsontwikkeling in Suid-Afrika teen die huidige tempo gehandhaaf moet word, is daar 'n groot moontlikheid dat waterskaarste 'n ernstige beperkende rol gaan speel tensy behoorlike voorsorgmaatreëls getref word om alle bronne van besoedeling te vrywaar.

Die Instituut tree as tegniese adviseur vir die Unie se departement van Waterwese op. In hierdie hoedanigheid staan sy pligte meestal in verband met die tegniese aspekte van aansoeke om die gebruik van water op groot skaal. Die Departement oefen volle beheer uit oor die toedeling van water vir allerlei doeleindes.

Certain biological processes make possible the re-use of sewage water, and these principles form the basis of techniques which are in use at modern sewage purification plants. The water which is discharged however, is not sufficiently high in quality for unlimited use. One of the most important functions of the Institute is to explore natural means which may make possible the elimination of any restriction on the use of purified sewage water.

If industrial development in South Africa is to be maintained at the present rate, there is a very great possibility of water shortage becoming a serious restricting factor, unless adequate precautionary measures are taken to protect all resources from pollution.

The Institute acts as technical adviser to the Union Department of Water Affairs, its duties in this capacity being mostly concerned with the technical aspects of all applications for the use of water on a large scale. The Department exercises full control over the allocation of water for various purposes. It also decides on the admissibility of purified factory effluents to rivers. In both cases, the National Institute for Water Research supplies technical advice.

The South African Bureau of Standards, in collaboration with the Institute, performs a useful function by

Hy besluit ook oor die toelaatbaarheid van gesuiwerde fabrieksafvalwater in die riviere. In albei gevalle word hy deur die Nasionale Instituut vir Watervorsing van tegniese raad bedien.

Die Suid-Afrikaanse Buro vir Standaard doen, in samewerking met die Instituut, nuttige werk met die opstel van gehaltestandaard vir water vir huishoudelike gebruik en ook vir afvalwater van alle tipes wat toegelaat word om in riviere te loop.

Die beperkings wat gelê word op die inloop van fabrieksafvalwater in riviere maak dit tans vir die nyweraar verpligtend om tydens fabrieksprosesse onnodige besoedeling van water te verhoed. Hy moet nou stowwe uit die water verwyder wat vroeër in die afvalwater verlore gegaan het. Daar bestaan gevalle waar verpligte herwinning 'n bron van inkomste geword het, terwyl die afvalwater in sy laaste stadium terselfdertyd heelwat minder besoedel was. Ander nywerhede was ook in staat om die verlies aan waardevolle materiaal in afvalwater te verminder en het gevind dat dieselfde water herhaaldelik weer gebruik kon word. Baie fabriek het by die oplossing van hierdie probleme die Nasionale Instituut vir Watervorsing se hulp ingeroep.

Munisipaliteite doen ook beroepe op die Instituut om hulle van diens te wees in verband met sowel rioolwatersuiwering as watervoorsieningskemas. Baie waterbronne het 'n buitengewone hoë gehalte aan fluoried en dit is reeds moontlik om sulke water, wat vir gesonde tande skadelik is, te behandel volgens 'n defluoridasie metode wat deur die Instituut ontwikkel is.

Streeklaboratoriums is in Pietermaritzburg en Windhoek opgerig om plaaslike probleme te bestudeer.

Die biologiese prosesse wat die grondslag vir die maak van kompos vorm, lyk besonder baie op die prosesse wat by die suiwering van rioolafvalwater toegepas word en die Instituut probeer op die oomblik om organiese stowwe soos huisvuilgoed en rioolslik in humus—meer algemeen bekend as kompos—om te sit. Aangesien die verwydering en opruiming van die stede se afval 'n ontsaglike probleem is, stel alle Suid-Afrikaanse munisipaliteite lewendig belang in hierdie skema. Buitendien sal 'n ekonomiese metode om kompos in die stede te maak van onskatbare waarde wees op ploeglande wat geen humus bevat nie.

Industriële Sielkunde

Die nywerheid het in toenemende mate gebruik gemaak van die Nasionale Instituut vir Personeelvorsing veral ten opsigte van personeelkeuring vir die hoër grade, probleme in verband met opleiding, en faktore wat menslike verhoudings beïnvloed. Aangesien dit maar moeilik gaan om mannekrag van die regte bekwaamheid en opleidingspeil en die regte uitkyk te bekom, is heelwat aandag geskenk aan 'n studie van hierdie belangrike faktore vir sukses in die beroep van die individu.

drawing up standards of quality for domestic water as well as for effluents of all types which are permitted to flow into rivers.

The limitations imposed on the admissibility of factory effluents to rivers now make it compulsory for the industrialist to prevent unnecessary pollution of water during processing. He must now remove from the water substances which were previously lost in the effluent. Cases already exist where compulsory reclamation has proved to be a source of income, considerable lessening of pollution in the final effluent being simultaneously accomplished. Other industries have found it possible to reduce the loss of valuable material to effluent water, and that the same water could be used time and again. In solving these problems many factories have called on the services of the National Institute for Water Research.

The services of the Institute are also called upon by Municipalities, not only in connection with sewage purification, but also for water supply schemes. Many water sources have an exceptionally high fluoride content and it is now possible to treat such water, which is detrimental to dental health, with a method of defluoridation developed by the Institute.

Regional Laboratories have been set up at Pietermaritzburg and Windhoek, to study local problems.

The biological processes on which composting is founded are remarkably similar to the techniques used in the purification of sewage effluents and the Institute is at present endeavouring to convert organic substances such as domestic rubbish and sewage sludge to humus—more generally known as compost. Because the removal and disposal of city waste is a formidable problem, all South African Municipalities are showing great interest in this scheme. In addition, there is little doubt that an economical method for producing compost in cities will prove invaluable on arable lands which lack humus.

Industrial Psychology

Industry made increasing use of the National Institute for Personnel Research, particularly with regard to the selection of higher grade personnel, problems relating to training and factors that influence human relations. As manpower with the right level of ability, training and outlook is hard to come by, much attention was devoted to studies on these important determinants of occupational success.

An investigation was done into the degree to which ability is being allowed to lie fallow as a result of early

Ondersoek is ingestel na die mate waarin bekwaamheid weens vroeë skoolverlating verlore gaan of die mate waarin bekwaamheid op die hoër vlakke te vergedryf word. Die vraag na hoogopgeleide mannekrag dwing mense wat eintlik geen basiese bekwaamheid daartoe besit nie, om hulle aan 'n universiteit of andersins, tot professionele status te bekwaam.

'n Studie is gemaak van houding teenoor werktoustande, vooruitsigte en die behandeling van die individu by sy werk. Baie afdelings van ons bevolking openbaar 'n gebrek aan die gewoontes en verwagtings wat by die industriële lewe tuis hoort. 'n Kennis van hulle houdings en die faktore wat hulle ontwikkeling beïnvloed, kan heelwat bydra om sulke mense by die werkomstandighede te laat aanpas.

Omdat dit so nodig is om die besmoontlike gebruik van ons uiters skaars blanke mannekrag te maak, is beroepsvoorligting in Suid-Afrika besonder belangrik. Die N.I.P.N. lewer op hierdie gebied diens slegs in beperkte mate, dit wil sê voorligting aan matrikulante en studente. In die loop van hierdie werk ontwikkel hy ook prosedures en proewe wat op ander vlakke toegepas kan word.

Uit 'n ondersoek na diensversuimsyfers, het dit geblyk dat jong mense meer geneig is om van die werk af weg te bly, maar namate nuwe werkers gewoond raak aan die werkroetine in die nywerheid en deur die huwelik meer verantwoordelikheid moet dra, hulle nuwe werkgewoontes ontwikkel en hul bywoning ook gereëlder word. By 'n sekere persentasie werkers kom egter karaktergebreke voor, wat ongetwyfeld aan omgewingstoestande gewyt moet word. 'n Studie van die houdings van 'n groep blanke werkers wat onder 'n groeupaansporingskema in diens was, het aan die lig gebring dat aansporingslone as sodanig gewoonlik byval vind, maar dat 'n persoonlike bonus meer gewild as 'n groepsbonus is. Heelwat kritiek is egter uitgespreek teen die manier waarop die produksiestandaarde vasgestel en gehandhaaf is en oor die aandeel wat die werker ontvang het uit die besparing in produksietyd wat tot stand gebring is. Die studie het die sienswyse gestaaf, wat voorheen reeds uitgespreek is, nl. dat aansporingskemas op die moreel en welstand van die werker 'n ongunstige bykomende uitwerking kan hê, tensy hulle deur deskundiges in oorleg met die werkers ingestel en in werking gestel word in 'n verband waar menslike betrekings andersins gesond is.

Die groot vraag na personeelkeuringstoetse vir naturellearbeid het voortgeduur en tegnieke vir aanlegtoetse is by 'n aantal nywerhede ingevoer.

'n Studie van die faktore wat die doeltreffendheid van Bantoestaatsamptenare beïnvloed, het getoon dat doeltreffendheid nie bloot 'n kwessie is van die vereiste graad van basiese bekwaamheid en opleiding nie, maar dat

school leaving, or ability is over-extended at the higher levels. The demand for highly trained manpower induces people who really lack the basic ability to try to qualify at University and other professional levels.

Studies were made of attitudes to conditions of service, prospects and the way the individual is treated on the job. Many sections of our population, being new to the industrial scene, display a lack of habits and expectations appropriate to industrial life. Knowledge concerning their attitudes and the factors that influence their development can be most helpful in adjusting such persons to the work situation.

Because of the need to make the best possible use of our scarce white manpower, vocational guidance is particularly important in South Africa. The N.I.P.R. renders a limited service in this field, providing guidance to matriculants and students. In the course of this work, it is also developing procedures and tests that will be applicable at other levels.

In an investigation into absence rates, it was found that young people were more likely to stay away from work, but that as new workers get used to the routines of industrial employment and as they acquire responsibilities through marriage, new work habits develop and regularity of attendance improves. In a proportion of operatives, however, there is some defect of character, no doubt largely due to environmental circumstances. In a study of the attitudes of a group of white operatives working under a group incentive scheme, it was found that wage incentives as such were generally approved, but that an individual bonus was preferred to a group bonus. Considerable criticism was, however, expressed against the manner in which production standards were set and maintained and concerning the share which the worker obtained of the saving that was effected in production time. The study confirmed the view previously expressed that incentive schemes may have adverse side-effects on the morale and well-being of workers, unless they are established by experts in consultation with the workers, and are operated in a context where human relations are otherwise sound.

The great demand for personnel selection tests for native labour continued, and aptitude testing techniques were introduced into a number of industries.

A study into the factors influencing the efficiency of Bantu Civil Servants showed that efficiency is not merely a matter of the requisite degree of basic ability and training, but that it is also affected by a complex racial situation in which the Bantu clerk occupies a marginal position in relation to his white supervisors and to the

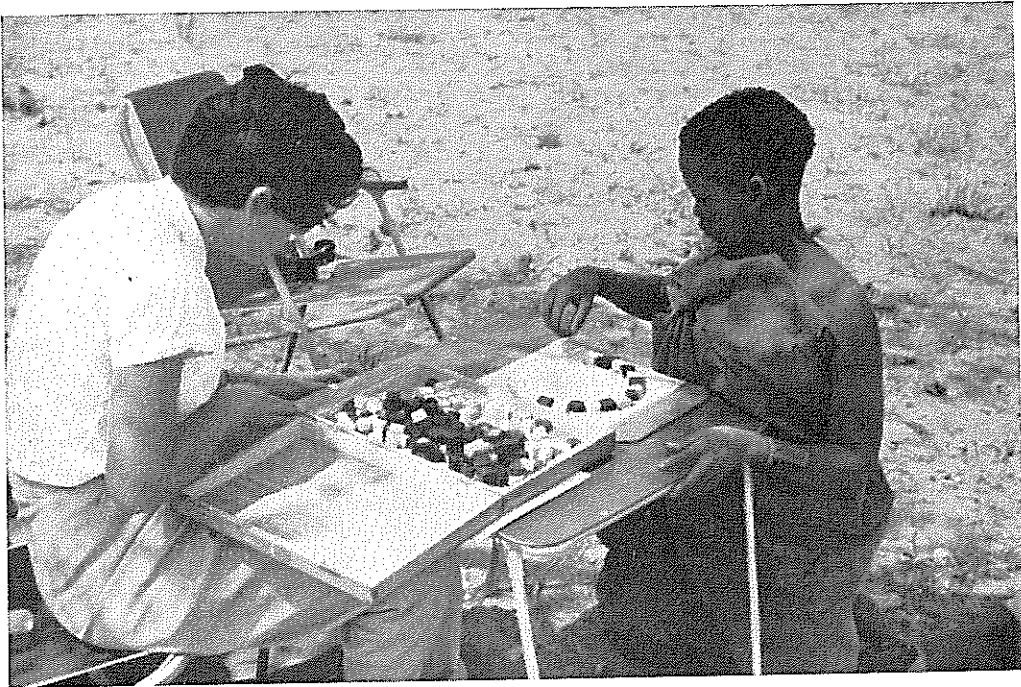
dit ook beïnvloed word deur 'n ingewikkelde rassetoestand waarin die Bantoeokterk hom bevind op 'n randgebied met betrekking tot sy blanke toesighouer en die naturellepubliek wat hy bedien en verder tot sy eie agtergrond en kultuur en die westerse administrasiesstelsel waarin hy diens doen.

Om die uitwerking van voeding op verstandelike ontwikkeling te bestudeer, is 'n reeks proefnemings uitgevoer waarby opeenvolgende geslagte rotte op 'n proteienarme dieët grootgemaak is. Die resultate dui op 'n duidelik minderwaardige vermoë om probleme op te los (d.w.s. swakker intelligensie) in die diere wat proteienarme voeding ontvang, in vergelyking met 'n normale kontrolegroep.

native public he serves, as well as to his own background and culture and the Western administrative system in which he serves.

To study the effect of nutrition on mental development, a series of experiments were made in which successive generations of rats were reared on a protein-deficient diet. The results indicate a distinct inferiority in problem-solving (and therefore in intelligence) on the part of the animals receiving a protein-deficient diet, in comparison with a normal control group.

Perceptual studies on indigenous native populations at various levels of education and assimilation of



Nasionale Instituut vir Personeelnavorsing: Boesmans het in die eerste prestasietoets wat ooit met sukses in hulle natuurlike omgewing uitgevoer is, op verbasende wyse groot intellektuele gawes op 'n verskeidenheid van gebiede aan die dag gelê

National Institute for Personnel Research: Bushmen, in the first performance tests ever to be successfully administered in their natural environment, surprisingly reflected a wide range of intellectual abilities

Waarnemingstudies van inboortingbevolkings op verskillende peile van opvoeding en assimilering van die westerse kultuur het aan die lig gebring dat Bantoe-proefpersone met laerskoolopleiding prentemateriaal tweedimensionaal vertolk. Selfs by ongegradueerdes en gegradueerdes kom hierdie neiging voor, terwyl by blanke proefpersone driedimensionale vertolking van prentemateriaal reeds op die peil van standerd drie algemeen is.

Western culture revealed that Bantu samples with primary school training interpret pictorial material two-dimensionally. This interpretation tends to occur even among under-graduates and graduates, whereas in European samples, three-dimensional interpretation of pictorial matter is common by the standard three school level.

Bushmen, in the first performance tests ever to be successfully administered in their natural environment,

Boesmans het, met die eerste prestasietoets wat ooit met welslae in hulle natuurlike omgewing toegepas is, met 'n verrassende reeks verstandelike vermoëns voor 'n dag gekom.

Die toepassing van die Wechsler-toets vir intelligensie by volwassenes het getoon dat daar op alle maatskaplik-ekonomiese vlakke 'n verskil ten gunste van die Engels-sprekende groep voorkom, maar dat die verskil in die hoogste en laagste maatskaplik-ekonomiese klasse die kleinste is. Bewyse is gevind dat selfs die geringe verskille wat tussen die kulturele omgewing van die twee taalgroepe bestaan, in 'n mate die toetsprestasie beïnvloed. Die ontplooiing van die intelligensie vereis prikkeling op verskillende maniere. Hoe afwisselender die omgewing, hoe meer geleentheid vir menslike en materiële kontakte en hoe heilsamer die uitwerking op verstandelike groei sal wees.

Voeding

Die Nasionale Voedingnavorsingsinstituut het sy studie voortgesit van die verwantskap tussen die vetopname uit die dieet en degeneratiewe hartkwaal en die aspekte van die probleem van proteïengebrek in Suid-Afrika, soos byvoorbeeld die studie van kwashiorkor, die waardebeoordeling van die voedingsgehalte van die proteïene in verskeie voedselsoorte en verwerkte materiaal. 'n Aanvullende proefneming in verband met voeding is onder natuurleeskoolkinders gedoen.

In hoofsaak is aandag bepaal by die Departement van Voeding se broodverrykingsbeleid. Op versoek van die Nasionale Advieskomitee vir Voedingnavorsing is 'n uitvoerige ondersoek ingestel na die grondbeginsels van voedselverryking en die toestand van ons huidige kennis van die voedingstatus van die Suid-Afrikaanse bevolking. Hierdie studie is gemaak met die oog op die opstel van 'n omvattende verslag oor die waarde van vismeelblom as proteïenaanvulling, en veral met betrekking tot die verryking van growwe brood in Suid-Afrika. Die vraag het ontstaan na aanleiding van 'n voorstel van die Voedingsafdeling om die huidige verrykingsmengsel bestaande uit afgeroomde melkpoeier en ontvette grondboontjiemeele, wat op nasionale skaal in die Unie gebruik word, deur vismeelblom te vervang. Die bewyse wat die Nasionale Voedingnavorsingsinstituut versamel het, bied egter geen regverdiging vir broodverryking in die Unie met vismeelblom of ander proteïenmateriaal nie.

'n Geleentheidskomitee vir Broodverryking is deur die Nasionale Voedingsraad aangestel om die waarde van die huidige broodverrykingskema wat op melkpoeier en grondboontjiemeele gebaseer is, te ondersoek. Die Instituut het 'n verteenwoordiger in hierdie komitee gehad en was saam met professor Joseph Gillman van die Universiteit van die Witwatersrand hoofsaaklik verantwoordelik vir die opstel van 'n memorandum oor

surprisingly reflected a wide range of intellectual abilities.

Application of the Wechsler test for adult intelligence showed that, at all socio-economic levels, there is a difference in favour of the English-speaking group, this difference being least in the highest and lowest socio-economic categories. Evidence was found that even the slight differences that obtain between the cultural environment of the two language groups exercise some effect on test performance. The deployment of intelligence requires stimulation in various ways. The more diversified the environment, the more plentiful the opportunities for contacts, human and material, and the more beneficial will be the effect on intellectual growth.

Nutrition

The National Nutrition Research Institute continued its studies into relationship between the dietary fat intake and degenerative heart disease and to aspects of the problem of protein deficiency in South Africa, such as the study of kwashiorkor, the assessment of the nutritive quality of the proteins in various foods and processed materials. A supplementary feeding trial was carried out among Native school children.

Attention was mainly focussed on the bread enrichment policies of the Department of Nutrition. At the request of the National Advisory Committee for Nutrition Research, detailed investigations were made into the basic principles of food enrichment and into the state of present knowledge regarding the nutritional status of the South African population. These studies were made with a view to the preparation of a comprehensive report on the value of fish flour as a protein supplement, with particular reference to the enrichment of brown bread in South Africa. The question arose as a result of a proposal by the Department of Nutrition that fish flour should be used to replace the present enrichment mixture, based on skimmed milk powder and defatted groundnut flour, which is used on a national scale in the Union. The evidence which has been collected by the National Nutrition Research Institute, however, fails to support the enrichment of bread in the Union with fish flour or other protein materials.

An *ad hoc* Committee on Enrichment was appointed by the National Nutrition Council to investigate the value of the present bread enrichment scheme based on milk powder and groundnut flour. The Institute was represented on this committee and with Professor Joseph Gillman of the University of the Witwatersrand was mainly responsible for the drawing up of a memorandum covering the principles of enrichment, on the

verrykingsbeginsels, op grond waarvan die geleentheidskomitee besluit het dat daar vir die skema geen wetenskaplike regverdiging is nie. Die Nasionale Voedingsraad het op 31 Oktober 1958 hierdie besluit aanvaar.

In die onderhawige tydperk is 'n parlementêre ondersoekkomitee aangestel om die werksaamhede van die Voedingsafdeling van die Nasionale Voedingnavorsingsinstituut te ondersoek. Daar is geen fout gevind met die Instituut se keuse van proefnemingsmetodes, sy interpretasie van die proefnemingsresultate of met die juistheid van sy verslae oor die huidige broodverrykingskema van die Voedingsafdeling nie.

Proefnemings is voortgesit in verband met die waarde van diëte waarin vismeelblom opgeneem is, vir die instandhouding van die genesing by herstellende kwashiorkorpatiënte. Die resultate het aangedui dat vismeelblom vir hierdie doel geensins so goed beantwoord as afgeroomde melkpoeier nie.

Voedselaanvulling vir natuureskoolkinders in 'n gedeelte van Wes-Transvaal met beskuitjies wat of afgeroomde melkpoeier of vismeelblom plus grondboontjemeel bevat, is uitgevoer en word nog 'n jaar lank voortgesit. Die kontrolegroep kinders wat geen aanvulling ontvang nie, word nog gehou om die proefpatroon statisties aanneemlik te maak.

In verband met die verwantskap tussen vetiname deur middel van die dieet en degeneratiewe hartkwaal, is die werk oor gehalte aan bloedcholesterol by verskillende ouderdoms- en rassegroepe voortgesit. 'n Uitgebreide opname onder blanke kinders wat verskillende skole in Pretoria bywoon, is van stapel gestuur om die cholesterolgehalte te bepaal en die skoolowerhede, die kinders en hulle ouers het uitstekend saamgewerk.

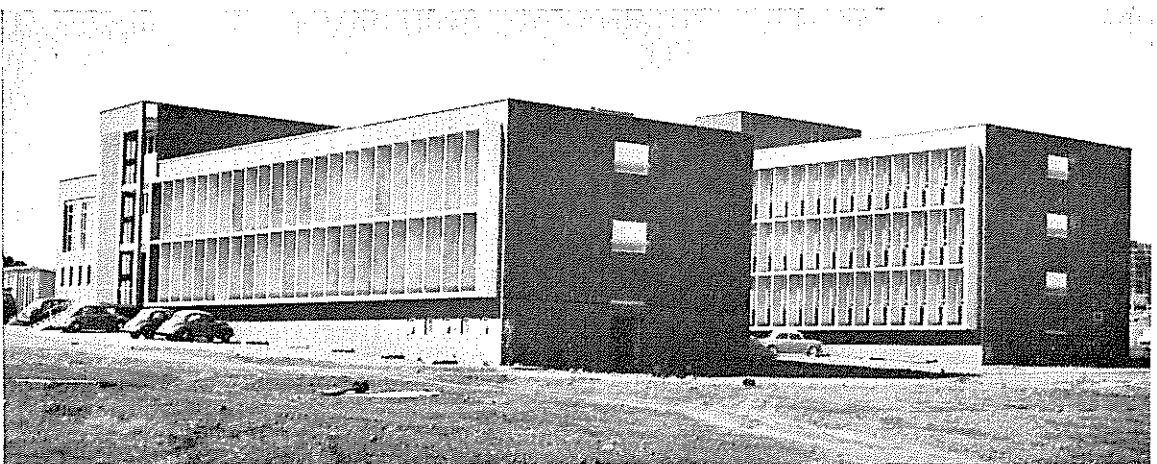
basis of which the *ad hoc* Committee reached the conclusion that the scheme had no scientific justification. This conclusion was accepted by the National Nutrition Council on the 31st October, 1958.

During the period under review a parliamentary committee of enquiry was appointed to investigate the activities of the Department of Nutrition and the National Nutrition Research Institute. No fault was found with the Institute's choice of experimental methods, with its interpretation of experimental results, or with the correctness of its reports on the present bread enrichment scheme of the Department of Nutrition.

Experiments were continued on the value of diets containing fish flour for the maintenance of cure in convalescent kwashiorkor patients. Results indicated that fish flour is by no means as satisfactory for this purpose as skimmed milk powder.

Supplementary feeding of Native school children in an area in the Western Transvaal with biscuits containing either skimmed milk powder or fish flour plus groundnut flour was carried out and is to be continued for another year. The control group of children receiving no supplement will be retained in order to keep the experimental design statistically acceptable.

In connection with the relationship of dietary fat intake to degenerative heart disease, work on the blood cholesterol levels of different age and racial groups was continued. An extensive survey among European children attending various Pretoria schools to determine cholesterol levels was launched and the co-operation of school authorities, children and parents has been excellent.



Nasionale Voedingnavorsingsinstituut: Nuwe gebou by Scientia

National Nutrition Research Institute: New building at Scientia

Op versoek van die Departement van Voeding het die Nasionale Voedingnavorsingsinstituut hulp verleen in twee reekse proefnemings aan fabriek by die bereiding van 'n klaar gekookte verrykte mieliepoer. Uit tegnologiese oogpunt was dit wel moontlik om 'n bevredigende materiaal te berei, maar die geldelike sy van die proses en die biologiese waardebeplanning van die produk moet nader bestudeer word.

Op die gebied van die voeding is daar onder andere ook vordering gemaak met 'n studie van die invloed van die buislose kliere op die benutting deur die liggaam van koolwaterstowwe, proteïene en vette. Die werk word, saam met 'n ondersoek na die ontwikkeling van lewerkanker en die bepaling van die voedingswaarde in 'n mieliedieet, deur die Gesamentlike Eenheid vir Voedingnavorsing aan die Universiteit van die Witwatersrand onderneem.

Dwarsdeur die wêreld word daar belang gestel in die verwantskap tussen die dieet en die serumlipiede en die betrekking wat hulle moontlik het op die toenemende gevaar na aterosklerose. Die werk in verband met hierdie probleem is belemmer deur die moeilikheid wat ondervind word om oor 'n lang genoeg tydperk dieet-toetse konsekwent deur te voer. Die W.N.N.R. se Gevangenisprojek oor Dieet en Metabolisme in verband met hart- en bloedvatsiektes besit die geriewe vir 'n langtermynstudie van 'n groot groep in toestande waar 'n buitengewone mate van kontrole moontlik is en daar word verwag dat die resultate wêreldwye betekenis sal hê.

Die Kliniese Voedingseenheid aan die Universiteit van Kaapstad is besig met 'n ondersoek na die vraagstuk van ondervoeding met besondere verwysing na die behoeftes van die groeiende kind. Daar is sterk aanduidings dat die duurder diereproteïene deur middel van geskikte samevoegings tot 'n minimum afgebring kan word. In Suid-Afrika is die ekonomiese implikasies hiervan verreikend. Hierdie eenheid is ook besig met 'n studie van die verwantskap tussen voeding en die geweldige toename van hartkwale onder blanke Suid-Afrikaners onder wie die sterftesyfer as gevolg hiervan vandag slegs vir die V.S.A. in die wêreldstatistiek agterstaan. Die studie word voortgesit van die oorerflike siekte wat as porfria bekend staan en wat miskien 25,000 Suid-Afrikaners kan aantast wat een voorouer gemeen het uit die vroeë dae van die Kaap.

MEDIËSE NAVORSING

('n Uitvoerige Verslag word in Deel XII opgeneem)

By gebrek aan 'n spesiale Suid-Afrikaanse liggaam om vir mediese navorsing te sorg, het die W.N.N.R. met die bystand van 'n Nasionale Komitee vir Navorsing na die Mediese Wetenskappe hierdie gebied ondersoek en ontwikkel.

At the request of the Department of Nutrition, the National Nutrition Research Institute collaborated in two series of factory scale experiments dealing with the preparation of a precooked enriched maize powder. From a technological point of view it was possible to prepare a satisfactory material, but the economics of the process and the biological evaluation of the product require further study.

Other progress in the field of nutrition includes a study of endocrine gland influence on the utilization of carbohydrates, proteins and fats by the body. Together with an investigation into the development of liver cancer and the assessment of food value in maize diets, this work is being undertaken by the Joint Nutrition Research Unit at the University of the Witwatersrand.

Throughout the world, interest is being shown in the relationship between diet and the serum lipids and their possible bearing on the increasing hazard of atherosclerosis. Work on this problem has been handicapped by the difficulty of maintaining consistent dietary tests over a sufficiently long period of time. The C.S.I.R. Prison Research Group of Diet and Metabolism relating to Cardio-Vascular Disease has facilities for a long-term study of a large group under conditions which allow an unusual degree of control, and it is expected that the results will have world-wide significance.

The Clinical Nutrition Unit at the University of Cape Town is investigating the question of protein malnutrition with particular reference to the needs of the growing child. There are strong indications that by appropriate combinations, the more expensive animal proteins can be cut to a minimum. In South Africa, the economic implications of this are far-reaching. This unit is also studying the relationship between nutrition and the enormous rise of heart disease in white South Africans, whose mortality from this cause is today second in world statistics only to the U.S.A. Studies continue on the inherited sickness known as porphyria, which may affect 25,000 South Africans with one common ancestor in the early days of the Cape.

MEDICAL RESEARCH

(A detailed report is contained in Part XII)

In the absence of a special South African body to cater for medical research, the C.S.I.R. has explored and developed this field with the advice and assistance of a national Committee for Research in Medical Sciences.

'n Bedrag van ongeveer £136,000 is in Januarie 1959 vir mediese en tandheelkundige navorsing gedurende die jaar 1959/60 toegewys, waarvan £19,400 bestem is vir onderhoud van geleentheidsbeurshouers aan universiteite en ander inrigtings; £7,500 gaan vir die Navorsingsafdeling van die Suid-Afrikaanse Instituut vir Mediese Navorsing en sowat £109,400 vir geneeskundige navorsingseenhede en groepe. 'n Bykomende toekenning van £120,000 word gedoen aan die Pneumokoniose-navorsingseenheid, waarvan die begroting met die bystand van die Unie-departement van Mynwese en die Transvaalse en Vrystaatse Kamer van Mynwese gefinansier word.

Die Raad het gedurende die jaar onderstaande nuwe mediese navorsingsgroepe ingestel:

- (i) Die Navorsingsgroep vir Degenerasiesiektes onder leiding van prof. A. J. Brink van die Universiteit van Stellenbosch.
- (ii) Die Navorsingsgroep vir Bestudering van Veroudering onder leiding van prof. T. Gillman van die Universiteit van Natal.
- (iii) Die Kardiovaskulêr-pulmonale Navorsingsgroep onder leiding van dr. V. Schrire van die Universiteit van Kaapstad.
- (iv) Die Navorsingsgroep vir Bestudering van Son-uitwerking op die Huid onder leiding van dr. G. H. Findlay van Pretoria.
- (v) Navorsingsgroep vir die Bestudering van die Biologiese Uitwerking van Ioniserende Straling onder leiding van dr. T. Fichardt van Pretoria.

Laasgenoemde groep is gestig en word gefinansier deur die Raad op Atoomkrag maar geniet die erkenning van die Raad as W.N.N.R.-groep.

Suid-Afrika, met sy gemengde bevolking in groepe wat van mekaar afgesonder is en tog langs mekaar leef in wyd uiteenlopende sosiale en ekonomiese omstandighede, bied vir mediese navorsers geleenthede, die gelyke waarvan wetenskaplikes feitlik in geen ander land ter wêreld kan vind nie. Een van die onderwerpe wat besonder aandag geniet, is die verwantskap tussen dieet en slagaarsiektes en nie minder as sewe van die Raad se navorsingsinstiteute is betrokke by een of ander aspek van die probleem nie. Heelwat vordering is al gemaak en Suid-Afrikaanse wetenskaplikes tel ongetwyfeld onder die vooraanstaandes van die wêreld op hierdie gebied.

In die sewentien mediese en tandheelkundige navorsingseenhede en -groepe van die W.N.N.R. vind belangrike ontwikkelings plaas. Die werksaamhede van die Navorsingseenheid vir Kliniese Voeding aan die Universiteit van Kaapstad het milde skenkings verwerf van die handel en nywerheid in Wes-Kaapland en van drie navorsingsstigtings in die Verenigde State van Amerika. Vir die nuwe gebou is fondse ingesamel, waarvan byna die helfte deur assuransimaatskappye

A sum of approximately £136,300 was allocated in January 1959 for medical and dental research during the financial year 1959/60, of which £19,400 was for the support of *ad hoc* grantees at universities and other institutions, £7,500 to the Research Division of the South African Institute for Medical Research and about £109,400 to medical research units and groups. An additional grant of £120,000 is made to the Pneumococcal Research Unit whose budget is financed jointly with the Union Department of Mines and the Transvaal and O.F.S. Chamber of Mines.

The Council established the following new medical research groups during the year:—

- (i) The Degenerative Diseases Research Group under the leadership of Prof. A. J. Brink of the University of Stellenbosch.
- (ii) The Research Group for the Study of Ageing under the leadership of Prof. T. Gillman of the University of Natal.
- (iii) The Cardio-vascular Pulmonary Research Group under the leadership of Dr. V. Schrire of the University of Cape Town.
- (iv) Research Group to study Sunlight Reactions of the Skin under the leadership of Dr. G. H. Findlay of Pretoria.
- (v) Research Group to study the Biological Effects of Ionizing Radiation under the leadership of Dr. T. Fichardt of Pretoria.

The last-mentioned group was established and financed by The Atomic Energy Board but has been accorded recognition by the Council as a C.S.I.R. group.

South Africa, with its mixed population, in groups isolated from each other yet existing side by side under widely differing social and economic conditions, offers opportunities to medical research workers that are available to scientists in practically no other country in the world. One of the subjects that is receiving particular attention is the relationship between diet and diseases of the arteries, no less than seven of the Council's research institutes, units and groups being concerned with some aspect of this problem. Considerable progress has been made and South African scientists are undoubtedly among world leaders in this sphere.

Significant developments are taking place in the seventeen C.S.I.R. medical and dental research units and groups. The activities of the Clinical Nutrition Research Unit at the University of Cape Town attracted generous donations from commerce and industry in the Western Cape and from three research foundations in the United States of America. Funds have been raised for a new building, almost half being donated by insurance companies, the remainder being provided by the Department of Education, Arts and Science.

geskenk is en die res deur die Departement van Onderwys, Kuns en Wetenskap voorsien is.

Die Navorsingseenheid vir Amebiase aan die Universiteit van Natal word binnekort in 'n nuwe gebou gehuisves; die fondse is uit 'n aantal bronne afkomstig en die United States Public Health Service het hierdie eenheid mildelik gesteun. Die Direkteur is uitgenooi om op die Wêreldkongres oor Gastro-enterologie in Washington op te tree as een van die deskundiges op die naamrol vir amebiasis en om tydens sy verblyf in die V.S.A. 'n aantal vooraanstaande organisasies toe te spreek. Later het hy, na besoeke aan Londen en Düsseldorf, die Sese Internasionale Kongres oor Tropiese Medisyne en Malaria in Lissabon bygewoon wat daartoe gelei het dat hy versoek is om met die Wêreldgesondheidsorganisasie in aanraking te kom met die oog op die bepaling van die voorkoms van amebiasis oor die hele wêreld.

Na 'n reeks uiters interessante waarnemings deur die Endokriennavorsingsgroep is die gevolgtrekking gemaak dat daar by 'n aantal siektes op die gebied van die metabolisme voor alles 'n oormatige kalsiumverlies in die urien plaasvind, met 'n vergoedende verhoging van die absorpsie uit die derm terwyl die teenoorgestelde gewoonlik aangeneem word. Daar is 'n begin gemaak met radio-isotoopstudies.

Die vernaamste werk van die Navorsingsgroep oor Degenerasiesiektes, wat slegs twaalf maande gelede gestig is, was 'n ondersoek van die probleem van hoë bloeddruk. Die Bilharzianavorsingsgroep het sy werk in verband met skulpdierdoders, sistosomiase by vee, wilde knaagdiers en die toets van middels voortgesit.

Die Navorsingseenheid vir Virussiektes deur Artropode oorgedra bestaan uit 'n span senior Amerikaanse viroloë wat saamwerk met twee Suid-Afrikaanse professionele beamptes en twaalf tegnisi. Hierdie eenheid het in die vyf jaar van sy bestaan elf virusse in Suid-Afrika ontdek; slegs van een is vasgestel dat hy reeds in ons land voorgekom het en party van hulle is vir die wetenskap tot nog toe onbekend. Sommige is belangrike bronne van siektes by huisdiere en kan ernstige siektes in mense veroorsaak. Tot dusver is virusse uit agt muskietsoorte geïsoleer.

Die Tandheelkunde-navorsingseenheid aan die Universiteit van die Witwatersrand ondersoek tans beenimplantmiddels, die mikrochemie van tandverkalking, die chemie van tandbeenverkalking en die metabolisme van die tandvleis- en mondepittele. In die tussentyd bestudeer die Voeding- en Tandheelkundige Navorsingsgroep die verband tussen tandverrotting en voedsel. Volledige aantekeninge word elke ses maande gemaak in twee streke waar die voorkoms van tandverrotting in groot mate varieer. Te Nuwerus is gevind dat die voorkoms van beenbederf slegs 9 tot 13% is, terwyl dit in Langkloof naby Port Elizabeth 99% is.

The Amoebiasis Research Unit at the University of Natal will shortly be housed in a new building, the funds for which were donated by a number of sources. Generous assistance has been given to this unit by the United States Public Health Service. The Director was invited to serve on the Panel on Amoebiasis at the World Congress of Gastro-enterology in Washington and, during his stay in the U.S.A., to address a number of prominent organizations. Later, after visits to London and Düsseldorf, he attended the Sixth International Congress of Tropical Medicine and Malaria in Lisbon, as a result of which he was asked to contact the World Health Organization with a view to assessing the incidence of amoebiasis all over the world.

A series of very interesting observations by the Endocrine Research Group led to the conclusion that, in a number of diseases in the metabolic field, there is primarily an excess of calcium loss in the urine with a compensatory increased absorption from the gut, whereas the converse is generally accepted. Radioisotope studies have been started.

The principal activity in the Degenerative Diseases Group, which came into existence only twelve months ago, has been an investigation into the problem of high blood pressure. The Bilharzia Research Unit continued its work on molluscicides, cattle schistosomiasis, wild rodents and drug trials.

A team of senior American virologists working in collaboration with two South African professional officers and twelve technicians constitute the Arthropod-Borne Virus Research Unit which, during the five years of its existence, has discovered eleven viruses in South Africa, only one being previously known to occur in this country and some being entirely new to science. Some are important causes of disease in domestic animals and can cause severe illnesses in human beings. To date, viruses have been isolated from eight species of mosquito.

The Dental Research Unit at the University of the Witwatersrand is investigating bone implantation materials, the microchemistry of calcification, the chemistry of dentin calcification, and the metabolism of the gingiva and oral epithelia. Meanwhile, the Nutrition and Dental Health Research Group is studying the relationship between tooth decay and food. Complete six-monthly recordings are being made in two areas where the prevalence of tooth-decay varies considerably. At Nuwerus it has been found that the incidence of caries is only 9 to 13%, while in the Langkloof near Port Elizabeth it is 99%.

Die Kardio-pulmonêre Eenheid bestudeer die funksie van die longe by vet proefpersone, die invloed van hoogte op die longe van normale mense, die uitwerking van borsmisvorming, die asemhalingspiere en sekere fundamentele aspekte van hoë bloeddruk.

'n Algemene werkpatroon is vasgestel in die Pneumokoniosenavorsingseenheid wat sy kinderskoene nou ontgroeï het. Verskillende aspekte van longbeskadiging deur stof word bestudeer. 'n Belangrike werk was die organisering van die Konferensie oor Pneumokoniose, wat deur sewentien vooraanstaande buitelandse wetenskaplikes en vyftig Suid-Afrikaanse veldwerkers bygewoon is.

In die Navorsingseenheid vir Menslike Biochemie word heelwat aandag tans geskenk aan 'n abnormale ysterafsetting in die Suid-Afrikaanse Bantoe. Waar dit reeds gewyt word aan intrasellulêre siektes wat vermoontlik weens chroniese ondervoeding ontstaan het, lyk dit volgens 'n studie wat die Eenheid daarvan gemaak het, of dit veroorsaak word deur yster wat met die bereiding van voedsel opgeneem word. Betekenisvol is dus die gebruik van die tradisionele ysterkookpot.

Die Tuberkulose-navorsingseenheid ondersoek leweroeskadiging wat na vermoede aan sekere antituberkulosemiddels toegeskryf kan word en die werk in verband met swamme by tuberkulose word voortgesit.

Die voorlopige resultate van 'n profilaktiese proefneming op 'n trop melkbeeste blyk goed geslaag te wees en dit wil voorkom of 'n eenvoudige manier gevind is om 'n skoon trop van 'n besmette trop te teel.

Die W.N.N.R. se Hartnavorsingseenheid aan die Universiteit van Pretoria wend pogings aan om rumatiekkoors met profilaktiese middels te bestry. 'n Studie van die menslike liggaam in sy geheel word voortgesit in 'n rigting wat diagnose deur die huisdokter sal vergemaklik.

Die openbare hospitale van Transvaal is tans verplig om volle besonderhede van sterfgevallen wat in verband met narkose en operasies voorkom, te verstrek aan die Navorsingsprojek in verband met sterfte as gevolg van Narkose wat ook besonderhede ontvang wat vrywillig deur verskeie ander liggame gegee word. Skielike hartverlamming gedurende operasies het besonder dikwels voorgekom en groter beklemtoning hiervan sou miskien minder sterfgevallen in die operasiesaal tot gevolg hê. Die moontlikheid van groter versorging van 'n pasiënt voor, onder en na narkose word ondersoek en die belangrikheid van behoorlike opleiding vir narkosetoediening word benadruk. As gevolg van vertoë wat hierdie Eenheid en die Vereniging van Narkotiseurs gesamentlik gerig het, is dit nou vir 'n inwonende geneesheer verpligtend om minstens 50 algemene narkosetoedienings onder toesig te doen voordat hy as mediese praktisyn in Suid-Afrika geregistreer mag word.

Tot 'n jaar of tien gelede het Suid-Afrika bloedweinig op die gebied van mediese navorsing gelewer. Vandag

The Cardio-Pulmonary Unit is studying lung function in obese subjects, the effects of altitude on the lungs of normal persons, the effects of chest deformity, the muscles of breathing, and certain fundamental aspects of high blood pressure.

A general pattern of work has been established in the Pneumoconiosis Research Unit, where teething difficulties are now over. Various aspects of lung damage from dust are being studied. An important activity was the organization of the Pneumoconiosis Conference, attended by seventeen eminent overseas scientists and fifty South African workers in the field.

In the Human Biochemistry Research Unit, much attention is being given to an abnormal iron deposition in the South African Bantu. While this has been attributed to intro-cellular disorders, probably started by chronic malnutrition, studies by the Unit tend to show that it is due to iron being taken up during the preparation of food. The use of the traditional iron cooking pots is thus significant.

The Tuberculosis Research Unit is investigating liver damage which is suspected to be due to certain anti-tuberculosis drugs, and work on fungi in association with tuberculosis continues.

Preliminary results indicate that a prophylactic experiment on a herd of dairy cows is proving highly successful and it seems that a simple method has been found to raise a clean herd from an infected one.

Attempts to control rheumatic fever by prophylactic means are being made by the C.S.I.R. Heart Research Unit at the University of Pretoria. Studies on the human body as a whole are being directed so as to facilitate diagnosis of disease by the family doctor.

It is now compulsory for Transvaal public hospitals to furnish full information on deaths associated with anaesthetics and surgical operations to the Anaesthetic Deaths Research Project, which also receives information voluntarily contributed by various other bodies. The frequency of sudden cardiac arrest during surgical operations has been marked and more emphasis on this may result in fewer theatre deaths. Possibilities of improving the care of patients before, under and after anaesthetics are being investigated and the importance of proper training for anaesthetists is being emphasised. As a result of representations made jointly by this Unit and the Association of Anaesthetists it is now compulsory for an intern to have performed at least fifty general administrations of anaesthetics under supervision before registering as a medical practitioner in South Africa.

Up to a decade or so ago, South Africa was responsible for very little indeed in the field of medical re-

word egter geweldige vordering gemaak, wat in groot mate deur die navorsingseenhede van die W.N.N.R. bygedra word en waarvan heelwat belangrik genoeg is om wêreldwye betekenis te hê.

STANDAARDISERING

(’n Uitvoerige verslag word in Deel II opgeneem)

Ten einde die tegniese en administratiewe beheer te verbeter en groter doeltreffendheid van die werk te verseker, is die oorspronklike vier afdelings van die Suid-Afrikaanse Buro vir Standaarde deur vyf vervang, nl. Chemiese Verwerkingsnywerhede en Produkte; Chemiese Tegnologie en Dienste; Biologiese Wetenskap; Siviele en Werktuigkundige Ingenieurswese; en Fisika en Elektrotegniese Ingenieurswese. Hierdie herverdeling werk glad.

Die steeds uitgebreide omvang van die Buro se aanneemtoetsdiens was belangrik. Hierdie dienste, wat reeds voortdurend aftrek kry waar handelsartikels vir plaaslike verbruik getoets moet word, het so uitgebrei dat Suid-Afrika se uitvoerhandel ook gedek word. Die artikels wat getoets is, omvat byvoorbeeld groot staal-pype vir Ciprus, verkeerstekens vir Ghana, kables vir Nieu-Seeland en miniatuurstroomverbrekers vir Australasië en die Verre Ooste. Dit behoort te dien as duidelike aanduiding dat Uniefabrikante nie net aan plaaslike markte alleen hoef te dink nie en dat die Buro deur middel van sertifisering van besendings sy deel bydra om oorsese markte op te bou.

Nog iets van belang was die merkbare uitbreiding van die houtnywerheid en die ywer waarmee staats- en private saagmeulens die Buro se goedkeuringsmerk verwerf het. Klaarblyklik het die meer uitgebreide toepassing van die graderingsreëls wat in die Buro se houtspesifikasie voorgeskryf word, reeds veel gedoen om die bestaande vooroordeel teen die gebruik van hout wat in Suid-Afrika gekweek is, te verminder. Langtermynkontrakte wat deur die Departement van Bosbou uitbestee word, bepaal tans dat die kontrakteur die S.A.B.S.-merk vir sy produkte moet verwerf.

’n Dokumentêre film oor hout, wat saam met ’n bekende Suid-Afrikaanse filmmaatskappy deur die Buro gemaak is, was sowel by die bioskoopganger as die houtnywerheid baie gewild en behoort daartoe by te dra om landswye belangstelling in ons eie produkte aan te wakker.

Die groot getalle permitte wat aan fabrikante (wat reeds 532 tel) uitgereik is, toon die toenemende gewildheid van die merkskema. Van die 28½ miljoen pond ingemaakte vrugte, groente en konfy wat kragtens die merkskema ondersoek en gekeur is, is slegs 0.12 persent afgekeur, in vergelyking met 18.4 persent in 1953.

search. Tremendous progress, however, is being made today, much of it attributable to the medical research units of the C.S.I.R., and much of that sufficiently important to have significance throughout the world.

STANDARDIZATION

(A detailed report is contained in Part II)

To improve technical and administrative control and to achieve greater working efficiency, five departments of the South African Bureau of Standards now replace the original four. These are Chemical Processing, Industries and Products; Chemical Technology and Services; Biological Science; Civil and Mechanical Engineering; and Physics and Electrical Engineering. This re-distribution is working smoothly.

The broadening scope of the Bureau’s acceptance testing services was significant. These services, although in constant demand for the testing of commodities for local consumption, expanded to include South Africa’s export trade. Large steel pipes for Cyprus, traffic signs for Ghana, cables for New Zealand and miniature circuit-breakers for Australasia and the Far East were among the articles tested. This should serve as a clear indication that Union manufacturers need not think in terms of local markets only and that the Bureau is doing its share in building up overseas markets by means of consignment certification.

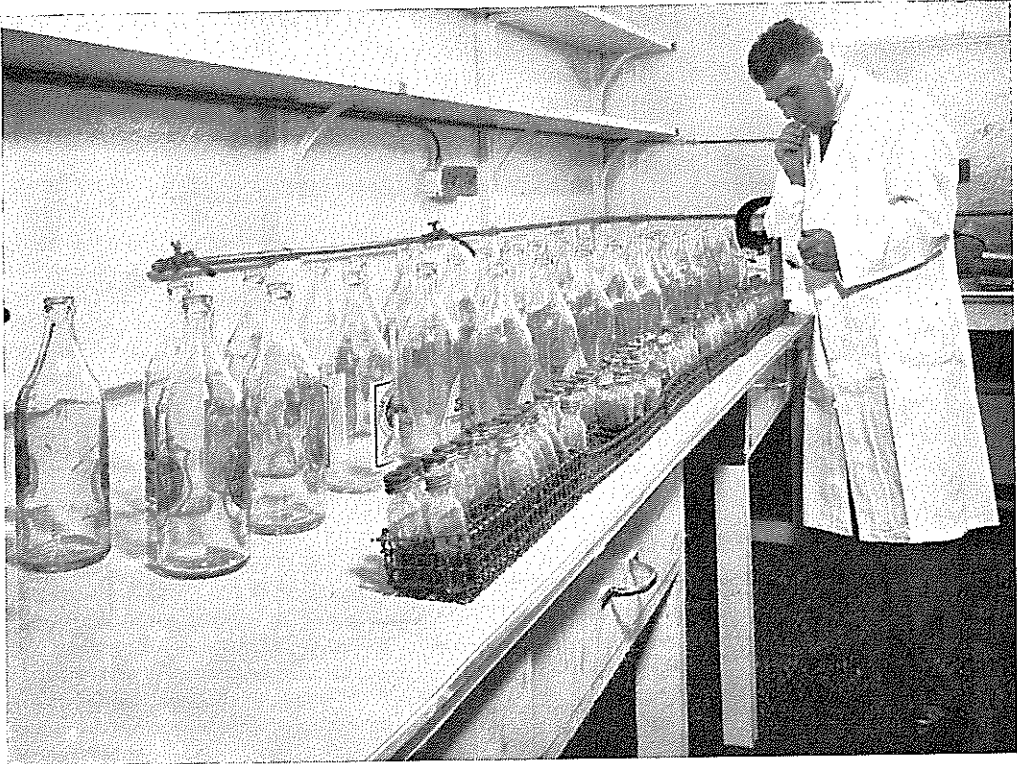
A further feature was the marked expansion in the timber industry and the keenness shown by state and private sawmillers in obtaining the Bureau’s mark of approval. It seems obvious that the wider application of the grading rules laid down in the Bureau’s timber specifications has already done much to diminish existing prejudices against the use of South African grown timber. All long-term contracts given out by the Department of Forestry now stipulate that the contractor must acquire the S.A.B.S. mark for his products.

A documentary film on timber, “Touching Wood”, made by the Bureau in conjunction with a well known South African film company, was well received by the cinema-going public as well as the timber industry, and should help to stimulate country-wide interest in home products.

The growing popularity of the mark scheme was evidenced by the large number of permits issued to manufacturers, the number now totalling 532. Of 28½ million pounds of canned fruit, vegetables and jams inspected and approved under the mark scheme, only 0.12 per cent was rejected compared with the 18.4 per cent in 1953.

Die Buro het op versoek van regeringsdepartemente, provinsiale administrasies, die Unieraad vir Tenders en ander groot aankoopliggame meer private spesifikasies as in vorige jare opgestel. Hierdie spesifikasies is veral vir grootskaalse kopers van waarde, aangesien hulle 'n duidelike grondslag vir transaksies vorm en goeie waarde verseker vir die geld wat bestee word.

Many more private specifications were drawn up by the Bureau than in previous years at the request of government departments, provincial administrations, the Union Tender Board and other large purchasing bodies. These specifications are particularly valuable to large-scale buyers as they provide a clear basis for transactions and ensure value for money.



Suid-Afrikaanse Buro vir Standaarde: Bepaling van die steriliteit van melkbottels na gewone skoonmaak

South African Bureau of Standards: Determining the sterility of milk bottles after normal cleaning

Die toetsgeriewe en permithouers het nuwe ondersteuning verlang van sekere instansies van die mynbedryf, wat nou goedere bestel op grond van S.A.B.S.-spesifikasies. Wat tenders betref, word 'n bewys verlang in die vorm van 'n S.A.B.S.-merk of 'n toetsertifikaat van die Buro. Diegene wat hierdie prosedure volg, vind dat dit besparing in die administratiewe koste en beter prestasie van gekoopte materiaal meebring.

Testing facilities and permit holders gained new support from certain sections of the mining industry which now order goods to S.A.B.S. specification. In the case of tenders, proof in the form of an S.A.B.S. mark or a Bureau test certificate is required. Those who follow this procedure have found that it results in savings in administrative costs and better performance of material purchased.

Die hoof van die Buro se tekstielafdeling was een van twee Suid-Afrikaanse verteenwoordigers op die Verdedigingskongres van die Gemenebes wat in 1959 in

The head of the Bureau's Textile Section was one of two South African representatives at the Commonwealth Defence Conference held in Australia in 1959.

Australië gehou is. Hy het twee verhandelings voorgedra, een waarvan die uitwerking van struktuur op die sterkte van seildoek en die ander die verweringsbestandheid van tentmateriaal wat teen rotte bestand gemaak is, behandel het. 'n Memorandum wat hy voorgelê het oor die biologiese aspekte van motvry-making word deur alle Gemeenesbeslante bestudeer.

Dwarsdeur die land was daar 'n merkbare verbetering in die etikettering van wolprodukte ingevolge die Handelswaremerkewet, terwyl monstertoetswerk en ondersoek van tekstielgoedere sowat 20 persent toegeneem het.

Die Buro het ywerig meegehelp in die veldtog om beter voedselhantering. Sowel artikels in die *Standaardbulletin* en ander publikasies as radiopraatjies het die belangrikheid van sindelikhed met voedsel benadruk.

In die chemiese dienste het veral vinnige, akkurate toetsmetodes aandag geniet en geriewe is ingestel vir werk met x-straaldiffraksie en fluoressensie gepaard met spektrofotometriese toetse in die ultraviolet en infrarooi veld van die spektrum.

Nasionale standaardspesifikasies vir verf, waarvan ses reeds in gevorderde stadium is, gaan uiteindelik 'n aantal private spesifikasies vervang.

Weens die fenomenale ontwikkelings in die rubber- en plastieknywerheid en die daaropvolgende vraag na toetsdienste is 'n inspuittoestel vir vormwerk en 'n apparaat vir druktoetse op pype aangeskaf. Moeilikhede by die werwing van behoorlik opgeleide personeel het daartoe gelei dat 'n gegradueerde oorsee gestuur is om 'n intensiewe, gespesialiseerde kursus oor rubber- en plastiektegnieke by te woon.

Internasionale standardisering van elektroniese onderdele is vir Suid-Afrika van belang, aangesien ons van invoer afhanklik is en omdat kommunikasies in oorlogstyd so 'n belangrike rol speel. Die Buro se Onderafdeling Elektronika het 'n bedrywige tegniese komitee van die Internasionale Elektrotegniese Kommissie georganiseer wat bestaan uit lede van die elektronika-bedryf en gebruikers van elektriese apparate.

Ses voorlopige lysste van 'n Engels-Afrikaanse Elektrotegniese Woordelys is reeds voltooi.

'n Onafhanklike Onderafdeling Papier is in die lewe geroep en die instelling daarvan is ten volle geregverdig deur die aansoek om toetswerk en spesifikasies van regeringsdepartemente en nywerhede.

Die betrekkinge met die nywerheid, wat nog altyd hartlik van aard was, is verder versterk deur die instelling van gereelde vergaderings met permitthouers, waarop menings en onderlinge probleme bespreek en wenke aan die hand gedoen kon word in verband met die toepassing van die standaardmerkskema. Die konstruktiewe aard van dié skema is reeds merkbaar.

He read two papers, one covering the effect of structure on the strength of canvas and the other the weathering resistance of rotproofed tentage material. A memorandum which he presented on the biological aspects of mothproofing is being studied by all Commonwealth countries.

A marked improvement throughout the country was noted in the labelling of wool products in terms of the Merchandise Marks Act, while sample testing and textile inspections increased by about 20 per cent.

The Bureau actively assisted in the campaign for better food handling. Articles in the *Standards Bulletin* and other publications, as well as radio talks, emphasized the importance of food cleanliness.

In chemical services, special attention was given to rapid, accurate methods of testing and facilities have been introduced for X-ray diffraction and fluorescent work together with spectro-photometric tests in visible, ultra-violet and infra-red fields of the spectrum.

National standards for paints, of which six are at an advanced stage of preparation, will eventually replace a number of private specifications.

Phenomenal development in the rubber and plastics industries and the consequent demand for testing services led to the acquisition of an injection moulding unit and an apparatus for the pressure testing of piping. Because of difficulties in the recruiting of suitably experienced staff, a graduate has been sent overseas to attend an intensive, specialized course in the rubber and plastic technologies.

International standardization of electronic parts is important to South Africa because of our dependence on imports and because of the part played by communications in war-time. An active technical committee of the International Electrotechnical Commission was organized by the Bureau's Electronics Section from members of the local electronics industry and users of electrical apparatus.

In the compilation of an English and Afrikaans Electrotechnical Nomenclature, six preliminary lists were completed.

An independent Paper Section was started and its establishment has been fully justified by requests for test work and specifications from government departments and industries.

Relations with industry, always of a cordial nature, were further strengthened by the inauguration of regular meetings with permit holders at which opinions and mutual problems could be discussed and suggestions made in connection with the administration of the mark scheme. The constructive nature of this scheme is already apparent.

PROFESSIONELE DIENSTE

Die eertydse Biblioteek, Skakel- en Inligtingsafdelings is saamgevoeg om die Departement Inligting en Spesiale Dienste te vorm. Sy werksaamhede word volledig in Afdeling XIII van hierdie verslag behandel. Die boekevoorraad van die Biblioteek, wat as sentrale wetenskaplike biblioteek vir Suid-Afrika dien, het tot 'n totaal van 39,029 gestyg, waarvan 3,360 publikasies gedurende die jaar ontvang is. Altesaam 43,307 publikasies is aan individue uitgereik.

Deur middel van herorganisering is 'n meer omvattende tegniese navraediens moontlik gemaak. Daar is 97 navrae beantwoord en 41 naslaanlyste met beskrywende aantekeninge, in sommige gevalle ná uitgebreide ondersoek van die literatuur, is uitgegee. Nog 'n nuwe diens wat ingestel is, is die voorsiening van kataloguskaartjies van biblioteektoevoegings as hulpmiddel vir individuele wetenskaplikes om hulle eie, gespesialiseerde bibliografieë op te stel.

Die Afdeling Publikasies se hoofsaak is die verskaffing van die reklameliteratuur wat aan die einde van hierdie afdeling opgegee word. Nog vier reklamegeskrifte is gedurende die jaar opgestel, asook twee tegniese verslae vir die Raad se laboratoriums.

Die Onderafdeling Vertalings kan tans werk in vyftien tale, benewens die twee amptelike tale van die Unie, onderneem. In die jaar is dokumente vertaal, wat altesaam sowat 1,051,500 woorde bedra.

Die Afdeling Bedryfseconomie hou hom hoofsaaklik besig met ondersoeke van die tipe „operasienavorsing” in verband met die ekonomiese aspekte van sekere navorsingsprobleme van toegepaste industriële aard, met die oogmerk om wetenskaplike navorsing in die voordeligste rigting te stuur. Vanjaar is 'n studie gemaak van boukoste in die algemeen en die koste van Bantoeedorpe in die stede is ondersoek. Die Nasionale Padnavorsingsinstituut het hom toegelê op 'n studie ter bepaling van die moontlike ekonomiese gevolge van alternatiewe beleidsbeslissings op elke vlak. Planne is beraam en aangepak om die ekonomiese aspekte van die hele gebied van padnavorsing te bestudeer. Daar is ook, onder andere, ondersoekwerk namens die houtwerheid en die Aartappelraad onderneem.

Patente: Die werksaamhede van die Afdeling Patente is met soveel welslae bekroon dat die Raad besluit het om 'n Patentontwikkelingskorporasie te stig om die verantwoordelikheid vir die ontwikkeling van die Raad se uitvindsels oor te neem. Hierdie ontwikkeling is reeds in die vooruitsig gestel toe die Afdeling Patente geskei is van die Departement Inligting en Spesiale Dienste en deur die invoering van die nuwe naam Afdeling vir die Ontwikkeling van Uitvindsels, wat eintlik 'n noukeuriger beskrywing van sy funksies en verantwoordelikhede is.

PROFESSIONAL SERVICES

The former Liaison, Library and Information Divisions have been combined to form the Information and Special Services Department, whose activities are fully covered in Section XIII of this report. The bookstock of the Library, which serves as a central scientific library for South Africa, reached a total of 39,029, 3,360 publications being received during the year. Altogether 43,307 publications were issued to individuals.

As a result of re-organization, a more comprehensive technical enquiry service has become possible. 97 enquiries were answered and, following extensive literature searches in certain cases, 41 annotated reference lists were published. A further new service established was the provision of catalogue cards of library accessions to enable individual scientists to build up their own specialized bibliographies.

The Publications Division is mainly concerned with the production of the publicity matter which is listed at the end of this section. Four additional publicity documents were produced during the year, as well as two technical reports for the Council's laboratories.

The Translation Section is now able to undertake work in fifteen languages in addition to the official languages of the Union. During the year, documents totalling some 1,051,500 words were translated.

The Industrial Economics Division is primarily concerned with "operations research", investigations into the economic aspects of certain research problems of an applied industrial nature with a view to directing scientific research into the most fruitful channels. Building costs were studied generally this year and an investigation was made into the costs of running urban Bantu townships. Studies at the National Institute for Road Research were aimed at determining the probable economic consequences of alternative policy decisions at all levels. Economic studies on the entire field of road research were planned and begun. Other work undertaken included investigations on behalf of the timber industry and the Potato Board.

Patents: Development of the activities of the Patents Division has been so successful that the Council has decided that a Patent Development Corporation should be formed to take over responsibility for the development of the Council's inventions.

This development was foreshadowed when, in closer conformity with its actual functions and responsibilities, the Patents Division was re-designated the Inventions Development Division and separated from the Information and Special Services Department.

Daar kan gesê word dat dit gedeeltelike regverdiging vir die uitgawe van openbare geld aan 'n staatsnavorsingsorganisasie is as die voordele van die navorsing vir die hele volk beskikbaar gestel word. Erkenning van die bydrae tot die mens se kennis deur die afsonderlike wetenskaplike en deur die Raad, word by wyse van publikasie nagestreef. 'n Patentebeleid skakel nie publikasie uit nie en sorg boonop vir groter erkenning by 'n wyer publiek. In die geval van sekere ontdekkings in verband met nuwe prosesse of toestelle het die onderverinding geleer dat publikasie op sigself onvoldoende is om toepassing te verseker. Dit is begryplik as 'n mens in aanmerking neem hoe groot die geldelike risiko's verbonde aan die kommersialisasie van nuwe uitvindings is. Min besigheidsmense sal bereid wees om kapitaal in ondernemings van dié aard te belê sonder die versekering dat hulle 'n gedeeltelike monopolie van die uitvinding sal geniet as teenprestasie vir die risiko wat hulle loop. Hierdie waarborg kan deur middel van 'n patent gegee word. Hoewel 'n patent op sigself geen waarborg vir die kommersiële aanwending van 'n uitvinding is nie, skep dit tog die toestand wat die nywerheid sal aanmoedig om sekere resultate van die Raad se navorsing toe te pas. 'n Patent verseker ook dat die Raad die toepassing van sy uitvindings en die gehalte van die vervaardigde produk in die openbare belang kan kontroleer.

Die doel was nog altyd om die toepassing van die resultate van die W.N.N.R. se navorsing te beheer en indien moontlik geldelike vergoeding vir die aanvanklike belegging te verkry. Patente maak die basis van onderhandeling uit, maar hulle is niks meer as 'n middel tot 'n doel nie. Hulle is 'n nuttige maar geensins 'n onmisbare element in die ontwikkeling en toepassing van navorsingsresultate. Die belangstelling van die Afdeling strek dus verder as die registreer van patente. Dit behels ook: tegniese-ekonomiese waardebeepaling van uitvindings; die koördinasie van verdere navorsing en ontwikkeling om die patent uit te bou en kommersiële aanwending te verseker; die voer van onderhandelings ten opsigte van lisensieooreenkomste; onderhoud en toesig in verband met patente, ooreenkomste, skendings, ens. Hierdie funksies word in noue oorleg met die laboratoriums uitgevoer.

Van die ontstaan van die Raad se patentebeleid af het die afdeling reeds sowat 45 uitvindings vir ontwikkeling en eksplorasie aangeneem. Hierby word nie gereken 'n aantal voorstelle wat vir oorweging voorgelê maar reeds in die beginstadiums afgewys is nie omdat hulle as sonder tegniese verdienstelikheid of handelsbelang beskou is. Op die oomblik staan daar „op die afdeling se boeke” twee en dertig uitvindings, waarvan twee en twintig deur lisensie-ooreenkomste gedek is.

Die Raad het vyf-en-sewentig patente of aansoeke om patente ingedien, met die reg op nog twaalf deur die

It can be said that, in part, the justification for the expenditure of public funds in a state research organization is to be found in the expectation that the benefits of the research will be made available to the nation. Recognition of the contribution to human knowledge by the individual scientist and by the Council is sought by way of publication. A patent policy does not prohibit publication and furthermore ensures increased recognition amongst a wider public. In the case of certain discoveries relating to new processes or devices, experience has shown that publication alone is insufficient to ensure the application of the work. This is understandable if one considers the financial risks associated with the commercialization of new inventions. Few businessmen would be prepared to invest capital in enterprises of this nature without the assurance that they would enjoy a partial monopoly on the invention in compensation for the risks taken. This safeguard can be provided by means of a patent. While a patent does not automatically guarantee the commercialization of an invention, it does create the conditions under which industry is encouraged to apply certain of the results of the Council's research. A patent also ensures that the Council is able to control the application of its inventions and the quality of manufacture in the public interest.

The objective has always been to secure the application of the results of C.S.I.R. research and if possible to secure a financial return on the initial investment. While patents provide a basis for negotiation, they are no more than a means to an end. They are a useful but not indispensable element in the development and application of research results. Thus the interests of the division extend beyond the filing of patents to include the following: techno-economic assessment of inventions; co-ordination of further research and development to strengthen the patent and ensure commercialization; negotiation of licence agreements; maintenance and supervision of patents, agreements, infringements, etc. These functions are carried out in close consultation with the laboratories.

Since the inception of the Council's patent policy, the division has accepted some 45 inventions for development and exploitation. This figure excludes a number of propositions submitted for consideration but rejected at the preliminary stages as being without technical merit or commercial significance. At present the division has thirty-two inventions "on its books" of which twenty-two are covered by licence agreements. The Council has seventy-five patents or patent applications lodged, with rights on an additional twelve lodged by T.N.O. (Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek).

T.N.O. (Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek).

Daar is in die laaste jare baie geskrywe oor die noodsaaklikheid om uitvoermarkte te ontwikkel. In die geval van die gevestigde nywerhede wat 'n betreklik gestandaardiseerde produk vervaardig, kan 'n afset alleen verkry word deur randverskynsels soos prys, leweringsdatum, diens ens. Die sukses waarmee gevestigde produkte in konkurrensie verkoop kan word, sal op sy beste maar beperk wees. Hierdie beperkings geld nie in gelyke mate vir nuwe produkte nie, veral as hulle deur patente beskerm is. So kan die Raad se navorsingspotensiaal, as dit reg ingespan word, help om nuwe uitvoer nywerhede te ontwikkel. Die Tellurometer, wat aan 'n Suid-Afrikaanse firma bo een uiterskeie groot buitelandse ondernemings van gevestigde naam en sterk hulpbronne in lisensie gegee is, het as pragtige voorbeeld gedien, want ander projekte wat nou in die ontwikkelings stadium is, belowe ewe goed.

Die voortgesette toepassing van die Raad se patentbeleid kan ook uit onverwagte hoeke vrugte afwerp. Die opkoms van die Suid-Afrikaanse tegnologie en kundigheid kan heel goed omstandighede meebring wat gunstiger is vir 'n aandeel van ons land se kapitaal in nuwe ondernemings deur buitelandse belange.

Openbare Betrekkings: By geleentheid van die Raad se besoekdae, wat op 3, 4 en 5 September 1958 gehou is, was daar 5,362 besoekers aan die laboratoriums by Scientia en 3,000 aan die laboratoriums in die stad. Spesiale reëlings is getref om 1,600 skoolkinders in standerd 9 en 10 in georganiseerde groepe deur die laboratoriums te neem.

Die navorsingslaboratoriums is nie oop vir die algemene publiek nie, behalwe op besoekdae, maar daar is geleentheid vir besoekers, o.a. groepe skoolkinders, om die laboratoriums van die Buro vir Standaarde te besigtig. Spesiale reëlings word getref vir vakkundige en tegniese groepe as hulle die navorsingslaboratoriums of die S.A.B.S. wil besoek. Onder laasgenoemdes was die afgevaardigdes na die Suid-Afrikaanse Veeartsenykongres, die Noord-Transvaalse Kamer van Mynwese, die Vereniging van Buitelandse Korrespondente, afgevaardigdes na die Internasionale Pneumokoniosiekonferensie, die Bankiersinstituut en baie ander. 'n Klein funksie is gehou om die Zebra, die elektroniese rekenmasjien by die Nasionale Fisiese Navorsingslaboratorium in te wy.

Uitstallings van die S.A.B.S. is gehou op die Suid-Afrikaanse Handelstentoonstelling, Bulawayo, en op die Randse Paastentoonstelling, terwyl algemene uitstallings van die W.N.N.R. by die Pretoriase Nywerheidstentoonstelling en die Wetenskaplike Tentoonstelling in Kaapstad gedoen is. Die Raad is bekroon met die Hollywood-wisseltrofee vir die beste ontwerp op die Pretoriase Tentoonstelling.

In recent years, much has been written about the need to develop export markets. In the case of traditional industries manufacturing a relatively standardized product, markets can be gained only on such marginal advantages as price, delivery date, service, etc. The success with which traditional products can be sold in competition will at best be limited. These limitations do not apply to the same extent with new products, particularly if they are protected by patents. Thus the Council's research potential, if correctly harnessed, can assist in the development of new export industries. The Tellurometer, which was licenced to a South African firm in preference to one of several large overseas concerns of established reputation and resources, has proved an outstanding example and other projects which are now under development offer prospects of similar success.

The continued application of the Council's patent policy may also yield results in unexpected directions. For example, the growth of South African technology and "know-how" may well bring about circumstances more favourable to increased participation of local capital in new ventures launched by overseas interests.

Public Relations: During the Council's annual open days there were 5,362 visitors to the laboratories at Scientia and 3,000 to the laboratories in the City. Special arrangements were made for 1,600 school children in Standards 9 and 10 to be taken through the laboratories in organized groups.

The research laboratories are not open to the general public, except during the open days, but facilities are provided for visitors (including groups of school children) at the laboratories of the Bureau of Standards. Special arrangements are made for professional and technical groups to visit the research laboratories or the S.A.B.S. These included delegates to the South African Medical Veterinary Congress, the Northern Transvaal Chamber of Industries, the Foreign Correspondent Association, delegates to the International Pneumokoniosis Conference, the Institute of Bankers and many others. Arrangements were made for a small function to mark the inauguration of Zebra, the electronic computer at the National Physical Research Laboratory.

Exhibits on the S.A.B.S. were staged at the South African Trade Exhibition, Bulawayo, and the Rand Easter Show, and general exhibits on the C.S.I.R. at the Pretoria Industrial Exhibition and the Science Exhibition in Cape Town. The Council was awarded the Hollywood Floating Trophy for the best designed stand at the Pretoria Show.

Inligting aan die Pers: 53 persberigte is uitgereik oor gebeurtenisse wat as van openbare belang beskou is. Verder is verteenwoordigers van die pers, die S.A.U.K., tydskrifte en blaaië altyd gehelp as hulle inligting uit die eerste hand van die Raad se personeel gevra het.

TEGNEESE DIENSTE

Tegniese dienste van allerlei aard is dwarsdeur die organisasie onder die Departement van Tegniese Dienste gesentraliseer. 'n Afdeling Grafiese Dienste is ingestel om fotografiese en drukwerk te onderneem. 'n Aantal universiteit en Staatsdepartemente is met raad gedien, en die Sentrale Werkwinkels het 'n verskeidenheid instrumente en aparate vir gebruik in die Raad se laboratoriums gebou.

Information for the Press: 53 "press releases" were issued on events considered to be of public interest. In addition, representatives of the Press, S.A.B.C., magazines and other journals were assisted whenever requested to obtain first-hand information from the Council's staff.

TECHNICAL SERVICES

Technical services of all types throughout the organization have been centralized under the Technical Services Department. A division of Graphic Arts was established to undertake photographic and printing work. Services in the form of advice were rendered to a number of universities and government departments, and a variety of instruments and apparatus was constructed by the Central Workshops for use in the Council's laboratories.



Die uitstalling van die Wetenskaplike en Nywerheidsnavorsingraad, wat met die Hollywood-wisseltrofee bekroon is vir die beste ontwerp op die Pretoriase Tentoonstelling

The exhibition stand of the Council for Scientific and Industrial Research, which was awarded the Hollywood Floating Trophy for the best design at the Pretoria Show

W.N.N.R. SE GEREELDE PUBLIKASIES

Nasionale Bounavorsingsinstituut

Bulletin (Reeks DB)—halfjaarlikse artikels i.v.m. die werk van die Instituut.

Inligtingspamflette (Reeks DIS)—tweemaandelikse seleksie van tegniese navrae met antwoorde.

Nasionale Instituut vir Personeelnavorsing

Joernaal van die N.I.P.N.—driemaal per jaar.

Nasionale Telekommunikasienavorsingslaboratorium

Maandelikse voorspellings van basiese radiovoortplanting in Suidelike Afrika.

Maandelikse bulletin van ionosferiese karakteristieke soos waargeneem in Johannesburg en Kaapstad.

Departement Inligting en Spesiale Dienste

Navorsingsoorsig—Kwartaalliks.

Jaarverslag

W.N.N.R.-Inligting—maandelikse byvoegingslys.

Keur van Wetenskaplike Nuus—weekliks vir die tegniese en daaglikse pers.

Register van Huidige Navorsing in Suid-Afrikaanse Universiteite—Jaarliks.

Suid-Afrikaanse Buro vir Standaarde

Suid-Afrikaanse Standaardebuletin—maandeliks.

C.S.I.R. PERIODICAL PUBLICATIONS

National Building Research Institute

Bulletin (Series DB)—half-yearly articles in relation to the work of the Institute.

Information sheets (Series DIS)—bi-monthly selections of technical enquiries with replies.

National Institute for Personnel Research

Journal of the N.I.P.R.—three times per year.

National Telecommunications Research Laboratory

Monthly basic radio-propagation predictions for Southern Africa.

Monthly bulletin of ionospheric characteristics observed at Johannesburg and Cape Town.

Information and Special Services Department

Research Review—Quarterly.

Annual Report

C.S.I.R. Information—monthly list of accessions.

Science News Selections—weekly for the technical and daily press.

Register of Current Research in South African Universities—Annually.

South African Bureau of Standards

South African Standards Bulletin—monthly.

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

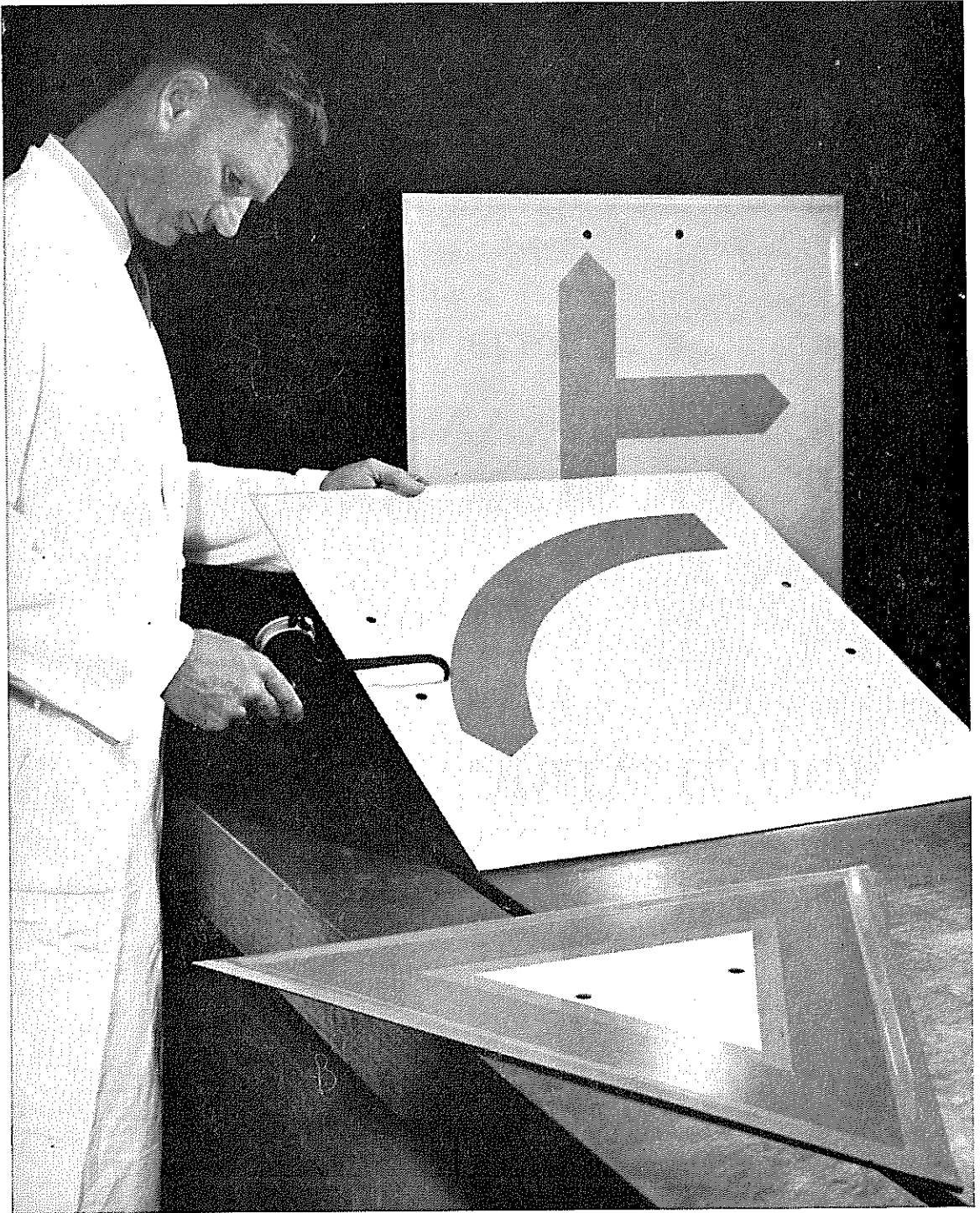
DEEL II

SUID-AFRIKAANSE BURO
VIR STANDAARDE

PART II

SOUTH AFRICAN BUREAU
OF STANDARDS

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. BOX 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)



Verkeerstekens vir Ghana; Meet van metaaldikte in die Metallurgiese Afdeling van die S.A. Buvo vir Standaardde

Traffic signs for Ghana: Metal thickness gauging in the Metallurgy Section of the S.A. Bureau of Standards

DIE SUID-AFRIKAANSE BURO VIR STANDAARDE

Direkteur: DR. A. W. LATEGAN

INLEIDING

In die tydperk onder bespreking is ses vergaderings deur die Standaarderaad gehou. Met leedwese moet melding gemaak word van die bedanking van drie van sy lede, nl. dr. A. J. A. Roux, professor M. N. S. Immelman en dr. H. O. Mönning. Die Raad spreek sy opregte dank aan hulle uit vir die uitstekende diens wat hulle in hul dienstryd gelewer het.

Die lede van die huidige Standaarderaad is die volgende:

Dr. S. M. Naudé (*Voorsitter*)
Dr. W. S. Rapson
Brig. dr. J. H. Rauch
Dr. F. J. de Villiers
Dr. V. Bosman
Prof. W. G. Sutton
Mnr. D. Lion-Cachet
Mnr. G. S. J. Kuschke
Mnr. J. de Villiers
Mnr. J. W. van der Merwe
Dr. P. W. Vorster

Om tegniese en administratiewe beheer te vergemaklik en as middel tot meer doeltreffende werkverrigting, is daar besluit om die Buro in vyf, in plaas van vier departemente, soos voorheen, in te deel. Hulle is:

Departement van Chemiese Verwerkingsnywerhede en -produkte: Bestaande uit die Afdeling Tekstiel, en Onderafdelings Hout, Leer en Skoel, en Papier.

Departement van Chemiese Tegnologie en Dienste:
(a) Afdeling Chemiese Tegnologie—Rubber, Plastika, Verf en Petroleum;
(b) Afdeling Chemiese Dienste—Organies- en anorganies-analitiese diens, Fisikochemiese en -analitiese diens, Metallurgie, Keramiek, en Water.

Departement van Biologiese Wetenskappe en Materiaal: Afdeling Biologie met Onderafdelings Entomologie, Farmaseutiese Produkte en Vitamiene; Afdeling Voedsel en Voer, en Afdeling Inspeksie van Ingemaakte Voedsel.

Departement van Siviele en Werktuigkundige Ingenieurswese:

(a) Afdeling Siviele Ingenieurswese met Onderafdelings Bougebruikskodes, Regulasies en Spesifikasies; Konstruksietoetswerk; Boumateriaal; Meubels en Houtprodukte; en Sement, Kalk en Toeslag.

(b) Afdeling Werktuigkundige Ingenieurswese—Tekenkantoor, Meettegniek, Bedryfsveiligheid en Onderafdelings Werktuigkunde, Verpakking en Toetsenjins.

THE SOUTH AFRICAN BUREAU OF STANDARDS

Director: DR. A. W. LATEGAN

INTRODUCTION

During the period under review six meetings were held by the Standards Council. The resignation of three of its members owing to pressure of work must be recorded with regret. They were: Dr. A. J. A. Roux, Professor M. N. S. Immelman and Dr. H. O. Mönning. The Council expresses its grateful thanks to them for the excellent services rendered during their term of office.

The membership of the present Standards Councils as follows:

Dr. S. M. Naudé (Chairman)
Dr. W. S. Rapson
Brig. Dr. J. H. Rauch
Dr. F. J. de Villiers
Dr. V. Bosman
Prof. W. G. Sutton
Mr. D. Lion-Cachet
Mr. G. S. J. Kuschke
Mr. I. de Villiers
Mr. J. W. van der Merwe
Dr. P. W. Vorster

To facilitate technical and administrative control and as a means of bringing about greater working efficiency, it was decided to divide the Bureau into five departments instead of the previous four. They are:

Chemical Processing Industries and Products: comprising the Textile Division, Timber, Leather and Footwear and Paper Sections.

Chemical Technology and Services:

(a) Chemical Technology Division—Rubber, Plastics, Paint and Petroleum.

(b) Chemical Services Division: Organic and Inorganic Analytical, Physics—Chemical and Analytical. Metallurgy, Ceramics and Water.

Biological Sciences and Materials Department: Biology Division: Entomology, Microbiology, Pharmaceutical Products and Vitaminology Sections, Foods and Feeds Division and Canned Food Inspection Division.

Civil and Mechanical Engineering Department:

(a) Civil Engineering Division—Building Codes, Regulations and Specifications, Construction Testing, Building Materials, Furniture and Wood Products and Cement, Lime and Aggregates Sections.

(b) Mechanical Engineering Division—Drawing Office, Engineering Metrology, Industrial Safety, Mechanical, Packaging and Test Engines Sections.

Departement van Fisika en Elektrotegniese Ingenieurswese:

(a) Afdeling Algemene Fisika—Elektronika, Nie-vernietigende Toetswerk, Herstel van Instrumente, ploffingsgevaar, Fotometrie en Statistiek;

(b) Afdeling Elektrotegniese Ingenieurswese—Elektriese Toestelle, Droë Selle en Batterye, Hoëspanning, Kables en Oorbrengringstoerusting, Meters en Instrumente, Bedradingsbybehore, en Veiligheidsregulasies.

Hierdie herindelings is reeds 'n paar maande van krag en werk glad.

Die onlangs ingestelde Wateronderafdeling maak dit vir die Buro moontlik om sy statutêre verpligtings ingevolge die Waterwet, No. 54 van 1956, na te kom. Sy aanbevelings vir 'n nasionale norm vir die gehalte van nywerheidsafvalwater is reeds aan die Departement van Waterwese voorgelê. Die Onderafdeling werk baie nou saam met die Nasionale Instituut vir Waternavorsing.

'n Glanspunt van die afgelope jaar was dat die Buro se aanvaarding toetsdiens al hoe omvangryker geword het. Hierdie diens, hoewel hy gedurig aangevra word vir toetswerk i.v.m. handelsartikels vir plaaslike verbruik, is nog verder uitgebrei om ook die land se uitvoerhandel te dek. Onder andere is groot staalpype vir Ciprus, verkeerstekens vir Ghana, kables vir Nieu-Seeland en miniatuurstroomverbrekers vir Australasië en die Verre Ooste getoets. Dit word beskou as 'n duidelike teken dat die Unie se fabrikante nie die plaaslike mark alleen hoef dop te hou nie en dat die Buro deur middel van sy sertifisering van besendings, sy deel tot die opbou van oorsese markte bydra.

Nog 'n glanspunt was die aanmerklike uitbreiding van die houtnywerheid en die geesdrif wat die staats- en private saagmeulens aan die dag gelê het om die Buro se goedkeuringsmerk vir hulle produkte te verwerf. Klaarblyklik het die toepassing in wyer kringe, van die graderingsvoorskrifte van die Buro se houtspesifikasies reeds baie uitgerig om die bestaande vooroordeel te verminder teen die gebruik van hout wat in Suid-Afrika gekweek is. Die Minister van Bosbou het in sy toespraak op die algemene jaarvergadering van die Vereniging van Saagmeulenaars en Duivervaardigers die werk van die Buro geloof toe hy gemeld het dat sy Departement in elke langtermynkontrak wat hy uitbestee, as aansporing tot goeie kwaliteit die voorwaarde stel dat die kontrakteur die S.A.B.S.-merk vir sy produkte kry.

'n Dokumentêre film oor hout, „Ons Haal die Paal”, wat die Buro saam met 'n bekende Suid-Afrikaanse filmmaatskappy gemaak het, was baie gewild sowel by die bioskoopgangerpubliek as by die houtnywerheid en sal landswyde belangstelling in die tuisgekweekte produk help aanwakker.

Die groot aantal permitte wat in die onderhawige tydperk aan fabrikante uitgereik is, getuig van die toenemende gewildheid van die merkskema. Die totaal permitthouers is tans 532. Met voldoening kan

Physics and Electrical Engineering Department:

(a) General Physics Division—Electronics, Non-destructive Testing, Instrument Repairs, Explosion Hazards, Photometry and Statistics.

(b) Electrical Engineering Division—Electrical Appliances, Dry Cells and Batteries, High Voltage, Cables and Transmission Equipment, Meters and Instruments, Wiring Accessories and Safety Regulations.

This re-distribution has been in force for several months and is working smoothly.

The recently created Water Section enables the Bureau to fulfil its statutory obligations under the Water Act, No. 54 of 1956. Its recommendations for a national standard for the quality of industrial effluents have already been submitted to the Department of Water Affairs. The Section works in close collaboration with the National Institute for Water Research.

The broadening scope of the Bureau's acceptance testing services was a feature of the year. These services, although in constant demand for the testing of commodities for local consumption, expanded to include South Africa's export trade, large steel pipes for Cyprus, traffic signs for Ghana, cables for New Zealand and miniature circuitbreakers for Australasia and the Far East being among the articles tested. This is considered a clear indication that the Union's manufacturers do not need to think only in terms of local markets and that the Bureau is doing its share in the building up of overseas markets by means of its consignment certification.

A further feature was the marked expansion in the timber industry and the keenness shown by state and private sawmillers to obtain the Bureau's mark of approval for their products. It seems obvious that the wider application of the grading rules laid down in the Bureau's timber specifications has already done much to diminish any existing prejudice against the use of South African grown timber. In his speech at the Annual General meeting of the Lumber Millers' and Shook Manufacturers' Association, the Minister of Forestry paid tribute to the work of the Bureau when he stated that as an inducement to promote quality, all long term contracts given out by his Department stipulate that the contractor must acquire the S.A.B.S. mark for his products.

A documentary film on timber, „Touching Wood”, made by the Bureau in conjunction with a well known South African film company has been very well received by the cinema-going public as well as the timber industry, and will help to stimulate country-wide interest in the home grown product.

Evidence of the growing popularity of the mark scheme was the large number of permits issued to manufacturers during the period reviewed, the number now totalling 532. It is extremely satisfactory to be

gerapporteer word dat van die 28½ miljoen pond ingemaakte vrugte, groente en konfynt wat kragtens die merkskema gekeur is, slegs 0.12 persent in vergelyking met die 18.4 persent van 1953, afgekeur is.

Heelwat meer private spesifikasies is op versoek van staatsdepartemente, provinsiale administrasies, die Unieraad vir Tenders en ander groot aankoopliggame deur die Buro opgestel. Hierdie spesifikasies wat 'n duidelike grondslag vir transaksies vorm en waarde vir geld verseker, is vir die koper op groot skaal van besondere waarde.

GEDurende die jaar het sekere afdelings van die mynbedryf opnuut van die toetsfasiliteite gebruik gemaak en permithouers begin ondersteun en hulle bestel nou die goedere op grond van die spesifikasies. Waar 'n S.A.B.S.-spesifikasie wel bestaan, word goedere op grond daarvan getoets, maar waar dit ontbreek, geskied die toetsing op grond van 'n private of ander spesifikasie. In die geval van tenders word 'n bewys in die vorm van 'n S.A.B.S.-merk of 'n toetssertifikaat van die Buro vereis. Diegene wat hierdie prosedure volg, het gevind dat dit besparing in administratiewe koste en beter prestasie van die materiaal wat gekoop word, meebring.

Van die twee Suid-Afrikaanse verteenwoordigers op die Verdedigingskonferensie van die Statebond wat in 1959 in Australië gehou is, was een die hoof van die Buro se Tekstielafdeling; hy het twee verhandelings voorgedra onderskeidelik oor die invloed van struktuur op die sterkte van seildoek en oor die verweringsweerstand van tentmateriaal wat teen verrotting bestand gemaak is. 'n Memorandum wat hy aangebied het oor die biologiese aspekte van motvrymaking word deur al die Statebondslande bestudeer.

Die Buro het deelgeneem aan die Unieregering se Nywerheidstentoonstelling wat in Bulawayo gehou is en ook aan die Randse Paastentoonstelling, waar sy uitstalling nie-vernietigende toetswerk vertoon het.

Betrekings met die nywerheid, wat nog altyd hartlik was, is verder versterk deur die instelling van gereelde vergaderings met permithouers, waar menings en gemeenskaplike probleme bespreek, en wenke aan die hand gedoen kan word in verband met die toepassing van die merkskema. Die konstruktiewe uitwerking van hierdie skema is reeds merkbaar.

Argitekte is besig met die eerste werktekenings vir die eerste van die nuwe geboue te Scientia. Dit sal die Afdelings Siviele en Meganiese Ingenieurswese huisves.

Sketsplanne is ontvang vir die geboue van die Afdelings Elektrotegniese Ingenieurswese en Fisika en Biologiese Wetenskappe en Materiaal en argitekte is reeds besig om die planne vir die orige twee geboue op te stel.

able to report that of the 28½ million pounds of canned fruit, vegetables and jams inspected and approved under the mark scheme, only 0.12 per cent was rejected compared with the 18.4 rejection figure of 1953.

A greatly increased number of private specifications was drawn up by the Bureau at the request of government departments, provincial administrations, the Union Tender Board and other big purchasing bodies. These specifications which provide a clear basis for transactions and ensure value for money, are particularly valuable to the buyer on the big scale.

During the year, testing facilities and permit holders found new support from certain sections of the Mining Industry which now order goods to specification. If an S.A.B.S. specification is available it is used, if not, goods are tested against a private or other specification. In the case of tenders, proof in the form of an S.A.B.S. mark or a Bureau test certificate is required. Users of this technique have found that it results in savings in administrative costs and better performance of material purchased.

Of the two South African representatives at the Commonwealth Defence Conference held in Australia in 1959, one was the head of the Bureau's Textile Division, by whom two papers covering the effect of structure on the strength of canvas and the weathering resistance of rotproofed tentage material respectively, were read. A memorandum on the biological aspects of mothproofing which he presented is being studied by all the Commonwealth countries.

The Bureau took part in the Union Government's Industrial Show held in Bulawayo, and also at the Rand Easter Show, at which its exhibit featured non-destructive testing.

Relations with industry, always of a cordial nature, were further strengthened by the inauguration of regular meetings with permit holders at which opinions and mutual problems could be discussed and suggestions made in connection with the administration of the mark scheme. The constructive nature of this scheme is already apparent.

Architects are engaged on the working drawings for the first of the new buildings at Scientia which will be occupied by the Civil and Mechanical Engineering Divisions.

Sketch plans for the Electrical Engineering and Physics and the Biological Sciences and Foods and Feeds buildings have been received, and architects are busy preparing plans for the remaining two buildings.

DEPARTEMENT VAN BIOLOGIESE WETENSKAPPE EN MATERIAAL

Aangesien die Departement van Biologiese Wetenskappe en Materiaal hom besig hou met verbruikersgoedere vir alledaagse gebruik, speel hy 'n belangrike rol op die gebied van standaardisasie en die toepassing en beheer daarvan.

In die Departement se laboratoria word talryke produkte getoets. In baie gevalle is die toetsvereistes reeds voorgeskryf in die verskillende spesifikasies wat vir die handelsartikels gepubliseer is en in ander gevalle word proewe uitgevoer om die aangevraagde spesifikasies vir die produkte op te stel.

Onderstaande handelsartikels is o.a. getoets: ingemaakte produkte soos bv. vis, kreef, vleis, vrugte, groente en konfynt; suiwelprodukte; deursigtig verpakte vleisprodukte soos ham, polonie en wors; vee- en pluimveevoedsel, farmaseutiese produkte, vitamienpreparate en insekdodende preparate wat huishoudkundige spuitmiddels, poeiers, weermiddels en aerosole behels.

Hierdie produkte word slegs genoem as aanduiding van die groot verskeidenheid algemene verbruikersprodukte wat in hierdie Departement getoets word, hoewel daar in die praktyk dwarsdeur die jaar 'n baie groter verskeidenheid getoets word, sowel vir die doeleindes van die merskema (d.w.s. vir fabrikante aan wie die merk vergun is) as by die kontrolering van die verpligte spesifikasies vir ingemaakte vis, ingemaakte kreef en ingemaakte vleis deur die Minister van Ekonomiese Sake in die Staatskoerant aangekondig.

Die laboratoria van die onderafdelings handel met die volgende toegepaste wetenskappe: mikrobiologie, mikologie, entomologie, vitamien, voedselchemie, voerchemie. Benewens voorgaande, is daar 'n laboratorium wat ondersoek van farmaseutiese produkte met behulp sowel van chemiese as van biologiese toetse uitvoer. Verder is daar die voedselonderzoeklaboratorium, wat die sentrum van groot bedrywigheid op nasionale skaal is. Laasgenoemde dien as kontrole- en koördinerende laboratorium vir alle buite-inspekteurs en die inspeksies wat dwarsdeur Suid-Afrika in verband met die vrywillige merkskema en die verpligte standdaarde vir ingemaakte voedsel uitgevoer word. Inspekteurs is in die Walvisbaaigebied van Suidwes-Afrika en ook te Windhoek en Luderitz, gestasioneer. In die Unie is hulle gestasioneer op die Witwatersrand, Johannesburg, Estcourt in Natal, Durban, Oos-Londen, Port Elizabeth, Kaapstad en ander gebiede van die Westelike Provinsie en in 'n aantal gebiede van Kaapstad tot by Port Nolloth. In Noord-Kaapland is 'n inspekteur te Vryburg gestasioneer.

Gedurende die inmaakseisoen wat op 31 Oktober 1958 geëindig het, is meer as 28½ miljoen pond ingemaakte vrugte, groente en konfynt goedgekeur om die merk te ontvang, terwyl slegs 35,888 lb. weens niewoeding aan die standaardspesifikasie afgekeur is.

BIOLOGICAL SCIENCES AND MATERIALS DEPARTMENT

The Biological Sciences and Materials Department, dealing as it does with everyday consumer products, plays a very important role in the field of standardization, its application and control.

In the laboratories of the Department numerous products are tested. In many instances the test requirements have already been specified in the various standards which have been published for the commodities, and in other instances tests are conducted for the purpose of preparing the specifications requested for the products.

Among the commodities tested are: canned products which include fish, rock lobster, meat, fruit, vegetables and jams; dairy products; open pack meat products such as hams, polonies and sausages; animal and poultry feedstuffs, pharmaceutical products, vitamin preparations and insecticidal preparations that comprise household sprays, dusts, repellents and aerosols.

These items are given purely as an indication of the great variety of general consumer products tested in this Department, although in practice a much wider variety is handled throughout the year, both for mark scheme purposes, (that is, for manufacturers to whom the mark has been awarded), and in the control of the compulsory specifications for canned fish, canned rock lobster and canned meat gazetted by the Minister of Economic Affairs.

The sectional laboratories of the Department deal with the following applied sciences: microbiology, mycology, entomology, vitaminology, food chemistry, feed chemistry. In addition to the foregoing there is a laboratory which performs examinations upon manufactured pharmaceutical products by means of both chemical and biological testing. There is also the food inspection laboratory which is the centre of extremely wide activity on the national scale. This latter serves as the control and co-ordinating laboratory for all the field inspectors and the inspections conducted throughout South Africa in respect of the voluntary mark scheme and the compulsory standards for canned foods. Inspectors are stationed in the Walvis Bay area of South West Africa, Windhoek and Luderitz. In the Union they are stationed on the Witwatersrand, Johannesburg, Estcourt Natal, Durban, East London, Port Elizabeth, in Cape Town and other areas of the Western Province and in a number of stations from Cape Town to Port Nolloth. In the Northern Cape an inspector is stationed at Vryburg.

During the canning season ended 31st October 1958, over 28½ million pounds of canned fruit, vegetables and jams were approved for labelling with the mark, while only 35,888 lb. were rejected as not complying with the standard specification. In contrast with 15.29 per cent

In vergelyking met 15.29 persent tydens die seisoen van 1952, en 18.4 persent in 1953, is slegs 0.12 persent van die verpakings wat vir ondersoek aangebied is, afgekeur. Hierdie betekenisvolle daling in die afgekeurde produkte oor 'n tydperk van agt jaar is 'n aanduiding van die waarde van die stelsel wat vir die ondersoek van ingemaakte vrugte, groente en konfyt kragtens die merkskema ingestel is, en die kopers vir oorsese bemerkingsorganisasies, wat die konsekwentheid van die gradering en die hoë gehalte van die produksie as gevolg van die Buro se goedkeuringsmerk besef, is terdeë bewys van hulle betroubaarheid.

Die Departement is hard besig met die opstel van nuwe spesifikasies wat op versoek van die georganiseerde nywerheid, handel of ander groepe soos bv. verbruikersgroepe of staatsdepartemente, van tyd tot tyd opgestel word. Op die oomblik word bv. spesifikasies opgestel vir handelsukrose, gesteriliseerde melk, veevoer, vitamienpreparate, minerale leksoute vir diere, snelbevrose vrugte en groente, vis- en witvismeel en ontsmettingsmiddels.

Waardevolle hulp is dus dwarsdeur die jaar aan die visnywerheid, die bedryf vir gebalanseerde vee- en pluimveevoer, vir farmaseutiese produkte en vir suiker verleen; ook aan dié wat chemiese skoonmaakmiddels ontsmettingsmiddels, insektemiddels en plaagbestrydingsprodukte vervaardig en aan die suiwelbedryf, roomysvervaardigers, die tekstielnywerheid en die voedselnywerheid in die algemeen. Benewens voorgaande, is ook ander nywerhede, soos bv. dié wat elektriese kables vervaardig, die hout- en die verfnywerheid onregstreeks gehelp deur die hulp verleen aan ander departemente van die Buro wat op hierdie gebied spesialiseer.

Die Departement het sy steun verleen aan die veldtog vir beter hantering van voedsel. Deur middel van die Standaardbulletin en ander publikasies het hy artikels gepubliseer en deur middel van die Suid-Afrikaanse Uitsaaikorporasie praatjies oor die lug gehou oor belangrike aspekte van voedselhantering en aldus 'n beter benadering tot sindelikeit met voedsel en voedseligiëne in voedselondernemings in die hand gewerk. Herdrukke van die gepubliseerde artikels is rondgestuur en het allwerweë belangstelling gewek in die kringe wat die openbare gesondheid dwarsdeur die land behartig. Die owerheid vir Openbare Gesondheid, die handel, nywerheid en alle belanghebbende liggame kon die Gebruikskode vir Voedseligiëne wat deur die Standaarderaad gepubliseer is, as nasionale gids raadpleeg.

Onderafdeling Entomologie: 'n Belangrike deel van die Onderafdeling se werk is die vasberade poging wat aangewend word om die bedrywighede van die plaeg wat die land jaarliks miljoene kos, d.w.s. rotte, gewone kleremotte en termiete onder beheer te bring. Dit beteken 'n strawwe program van toetswerk om eien-

rejected in the 1952 season and 18.4 per cent rejected during 1953, the percentage of rejected packs has decreased annually until, during last season, only 0.12 per cent of packs offered for inspection were rejected. This significant reduction in rejections over a period of eight years indicates the value of the system adopted for the inspection of canned fruit, vegetables and jams produced under the mark scheme, the reliability of which has come to be recognized by buyers for overseas marketing organizations who appreciate the consistent grading and high quality of the production that is implied by the Bureau's mark of approval.

The Department is actively engaged in the preparation of the new specifications which are prepared from time to time at the request of organized industry and organized commerce or other organized groups, such as consumer groups or government departments. Types of specification at present being prepared include commercial sucrose, sterilized milk, cattle feeds, vitamin preparations, animal mineral licks, quick frozen fruits and vegetables, fish meal and white fish meal, and antiseptics.

Valuable assistance was thus rendered throughout the year under review to the fishing, animal and poultry balanced feedstuffs, pharmaceutical and sugar industries, as well as those dealing with the preparation of chemical cleansers, disinfectants and antiseptics, the preparation of insecticides and pest control products, the dairy, ice-cream and textile industries and the food industry in general. In addition to the foregoing, others, such as the electric cable, timber and paint industries were indirectly helped through the assistance given to other departments of the Bureau specializing in these fields.

The Department assisted in the campaign for better food handling. Through the medium of the Standards Bulletin and through the medium of other publications and the South African Broadcasting Corporation it published articles and gave talks over the air on the important aspects of food handling, postulating a better approach to food cleanliness and food hygiene in food establishments. Reprints of published articles were circulated and evoked a very wide interest in public health channels throughout the country. As a national guide, Public Health authorities, commerce, industry and all interested bodies were able to refer to the Code of Practice for Food Hygiene published by the Standards Council.

Entomology Section: An important part of the Section's work is the determined attempt being made to control the activities of pests whose depredations cost the country many millions every year, namely, rats, common clothes moths and termites. This entails a heavy programme of testing to establish such properties

skappe soos die bestandheid van boubord en plastiek-materiaal teen rotte, die permanentheid van mot-vrymaking van woltekstiel en die weerstand van sekere plastiekmateriaalsoorte teen termietaantasting vas te stel.

Nog 'n funksie, wat van groot waarde vir die nasionale ekonomie is, is die radiografiese ondersoek van graan en saad wat in bewaring is, om insektebesmetting op te spoor, waardeur Suid-Afrika jaarliks ontsaglike verliese ly.

'n Toetsmetode is in die loop van die jaar vasgestel en 'n nuwe apparaat is ontwerp, waarmee die waarde van die insekteafweervermoë van sekere stowwe bepaal kan word. Bestaande toetsmetodes vir die bepaling van die eienskappe van plastiekmateriaal t.o.v. bestandheid teen termiete is gewysig om 'n helderder beeld van die skade wat gedoen is, te verkry. 'n Begin is gemaak met die hersiening van die teel en voeding van proefinsekte.

Biologiese toetse is uitgevoer in verband met verskillende insekdodende formulerings, soos bv. naverwerkende spuitmiddels, aerosole onder lae druk, insekdodende lak, weermiddels en saadbehandelingsformulerings, wat van fabrikante, staatsdepartemente en inrigtings ontvang is. Toetsresultate t.o.v. aerosole onder lae druk, wat by die Buro verkry is, is met die resultate t.o.v. aerosole wat amptelik getoets is, vergelyk.

Aangesien aerosole gewild is vir gebruik in Suid-Afrikaanse huise, is fasiliteite ingerig om die bedwelmen doodmaakeienskappe van aerosole biologies en statisties te bepaal.

Die monsters wat getoets is, het duidelik bewys dat die aerosole wat in Suid-Afrika vervaardig word, oor die algemeen van goeie kwaliteit is.

Proewe is vir Staatsdepartemente uitgevoer i.v.m. die vatbaarheid van kleedstowwe vir aantasting deur die larwes van die gewone kleremot. Verskillende behandelings is aangewend om wolmateriaal deur plaaslike en oorsese fabrikante aangebied, motvry te maak. Die toetse het, benewens die werklike motvrymakende eienskappe, die duursaamheid van die behandeling t.o.v. was, droogskoonmaak en blootstelling aan kunssonlig vasgestel.

Toetse vir bestandheid teen termiete, wat ook vir plaaslike en oorsese fabrikante uitgevoer is, is op die Buro se proefplot te Pienaarsrivier gedoen. Die materiaal wat getoets is, was polivinielchloried, poliëileen en pentateen, en het ook kabels en waterpype ingesluit.

Die bestandheidswaarde van boubord en polivinielchloriedmateriaal teen aantasting deur rotte is bepaal, terwyl sisal- en goinglyn toetse ter vergelyking ondergaan het om vas te stel watter materiaal die vatbaarste vir beskadiging deur knaagdiers is.

D.D.T.-insektedoders is ook gereeld aan ondersoek- en kontroletoetse kragtens die merkskema onderwerp.

as the rat resistance of building boards and plastic materials, the permanency of mothproofing on wool textiles and the resistance of certain plastic materials to termite attack.

A further function of considerable value to the national economy is the radiographic examination of stored grain and seed for the detection of the insect infestation that causes South Africa huge losses annually.

During the year a method of test was established and a new apparatus was designed for the evaluation of the insect repellency effect of certain substances. Existing test methods for assessing the termite resistance properties of plastic materials were modified in order to obtain a clearer picture of the damage done. A start was made with the revision of methods of breeding and feeding test insects.

Biological tests were performed on different insecticidal formulations such as residual sprays, low pressure aerosols, insecticidal lacquers, repellents and seed dressings received from manufacturers, government departments and institutions. Comparisons were made of test results on low pressure aerosols carried out at the Bureau with results on Official Test Aerosols.

As insecticidal aerosols are popularly used in South African homes, facilities were established to evaluate the knockdown and killing properties of aerosols biologically and statistically.

From the samples tested it was clear that the aerosols manufactured in South Africa were, in general, of high quality.

Tests were conducted for government departments on the susceptibility of clothing materials to attack by common clothes moth larvae. Various mothproofing treatments were used on woollen materials submitted by local and overseas manufacturers. In addition to actual mothproofing properties, the tests established the durability of the treatment to washing, dry-cleaning and exposure to artificial sunlight.

Termite resistance tests, also conducted for local and overseas manufactures were carried out at the Bureau's test plot at Pienaars River. The materials under test were polyvinyl chloride, polyethylene and pentathene, and included cables and water pipes.

The resistance of building boards and polyvinyl chloride material to rat attack was evaluated while sisal and jute strings underwent comparative tests to determine which material was the more vulnerable to rodent damage.

Regular inspection and control tests were carried out on D.D.T. insecticides under the mark scheme.

Die gebruikskode vir die veilige gebruik van plaagdoders het sy finale stadium bereik. Hulp is aan die British Standards Institution en die Internasionale Standaardorganisasie verleen in verband met die vaststelling van gewone name vir plaagdoders en, in samewerking met die Onderafdeling Verpakking, is daar gevorder met die klassifisering van plaagdoders t.o.v. veilige hantering tydens vervoer.

Afdeling Voedsel- en Voerchemie

Die vernaamste funksies van die Voedsel-en-voerlaboratorium kan in drie dele verdeel word: roetine-toetsing van handelsartikels soos hoendervoer, bruiswater, ingemaakte vleisprodukte en roomys wat kragtens die standaardmerkskema geproduseer word, die lewering van ontledingsdienste aan nyweeraars, staatsdepartemente en munisipaliteite, die afronding van gewens en die toetsing van analitiese metodes i.v.m. die opstel van nuwe spesifikasies.

Gedurende die jaar was dit moontlik om met behulp van die Navorsingsinstituut vir die Visnywerheid en die Nasionale Voedingnavorsingsinstituut die gegewens wat met talryke bepalinge van die gehalte aan verteerbare proteïene in vismeel verkry is, op grond van die voedingswaarde korrek te vertolk. Dit het geblyk dat die verteerbaarheidsyfer van hierdie produkte 'n goedkoop, gerieflike norm vir proteïenwaarde sou verskaf. Dit is baie belangrik, nie alleen vir spesifikasies vir vismeel en witvismeel nie, maar in alle gevalle waar proteïene verwerk word of warmtebehandeling ontvang.

Benewens die analitiese kontrole van markprodukte, is gereelde besoeke gebring aan die fabriek van permitteurs om te verseker dat fabriekskontrolemetodes toereikend is en dat higiëniese toestande in voedsel-fabriek gehandhaaf word.

Heelwat meer monsters, waaronder monsters van mout, voer en voermateriaal, brouerskorrels en afvalwater, asyn, mayonnaise en eetbare olie is vir ontleding ontvang. Verder is monsters uit 'n besending ingemaakte vrugte vir uitvoer geanaliseer en op grond van die invoerders se vereistes ondersoek.

Die werk i.v.m. die bepaling van melkvet in melk volgens die Gerber-metode is voltooi. As gevolg van die gegewens wat deur hierdie laboratorium en andere vrygestel is, is die amptelike ontledingsmetode gewysig.

Die Departement van Landbou se komitee vir die standaardisering van analitiese metodes vir voer, waarin die Afdeling verteenwoordig was, het sy werk afgehandel. Die opstel van standaardontledingsmetodes is van groot belang sowel in verband met die roetine-ontleding van die betrokke produkte as by die opstel of hersiening van toepaslike spesifikasies. Verder vordering is gemaak met die rasionalisering van roetine-ontledingsmetodes en gevolglik is heelwat arbeid bespaar.

The code of practice for the safe use of pesticides reached its final stages. Assistance was rendered to the British Standards Institution and the International Standards Organization in establishing common names for pesticides, and, in collaboration with the Packaging Section, progress was made with the classification of pesticides in their relation to safe handling during transportation.

Food and Feeds Chemistry Division

The main functions of the Food and Feeds Laboratory can be divided into three parts: the routine testing of commodities such as poultry feeds, mineral waters, canned meat products and ice-cream, produced under the standardization mark scheme, the provision of analytical services to industrialists, government departments and municipalities, the completion of data and the testing of analytical methods in connection with the preparation of new specifications.

During the year, the co-operation of the Fishing Industry Research Institute and the National Nutrition Research Institute enabled the data obtained from numerous determinations of digestible protein contents of fish meal to be correctly interpreted in terms of nutritional value. It became evident that the index of digestibility of these products would provide a cheap and convenient criterion of protein value. This is of great importance, not only with regard to specifications for fish meal and white fish meal, but in all cases where proteins are processed or receive heat treatment.

In addition to the analytical control of mark products, regular visits were paid to the factories of permit holders to ensure that factory control procedures were adequate and that hygienic conditions in food factories were being maintained.

A greatly increased number of samples including malts, feeds and feed materials, brewers' grains and effluents, vinegar, mayonnaise and edible oils was received for analysis. In addition, samples from a consignment of canned fruit for export were analysed and inspected against the requirements of the importers.

Work on the determination of milk fat in milk by the Gerber method was concluded. As a result of the data made available by this and other laboratories, the official method of analysis has been modified.

The committee of the Department of Agriculture for standardizing analytical methods for feeds on which the Division was represented, completed its work. The preparation of standard methods of analysis is of great importance both to the routine analysis of the products concerned and to the preparation or revision of relevant specifications. Further progress was made in the rationalization of routine analytical procedures and as a consequence a considerable saving of labour resulted.

Heelwat gegewens omtrent die kleur en troebelheid van suiker in oplossing is verkry en in verband met die vereistes en toetsmetodes wat in die spesifikasie vir handelsukrose opgeneem moet word, is daar noue samewerking met die Suikerfabrikasienavorsingsinstituut gehandhaaf.

Die werk i.v.m. die spesifikasie vir veevoer en wei-poeier is voortgesit en die finale dokumente daarvan word opgestel. Vordering is ook gemaak met die spesifikasie vir mineraalmengsels vir plaasdiere, vismeel, witvismeel, vleisprodukte in deursigtige verpakings, handelsukrose, gesteriliseerde melk en snelbevrore vrugte en groente.

Afdeling Voedselinspeksie

Die Afdeling behartig op die oomblik die toepassing van die volgende spesifikasies. *Verpligte*: ingemaakte vleisprodukte, ingemaakte vis, ingemaakte kreef. *Vrywillige*: ingemaakte vleisprodukte, ingemaakte stokvis, vissmeer, ingemaakte vrugte, ingemaakte groente, ingemaakte konfynt, jellie en marmelade, ingemaakte pynappelsap en ingemaakte tamatiesap.

Die werk van die Afdeling gedurende 1958 is gekenmerk deur ondersoeke en inspeksies van ongeveer 80,000 monsters, wat rekordhoeveelhede ingemaakte vis (ingevolge die toepaslike verpligte standaard) en ook rekordhoeveelhede ingemaakte vrugte, groente en konfynt kragtens die standaardmerkskema verteenwoordig. In 1958 is altesaam 180,000,000 lb. ingemaakte voedsel (sowat 265,000,000 blikke) onder toesig van die Buro se Voedselinspeksie-afdeling geproduseer. Betekenisvol is die feit dat uit die ongeveer 194,000,000 blikke ingemaakte vis wat te Walvisbaai gedurende die seisoen van 1958 geproduseer is, elke produksielot van 1,451 verskillende produksies aan die vereistes van die verpligte spesifikasies voldoen het.

Die gehalte van die meeste plaaslik vervaardigde produkte wat binne die bestek van die verpligte standaardde val, is op bevredigende peil gehandhaaf terwyl die gehalte in sommige gevalle verbeter het. Daar was 'n goeie vraag van oorsee af na Suid-Afrikaanse ingemaakte vleis, en veral ham, en geen klagtes oor die gehalte is ontvang nie. Op die gebied van ingemaakte vis en veral ingemaakte sardyne, makriel en maasbankers, het die Suid-Afrikaanse inmaakfabrieke 'n vaste plek op die wêreldmarkte vir hul produkte verower.

Dit is van betekenis dat groot hoeveelhede ingemaakte vis onder koperetikette verkoop word en dat sommige van hierdie etikette dwarsdeur die wêreld bekend is vir die kwaliteit van die verpakte produkte. Die betrokke nywerhede het geleer dat dit absoluut noodsaaklik is om oor al die voorbereidings- en verwerkingsprosedures en oor die handhawing van higiëniese vervaardigingstoestande dwarsdeur die fa-

Much data regarding the colour and turbidity of sugars in solution were obtained and close liaison was maintained with the Sugar Milling Research Institute in connection with the requirements and test methods to be included in the specification for commercial sucrose.

Further work was done on the specification for cattle feeds and whey powder—the final documents of which are being prepared. Progress was also made on the specification for mineral supplements for farm animals, fish meal, white fish meal, open pack meat products, commercial sucrose, sterilized milk and quick-frozen fruits and vegetables.

Food Inspectorate Division

The Division is at present responsible for the administration of the following specifications: *Compulsory*: canned meat products, canned fish, canned rock lobster. *Voluntary*: canned meat products, canned hake, fish paste (fish spread), canned fruits, canned vegetables, canned jams, jellies and marmalades, canned pineapple juice, and canned tomato juice.

A feature of the work of the Division during 1958 was the carrying out of examinations and inspections on approximately 80,000 samples representing record quantities of canned fish (under the relevant compulsory standard) as well as record quantities of canned fruits, vegetables and jams under the standardization mark scheme. In all, some 180,000 lb. of canned food (approximately 265,000,000 cans) were produced during 1958 under the supervision of the Bureau's Food Inspectorate. A significant fact is that of approximately 194,000,000 tins of canned fish produced at Walvis Bay during the 1958 season, every batch in 1451 different productions was found to comply with the requirements of the compulsory specification.

The quality of the locally manufactured products falling within the scope of the compulsory standards was maintained at a satisfactory level in the case of most of the products, and at an improved level in others. There was a good demand from overseas for South African canned meats, mostly hams, and no complaints were received about the quality of the products. In the field of canned fish, notably canned pilchards, mackerel and maasbanker, the South African canners have permanently established their products on world markets.

It is significant that great quantities of canned fish are sold under buyers' labels and that some of these labels have a world-wide reputation for the quality of the products packed. The industries in question have learned the absolute necessity for strict control over all preparation and processing procedures and over the maintenance of hygienic conditions of manufacture

briek streng beheer uit te oefen. Die toepassing van hierdie kennis en 'n besef van die waarde van kwaliteitsbeheer en higiëniese werktoestande werp tans vrugte af.

In die onderhawige tydperk het die toets van ingevoerde ingemaakte vis- en vleisprodukte ook 'n hoogtepunt bereik. Veral ingemaakte vis (meestal salm en sardientjies) is in groot hoeveelhede ingevoer. Die gehalte van die produkte was oor die algemeen baie goed en in slegs twee gevalle moes toestemming om die besendings te verkoop, geweier word.

Die gehalte van die produkte met die merk daarop wat kragtens die vrywillige standaard geproduseer word, het weer duidelik geblyk. In hierdie verband kan gemeld word dat ingemaakte vrugte wat die Buro se Inspeksie-afdeling vir etikettering kragtens die merkskema goedgekeur het, groot byval by oorsese kopers gevind het. Hierdie kopers bring hul eie etikette op hierdie produkte aan sonder om verdere monsters uit te sny. Dis bepaald 'n teken van die hoë agting wat hulle vir die Buro se merk en die gehalte van sy inspeksies het. Die fabrikante van ingemaakte voedsel wat die standaardmerk dra, moet gelukkigewens word met hulle sukses. Hul lewendige samewerking met die Buro se inspekteurs het die Afdeling in groot mate gehelp om sy moeilike taak te verrig, waarby hy die fabrikant van diens is, terwyl hy terselfdertyd die belange van die verbruiker beskerm.

In die onderhawige jaar is nog 'n baie geslaagde kursus vir fabrieksbestuurders deur die Afdeling in die Buro se laboratoria te Pretoria gehou, toe aspekte soos kwaliteitsbeheer uit alle oogpunte, higiëne en sanitasie uitvoerig behandel is.

Onderafdeling Mikrobiologie: Die Onderafdeling hou hom hoofsaaklik besig met die twee groepe bakterieë wat die menslike bedrywigheede wesenlik beïnvloed—die heilsame en skadelike organismes.

Heelwat tyd en werk is dus bestee aan die opsporing en uitkenning van bederfororganismes in monsters van allerlei aard in verduursaamde voedsel en drank soos bv. ingemaakte vleis, vis, vrugte en bruiswater.

Verskeie aspekte van die higiëniese hantering van voedsel is bestudeer met die oog op die opvoeding van die algemene publiek in hierdie saak.

Wat die nuttige bakterieë betref, hou die Onderafdeling 'n klein maar baie nuttige tipekultuurversameling in stand. Die doel is om bakteriëestamme aan die gang te hou wat vir die nywerheid, staatsliggame, universiteite en die Buro se eie laboratoria van die grootste nut is.

In die afgelope 12 maande is meer werk verrig as in vorige jare. Dit is hoofsaaklik toe te skrywe aan die groter aantal merkhouders, aangesien heelwat meer monsters nodig is om die vereiste toetse uit te voer wat die mikrobiologiese stabiliteit van die produksie waarborg. Dit geld veral vir voedselprodukte.

throughout the factory premises. The application of this knowledge and the appreciation of the value of quality control and hygienic conditions of operation are now paying dividends.

The testing of imported canned fish and meat products under the compulsory standards also reached a peak during the period under review. Canned fish especially (mostly salmon and sardines) was imported in great quantity. The quality of the products was generally very satisfactory and only in two instances was it necessary to refuse to permit the sale of consignments.

The quality of the "mark" products produced under the voluntary standards was again evident. In this connection it may be mentioned that canned fruits accepted by the Bureau's Inspectorate for labelling under the mark scheme were in great demand with overseas buyers. These buyers label such productions under their own labels without cutting further samples. This is indeed indicative of the high regard in which the Bureau's mark is held and the quality of its inspection. The manufacturers of canned foods bearing the standardization mark are to be congratulated on their success. Their active co-operation with the Bureau's inspectors assisted the Division in no small manner in the execution of its difficult task of assisting the manufacturer while protecting the interest of the consumer.

During the year under review a further very successful course for factory managers was held by the Division at the Bureau's laboratories in Pretoria, when aspects such as quality control in all its facets, hygiene and sanitation were dealt with in detail

Microbiology Section: The Section is mainly concerned with the two groups of bacteria which affect human activities closely—the beneficial and the harmful organisms.

Much work and time was thus devoted to the detection and identification of spoilage organisms in samples of all kinds of preserved foods and drinks such as canned meat, fish, fruit and mineral waters.

During the year various aspects of hygienic food handling were studied in the hope of assisting the education of the general public in this respect.

With regard to useful bacteria the Section maintains a small, but very useful type culture collection. The purpose is to maintain bacterial strains which are of most use to industry, government bodies, universities and the Bureau's own laboratories.

The volume of work carried out during the past 12 months greatly exceeded that of previous years. This was mainly due to the increase in the number of mark holders, which entails a much larger number of associated samples for the testing which has to be done to ensure the microbiological stability of the production. This applies especially to food products.

'n Poging is aangewend, deur middel van artikels in die Standaardbulletin, om sowel verbruiker as fabrikant te laat weet dat die Buro se laboratoria tot hul diens gereed is om mikrobiologiese probleme op te los. Dit het heelwat belangstelling gaande gemaak en baie navrae tot gevolg gehad, waardeur toetswerk soos bv. mikrobiologiese opnames van voedselhanterings-ondernemings, nl. melkerye, romerye, roomysfabrieke, kruiefabrieke en dies meer, toegeneem het.

Die Buro se Gebruikskode vir Voedselhygiëne het heelwat belangstelling gewek.

In die onderhawige tydperk is mikrobiologiese toetse uitgevoer op sowat 50 tipes industriële produkte, van voedselprodukte soos vleis, vis en eiers tot ontsmettingsmiddels en oliebrandstof.

Mikrobiologiese ondersoeke is uitgevoer i.v.m. ontsmettingsmiddels, kookolie, room, vismeel, vleis in deursigtige verpakings, grondboontjebotter, kwaternêre ammoniumverbindings, sout, gesteriliseerde melk, suiker en witvismeel, om gegewens te verkry wat nodig is by die opstel van standaardspesifikasies.

Met die oog op 'n studie van die metodes wat werkers op soortgelyke gebied oorsee toepas, het 'n senior beampte van die Mikrobiologiese Onderafdeling 'n aantal laboratoria in Europa besoek.

Ingevolge die verpligte spesifikasies beywer hierdie Onderafdeling hom vir die versekering van mikrobiologiese stabiliteit in ingemaakte vis, kreef en vleis. As gevolg van hierdie werk en die samewerking van die bestuur van die fabrieke is 'n baie hoë standaard by die inmaak van vis- en kreefprodukte behaal en het bederf weens besoedeling deur mikrobies selde voorgekom. In hierdie opsig kan met sekerheid gesê word dat die plaaslike produkte gunstig met soortgelyke produkte op enige plek in die wêreld vergelyk. Van hierdie produkte is 35,000 monsterblikkies wat uit sowat 50,000 produksielotte uitgesoek is, mikrobiologies ondersoek. Die aantal wat mikrobiologies onbevredigend geblyk het, was baie klein.

Oor die algemeen was die beeld van die mikrobiologiese stabiliteit van ingemaakte vleisprodukte 'n verbetering op dié van die vorige jaar. Uit 7,500 produksiereekse is 39,500 monsterblikke getoets en ook hier was die persentasie produksiereekse wat mikrobiologies onbevredigend was, baie klein.

Ander bedrywighede omvat bv. die toetsing van 6,000 monsters van ingemaakte produkte soos vrugte, groente, konfynt en bruiswater, waaronder ook monsters van permithouers afkomstig.

Die talle uiteenlopende mikrobiologiese ondersoeke deur die Onderafdeling gedoen, het gelei tot die gevolgtrekking dat daar oor die afgelope paar jaar aanmerklike verbetering in fabriekstoestande plaasgevind het.

By the publication of articles in the Standards Bulletin an effort was made to inform both consumer and manufacturer that the Bureau's laboratories were at their disposal for the solution of microbiological problems. This aroused considerable interest and resulted in many enquiries, leading to an increase in test work such as microbiological surveys of food handling plants, namely, dairies, creameries, ice-cream plants, condiment factories and similar plants.

Great interest was shown in the Bureau's Code of Practice for Food Hygiene.

During the period under review microbiological tests were carried out on approximately fifty types of industrial products ranging from food products such as meat, fish and eggs to disinfectants and fuel oil.

For the purpose of obtaining information required for the preparation of standard specifications, microbiological investigations were carried out on antiseptics, cooking oil, cream, fish meal, open pack meats, peanut butter, quarternary ammonium compounds, salt, sterilized milk, sugar and white fish meal.

With a view to studying the procedures used by workers in similar fields of activity overseas, a senior officer of the Microbiological Section visited a number of laboratories in Europe.

Under the compulsory specifications this Section is concerned with the assurance of microbiological stability in canned fish, rock lobster and meat. As a result of this work and the co-operation of factory managements, a very high standard has been reached in the canning of fish and rock lobster products, and spoilage due to microbial contamination was rarely found. In this respect it can safely be said that local products compare very favourably with similar productions anywhere else in the world. Of these products, 35,000 sample cans selected from approximately 5,000 production lots were examined microbiologically. The numbers found to be microbiologically unsatisfactory were extremely low.

The overall picture showed an improvement in the microbiological stability of canned meat products over the previous year's production. Sample cans tested numbered 39,500 from 7,500 productions and here again the percentage of productions found to be microbiologically unsatisfactory was very small.

Other work included the testing of 6,000 samples of products such as canned fruit and vegetables, jam and mineral waters, including samples from permit holders.

The many and varied microbiological examinations conducted by the Section led to the conclusion that a marked improvement in factory conditions has taken place over the last few years.

Onderafdeling Mikologie: Die Onderafdeling hou hom veral besig met drie probleme wat verskillende nywerhede raak: die bepaling van die organismes wat mikologiese bederf veroorsaak; toetsing van die doeltreffendheid van verbindings wat swamvorming bestry en van materiaal wat teen swamvorming behandel is; en toetswerk in verband met heilsame gisorganismes.

Toetswerk wat o.a. gedurende die jaar gedoen is, was die bepaling van die gistingsgehalte van kafferbiërgis. Hierdie bepalings was 'n waardevolle bydrae tot die werk wat in die land gedoen word om die kafferbiërynerheid op 'n behoorlik wetenskaplike grondslag te plaas.

Baie min fabrikante van bruiswater in Suid-Afrika kan die onderhoud van 'n eie mikrobiologiese laboratorium bekostig. Om hierdie fabrikante te help, is 'n diens vir opnames in die fabriek ingestel, waarvolgens monsters in elke stadium van die produksieproses geneem is om die verskillende besoedelingsorganismes op elke punt te kan noem en die bestuur van die fabriek te verwittig waar die besoedelingspunte in die bewerkingsproses geleë is. Daarna kon doeltreffende teenmaatreëls getref word om besoedeling van die eindproduk te voorkom. Hierdie diens is moontlik gemaak deur die gebruik van 'n nuwe monsternemingsmetode wat die moontlikheid van 'n wisseling in die getalle organismes tussen die tyd wanneer die monsters geneem word en die tyd wanneer hulle getel word, uitskakel—'n nadeel wat kenmerkend van die ouer monsternemingsmetodes is.

Roetinetoetswerk is op behandelde seildoek gedoen om die bestandheid teen swamaantasting van die materiaal te bepaal. Hiervoor is drie verskillende toetsmetodes gebruik, nl. die bekende metode van begraving in die grond, die metode van suiwer kultuur waarby die toetsstukke onderwerp word aan aantasting deur *Chaetomium globosum* en derdens, die swaminkuberingstoets waarby *Aspergillus niger* gebruik word om die swamweerstand van die materiaal se behandelingstof te bepaal. Standaardtoetsseildoek is van die Verenigde State verkry en derhalwe kan die resultate tans deur middel van die drie metodes verkry, met mekaar en ook met die resultate oorsee verkry, vergelyk word.

Die standaardtoetsmetode vir die skimmeltelling op monsters tamatiesous en tamatiekonsentraat is op talle van hierdie produkte toegepas. Monsters van bruiswater is ook kragtens die merkskema getoets om te bepaal of hulle vry is van lewensvatbare skimmel- en gissoorte en aldus te verseker dat hulle aan die vereistes van die spesifikasie voldoen.

Met behulp van geskikte toetsswamme wat in die Onderafdeling se herbarium gehou word, is allerlei produkte soos bindtou vir landboukundige gebruik, skoenvoering, reddingsgordels en bitumineuse dakvielt

Mycology Section: The Section deals primarily with three problems affecting various industries: the determination of the organisms causing mycological deterioration; testing of the efficacy of anti-fungal compounds and materials treated against fungi; and test work in connection with beneficent fermentative organisms.

Test work during the year included the determination of the fermentative quality of kaffir beer yeast. These determinations made a valuable contribution to the work being done in this country to establish the kaffir beer industry on a proper scientific basis.

Very few mineral water manufacturers in South Africa can afford to maintain their own microbiological laboratories. To assist these manufacturers, plant survey services were established, which entailed the taking of samples along the production line, enumerating the various contaminant organisms at each point, and informing the factory management as to focal points of contamination along the production line. Effective counter measures could then be instituted to prevent contamination of the final product. This service was made possible by utilizing a new method of sampling which eliminates the possibility of variation in numbers of organisms between time of sampling and time of counting, a drawback characteristic of the older sampling methods.

Routine test work was done on treated canvas to determine the fungal resistance of the material. Three different test methods were used for this purpose, namely, the well known soil burial method, the pure culture method whereby the specimens are subjected to the attack of *Chaetomium globosum* and thirdly, the fungal incubation test using *Aspergillus niger* to determine the fungal resistance of the proofing of the material. Standard test canvas was obtained from the United States with the result that it is now possible to compare the results obtained by means of these three methods with each other and also with results obtained overseas.

The standard test method for the mould count on samples of tomato sauces and tomato concentrates was applied to a large number of these products. Mineral water samples were also tested under the mark scheme to determine their freedom from viable moulds and yeasts and thus ensure their compliance with the requirements of the specifications.

By utilizing suitable test fungi maintained in the Section's herbarium, a variety of products such as agricultural binder twine, shoe linings, life belts and bituminous roofing felt were subjected to fungal re-

aan swamweerstandstoetse onderwerp. Die oorsaak van die bederf van ander produkte soos biltong en babaluers is deur middel van mikologiese toetse vasgestel.

Voorlopige toetswerk word uitgevoer met die oog op die opstel van 'n spesifikasie vir twee landboukundige swamdoders, nl. Bordeaux-mengsel en koperoksichloried. Vir die bepaling van die biologiese aktiwiteit van hierdie plaagmiddels moet 'n spesiale mikrospruit gebruik word. Die Onderafdeling moes eers die spuit ontwerp, en hy word nou gemaak.

Onderafdeling Farmaseutiese Produkte: Die Afdeling Farmaseutiese Produkte behartig die toetswerk in verband met allerlei farmaseutiese stowwe soos bv. vitamien, antibiotika, inspuitingstowwe, tablette en die opstel en toepassing van spesifikasies vir hierdie handelsartikels.

Fabrikante van farmaseutiese produkte en verbruikers soos staatsliggame en provinsiale besture het in merkbare mate al hoe meer gebruik gemaak van die inspeksie- en toetsfasiliteite wat aangebied word. Die nywerheid is ook bygestaan deur opleiding van bedryfspersoneel in die gespesialiseerde tegnieke van essaiëring en die toets van monsters wat deur verskillende ondernemings onder spesifieke voorwaardes aangebied word om hul eie navorsingsprojekte te bevorder (hoofsaaklik die veroudering en stabiliteit van hulle produkte). 'n Interessante ontwikkeling was die voorlopige navrae wat drie groot oorsese fabrikante gedoen het omtrent die moontlikheid dat die Buro die algehele beheer moet oorneem oor die toetswerk i.v.m. sommige van hulle plaaslik vervaardigde produkte. Op die oomblik word gewerk aan die instelling van resultaatkorrelering tussen die verskillende laboratoria.

Die groot aantal monsters wat vir toetsing aangebied word, getuig van die groeiende belangstelling wat die nywerheid aan die dag lê vir die fasiliteite wat die Buro bied. Hierdie diens brei bo alle verwagting uit en dra ontsaglik veel tot die ekonomiese ontwikkeling van die Suid-Afrikaanse farmaseutiese nywerheid by.

Vroeg in 1959 het 'n senior tegniese beampte van die Onderafdeling vier maande met besoeke aan toets- en -kontrolelaboratoria en allerlei organisasies op die Vasteland, in die Verenigde Koninkryk en die Verenigde State deurgebring. Heelwat van die nuttige, belangrike kennis wat reeds in die vorm van aantekeninge ontvang is, sal onmiddellik toegepas word.

Die Onderafdeling het altesaam sowat 500 monsters van allerlei aard vir toetsdoeleindes ontvang en gemiddeld drie toetse is per monster uitgevoer. Sowat 350 hiervan was afkomstig van private organisasies en die nywerheid en ander weer van regeringsliggame en provinsiale besture en hospitale.

Namens die Unieraad vir Tenders is sestig besendings farmaseutiese produkte en vitamienpreparate onder-

sistance tests. The cause of deterioration of other products like biltong and babies' napkins was established by means of mycological tests.

Preliminary test work is in progress for drawing up a specification for two agricultural fungicides, namely, Bordeaux mixture and copper oxychloride. To determine the biological activity of these pesticides a special micro-sprayer must be used. This sprayer had first to be designed by the Section and is now being constructed.

Pharmaceutical Products Section: The Pharmaceutical Products Section concerns itself with the testing of pharmaceutical substances of all descriptions, such as vitamins, antibiotics, injections, tablets and the preparation and administration of specifications for these commodities.

Manufacturers of pharmaceutical products as well as consumers such as government bodies and provincial authorities made noticeably increasing use of the inspection and testing facilities offered. Other aids to industry consisted of training industrial staff in the specialized techniques of assay and testing of samples submitted by various concerns under specified conditions to further their own research projects (mainly the ageing and stability of their products). The preliminary enquiries made by three large overseas manufacturers on the possibility of the Bureau taking over the complete control testing of some of their locally manufactured products was an interesting development. Work is at present under way to establish correlation of results between the various laboratories.

The growing interest shown by industry in the facilities offered by the Bureau was apparent by the large number of samples submitted for testing. This service is expanding beyond all expectations and is greatly assisting in the economic development of the South African pharmaceutical industry.

Early in 1959 a Senior Technical Officer of the Section spent four months visiting testing and control laboratories and various organizations on the Continent, in the United Kingdom and in the United States. Much of the useful and important information already received in the form of notes will be put into immediate use.

A total of approximately 500 samples of a diverse nature were received by the Section for testing purposes and on an average three tests were performed per sample. Some 350 of these were submitted by private organizations and industry and others by government bodies and provincial authorities and hospitals.

Sixty consignments of pharmaceutical products and vitamin preparations were inspected, sampled and tested on behalf of the Union Tender Board, about 20 per cent

soek, monsters is daaruit geneem en getoets en sowat 20 persent daarvan het nie aan die vereistes voldoen nie.

Kragtens die merkskema is negentig produksielotte parenterale oplossings en insulien- en protamiensinkinsulien vir inspuiting ondersoek; monsters is daaruit geneem en getoets en almal het aan die vereistes van die spesifikasie voldoen.

Die werk i.v.m. spesifikasies vir farmaseutiese produkte het gevorder. 'n Begin is gemaak met 'n spesifikasie vir vitamien en vitamienpreparate en in hierdie verband het vooraanstaande produseerders en toetsorganisasies dwarsdeur die wêreld nuttige inligting verstrek. Baie fabrikante en staatsliggame stel groot belang in hierdie projek.

Ses verskillende produkte deur verskeie fabrikante gemaak, dra op die oomblik die Buro se merk.

Vitamienonderafdeling: Die Onderafdeling het hom hoofsaaklik besig gehou met die mikrobiologiese bepaling van vitamien van die B-groep. Dit omvat Vitamien B₁ (tiamien), Vitamien B₂ (riboflavien), pantoteensuur, niasien en nikotienamied; Vitamien B₆ (piridoksien), foliensuur; inositol; cholien; biotien; en Vitamien B₁₂ (siaankobalamien). Die vitamien van groep A en groep C, en ook Vitamien B is in baie monsters chemies bepaal.

Die ondersoek na die bepaling van vitamien volgens die metode van die plaat met holtes het in groot mate geslaag. Hierdie metode word verkies bo die proefbuismetodes omdat dit minder tyd in beslag neem. Daar word gepoog om pantoteensuur volgens hierdie metode te bepaal, en vordering is reeds daarmee gemaak.

Die gehalte aan Vitamien B₁₂ van 'n ru-lewerekstrak is bepaal. Die Buro se sukses in hierdie opsig verdien spesiale vermelding omdat die mikrobiologiese bepaling van Vitamien B₁₂ in 'n ru-lewerekstrak besonder ingewikkeld is weens die aanwesigheid van treonien en ander stowwe waarvan die samestelling onbekend is.

Ongeveer 75 persent van die werk het in verband gestaan met die kontroletoetsing van pluimveevoer om vas te stel of die gehalte aan riboflavin en pantoteensuur aan die vereistes van die spesifikasie vir pluimveevoer voldoen.

Heelwat werk is vir private firmas en inrigtings gedoen. Kontroletoetsing is vir die Unieraad vir Tenders i.v.m. die vitamiengehalte van vitamienstroop, multivitaminetablette, vitamien B-kompleks vir inspuiting, tablette en beskuitjies, eiers en manitolpreparate uitgevoer.

Daar is ook gewerk aan die mikrobiologiese bepaling van aminosure en aan sistien. Histidien- en arginienbepalings is uitgevoer t.o.v. 'n monster avokado-olie.

of these consignments failing to comply with the requirements.

Ninety batches of parenteral solutions and insulin and protamine zinc insulin for injection were inspected, sampled and tested under the standardization mark scheme, all of which complied with the requirements of the specifications.

Work on specifications for pharmaceutical products progressed. A specification for vitamins and vitamin preparations was commenced and very useful information in this connection has been received from leading producers and testing organizations throughout the world. Great interest is being shown in this project by many manufacturers and government bodies.

Six different products made by various manufacturers at present bear the Bureau's mark of approval.

Vitaminology Section: The Section was mainly occupied with the microbiological determination of vitamins of the B-group. This includes Vitamin B₁ (thiamin), vitamin B₂ (riboflavin), pantothenic acid, niacin and nicotinamide; vitamin B₆ (pyridoxine), vitamin Bc—folic acid; inositol; choline; biotin; and vitamin B₁₂ (cyanocobalamin). The vitamins of the A and C groups including a large quantity of the samples submitted for the determination of thiamin were determined chemically.

The investigation into the determination of vitamins by means of the cup-plate method was to a great extent successful. This method is preferred to the tube methods as being less time consuming. Attempts are being made to determine pantothenic acid according to this method and progress has already been achieved.

The vitamin B₁₂ content of a crude liver extract was determined. The success of the Bureau in this respect deserves special mention, as the microbiological determination of vitamin B₁₂ in a crude liver extract presents special complications owing to the presence of threonine and other substances of unknown composition.

Approximately 75 per cent of the work was in connection with the control testing of poultry feeds in order to determine compliance of the riboflavin and pantothenic acid contents with the requirements of the standard specification for poultry feeds.

Much work was done for private firms and institutions. Control tests were carried out for the Union Tender Board on vitamins in vitamin syrups, multivitamin tablets and vitamin B-complex injections, tablets and vitamin enriched biscuits, eggs and manitol preparations.

Work was also done on the microbiological determination of amino-acids. The following amino-acids were determined: threonine; aspartic acid; and cystine. Histidine and arginine were determined in a sample of avocado oil.

DEPARTEMENT VAN CHEMIESE VERWERKINGSNYWERHEDE EN PRODUKTE

Die aanmerklike verbetering dwarsdeur die land in die etikettering van wolprodukte ingevolge die Handelswaremerkewet, wat die tekstielinspekteurs tydens hulle inspeksies bespeur het, was bemoedigend.

Die omvang van die werk wat die Tekstielfafdeling in sy geheel onder hande gehad het, was, wat die aantal inspeksies en getoetste monsters betref, sowat 20 per sent meer as dié van die vorige jaar. Dit was hoofsaaklik werk wat ten behoeve van staatsdepartemente soos die Suid-Afrikaanse Spoorwegadministrasie, die Unieraad vir Tenders en die Krygsproduksiekantoor uitgevoer is.

Met die aanstelling van 'n senior tegniese beampte gedurende die jaar is 'n onafhanklike Papieronderafdeling ingestel. Hierdie stap is ten volle geregverdig deur die aansoeke om toetswerk en spesifikasies wat van staatsdepartemente en die nywerhede sedert die instelling van hierdie onderafdeling ontvang is.

Die Departement van Bosbou het vergunning gekry om die goedkeuringsmerk te gebruik en die saagmeulens te Timbadola, Nelspruit, Elandshoek, Stutterheim, George en Wemmershoek het die merk op hul produkte aangebring. Die Departement se optrede verdien lof want daar word gemeen dat dit die eerste en noodsaaklikste stap is om 'n gunstige mark vir Suid-Afrikaanse hout te skep. Verder is dit 'n uitstekende maatreël om enige vooroordeel teë te gaan wat miskien nog bestaan teen hout wat in Suid-Afrika gekweek is, en dit uiteindelik uit te wis. Nog 'n stap wat die Direkteur van Bosbou gedoen het om die verkoop van plaaslike hout te bevorder, was die beslissing wat lui dat enige langtermynkontrak om houtstompe van die Departement te verkry aangeneem sou word op voorwaarde dat vergunning verkry word om die merk op die produk aan te bring. Die nywerheid het hierdie verklaring met welwillendheid bejeën en die meeste groot saagmeulens het reeds aansoek gedoen om die merk te gebruik.

In 'n toespraak voor die Algemene Jaarvergadering van die S.A. Vereniging van Saagmeulenaars en Dui-vervaardigers het die Minister van Bosbou aangekondig dat hy ingestem het om houtinvoer in die Unie met 30 per sent te verminder in 'n verdere poging van die Staat om die verkoop van Suid-Afrikaanse hout aan te moedig.

Afdeling Tekstiel en Klerasie

Die omvang van die werk wat die Afdeling in sy geheel gehanteer het, het weer heelwat toegeneem. Dit kan veral toegeskryf word aan die groter aantal besendings stukgoedere, tekstielartikels en klerasie wat ondersoek en getoets is. Dit het tot 1,057 gestyg, 'n verhoging van 20 per sent bo dié van die vorige jaar.

CHEMICAL PROCESSING INDUSTRIES AND PRODUCTS DEPARTMENT

The marked improvement throughout the country in the labelling of wool products in terms of the Merchandise Marks Act, was an encouraging feature noted by the textile inspectors during their inspections.

The volume of work handled by the Textile Division as a whole showed an increase of about 20 per cent over the previous year in the number of inspections and samples tested. The work was done mainly on behalf of government departments such as the South African Railways Administration, the Union Tender Board and the Defence Production Office.

An independent Paper Section was started during the year by the appointment of a senior technical officer. Requests for test work and specifications by government departments and industries received since the establishment of this Section, have fully justified this step.

The certification mark was granted to the Department of Forestry and has been applied by the mills at Timbadola, Nelspruit, Elandshoek, Stutterheim, George and Wemmershoek to their products. The Department's action is to be commended as it is felt that this is the first and most essential step towards creating a favourable market for South African timber. Furthermore, it is an excellent way to counteract, and eventually to eliminate, any remaining prejudice against South African grown timber. A further step taken by the Director of Forestry to promote the sales of local timber was the ruling in which it was stated that the acceptance of any long term contract for logs from the Department would be made conditional on obtaining permission to apply the Bureau's mark to the product. The statement was favourably received by industry, and most of the larger mills have already applied for permission to use the mark.

When addressing the Annual General Meeting of the S.A. Lumber Millers' and Shook Manufacturers' Association the Minister of Forestry announced that he had agreed to cut imports of timber into the Union by 30 per cent, in a further endeavour by the State to encourage the sale of South African timber.

Textile and Clothing Division

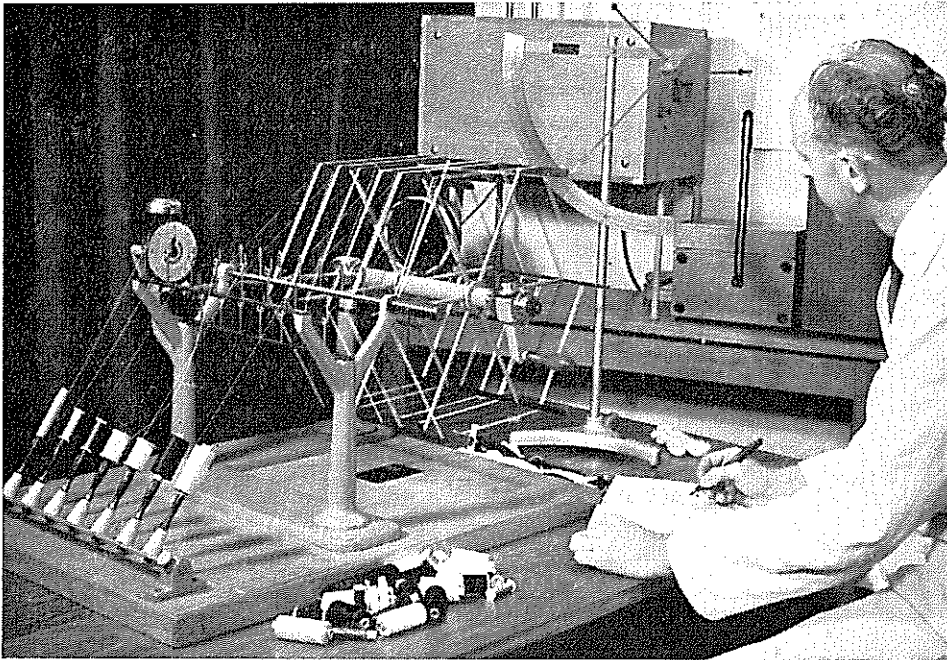
The volume of work handled by the Division as a whole, showed a further considerable increase. This was mainly due to the greater number of consignments of piece-goods, textile articles and clothing inspected and tested which rose to 1,057, an increase of 20 per cent over the previous year. The work was done on

Die werk is ten behoeve van staatsdepartemente, die provinsiale administrasies, die S.A. Spoorwegadministrasie, die Kamer van Mynwese en die Sitrusraad gedoen.

Die aantal tekstielmonsters vir die Departement van Doeane en Aksyns geanaliseer, wat gedurende die vorige 12 maande 'n buitengewoon hoë syfer bereik het, het gedaal, maar die getal was nogtans 642. Hierdie werk word al hoe ingewikkelder en meer tydrawend, hoofsaaklik weens die toenemende gebruik van vesels deur die mens gemaak, waarvan vier of vyf verskillende soorte soms in een en dieselfde monster voorkom.

behalf of government departments, the provincial administrations, the South African Railways Administration, the Chamber of Mines, and the Citrus Board.

The exceptionally high number of textile samples analysed on behalf of the Department of Customs and Excise during the previous twelve months was not reached, nevertheless 642 samples were analysed. This work becomes more and more involved and time-consuming, largely in view of the greater use of man-made fibres, blends of sometimes four or five different fibres being encountered in one sample.



Draadteltoetse word uitgevoer in die Burose Tekstiel laboratorium met lugversorging

Thread count tests in progress in the Bureau's air-conditioned Textile Laboratory

Die drie inspekteurs wat ingevolge die Handelswaremerkewet werksaam is, was nog net so besig soos in die vorige tydperk; hulle het weer monsters geneem om deur die Buro geanaliseer te word vir voldoening of nie aan die wol etiketteringsregulasies. In hierdie opsig is dit 'n bemoedigende teken dat daar dwarsdeur die land 'n aanmerklike verbetering in die etikettering van wolprodukte is.

Die aantal private spesifikasies vir staatsdepartemente en ander groot kopers was weer groot—altesaam 32 is in hierdie tyd opgestel. Hieronder was spesifikasies

The three textile inspectors operating under the Merchandise Marks Act maintained the level of activity of the previous period, and samples were again taken and submitted for analysis to the Bureau to check their compliance or otherwise with the wool labelling regulations. An encouraging feature in this connection is the marked improvement throughout the country in the labelling of wool products.

The number of private specifications prepared for government departments and other large buyers was again high, a total of 32 being drawn up during the

vir nylon/wolvlagdoek, en nasionale vlaevir die Departement van Publieke Werke, nylonskoenveters, kouse en waterdigte kamaste vir die Krygsproduksiekantoor, naagaring vir die Unieraad vir Tenders, reënjasstof en pajamapakke vir die Suid-Afrikaanse Polisie, vlas, seildoek, terryhanddoeke, flenniefrokkes en veerkusings vir die Suid-Afrikaanse Spoorweë, oorjasse vir die Anglo-American Corporation en beskermende klere vir African Explosives and Chemical Industries.

Die toetswerk wat uitgevoer is t.o.v. monsters deur staatsdepartemente, plaaslike fabrikante, handelaars en invoerders ingestuur, het 'n toename van 23 persent getoon en 342 verslae is uitgereik. Opdraggevers was o.a. die Stadsraad van Pretoria en van Johannesburg, die Vlootwapeningskantoor en die Aartappelraad. Die monsters wat getoets is, het 'n groot verskeidenheid tekstielstukgoedere, -artikels en -klere gedek.

Die ontledings wat namens die Speurdiens van die Suid-Afrikaanse Polisie gedoen is, het toegeneem.

Die werk in verband met die opstel van standaardspesifikasies het gevorder. Weens die groot omvang van die spesifikasiewerk wat dikwels vergaderings van die tegniese komitee vereis, het die Skakelkomitee vir die Klerasie- en Tekstielnywerhede besluit dat die spesifikasies wat weens die aard daarvan maklik gesamentlik aangepak kan word, deur 'n hoofkomitee, wat slegs twee of drie keer per jaar vergader, afgehandel behoort te word.

Die vier gekonsolideerde komitees wat gevorm is deur die samevoeging van tegniese komitees word die Komitee vir Geweefde Katoentekstielgoedere, die Komitee vir Geweefde Woltekstielgoedere, Komitee vir Gebreide Stof en Kouse en die Tekstieladvieskomitee genoem. Die konsolidering van hierdie tegniese komitees behoort tyd te bespaar.

Gedurende die jaar is 'n aantal aansoeke om permitte vir die aanbring van die Buro se merk ontvang en afgehandel.

Houtonderafdeling: 'n Opvallende kenmerk van die jaar was die groot aantal aansoeke wat ontvang is om die merk op bouhout aan te bring. Dit het voortgevloei uit die voorwaarde wat die Departement van Bosbou gestel het dat saagmeulenaars wat houtstompe van staatsplantasies op langtermynkontrakte koop, binne redelike tyd die Buro se sertifiseringsmerk op die hout sal moet aanbring.

Die staatsaagmeulens het nie alleen die voortou geneem met die verwerwing van die merk op bouhout vir die groot saagmeulens nie, maar ook 'n pragtige voorbeeld gestel deur self feitlik hulle hele verkoopbare opbrengs kragtens die merkskema te produseer en te bemark.

Nog 'n aansporing vir plaaslike hout was die regering se opdrag aan al sy departemente, provinsiale administrasies en staatsondersteunde liggame om waar moontlik by voorkeur Suid-Afrikaanse hout en nie ingevoerde hout te koop nie. Tengevolge spesifiseer

period. These included specifications for nylon/wool bunting and national flags for the Public Works Department, nylon shoe laces, stockings and waterproof leggings for the Defence Production Office, sewing thread for the Union Tender Board, raincoat material and pyjama suits for the South African Police, flax, canvas, terry towels, flannel vests and feather pillows for the South African Railways, overalls for the Anglo-American Corporation, and protective clothing for the African Explosives and Chemical Industries Ltd.

The test work carried out on samples submitted by government departments, local manufacturers, merchants and importers showed an increase of 23 per cent and 342 reports were issued. The sponsors included the City Councils of Pretoria and Johannesburg, the Naval Armaments Supply Office and the Potato Board, and the samples tested covered a very wide variety of textile piece-goods, articles and clothing.

Analyses carried out on behalf of the Criminal Investigations Department of the South African Police increased in volume.

Progress was made with the work on the preparation of standard specifications. Owing however to the heavy programme of specification work involving frequent technical committee meetings it was decided by the Liaison Committee for the Clothing and Textile Industries that those specifications, which by their character could be conveniently handled collectively, should be dealt with by main committees meeting only twice or three times a year.

The four consolidated committees formed by grouping technical committees are designated Woven Cotton Textiles Committee, Woven Wool Textiles Committee, Knitwear and Hosiery Committee, and Textile Advisory Committee. The consolidating of these technical committees should prove time-saving.

A number of applications for permits to apply the mark of the Bureau were received and dealt with during the year.

Timber Section: One of the striking features of the year was the large number of applications received for the mark on structural timber. This largely resulted from a condition laid down by the Department of Forestry that millers buying logs on long-term contracts from state forest plantations would be required to apply the Bureau's certification mark to the wood within a reasonable period.

In addition to taking the lead in obtaining the mark on structural timber for the larger sawmills, the state sawmills set a fine example by producing and marketing virtually all their saleable production under the mark.

A further stimulus for local timber was the instruction given by the Government that all its departments, provincial administrations and state-aided bodies should buy South African wood in preference to the imported product. Consequently, the Public Works Department

die Departement van Publieke Werke en die Suid-Afrikaanse Spoorwegadministrasie bouhout volgens S.A.B.S.-standaarde gegradeer, wanneer hout van hierdie aard vereis word. Nog 'n belangrike teken is dat duisende kubieke voet naaldhout met die merk daarop gebruik is vir die bou van 10,000 spoorweg-trokke vir beeste en vrugte.

Die vraag na goedgegradeerde Suid-Afrikaanse dennehout met die merk op was gunstig en hierdie hout is vir die grootskaalse behuisingskemas vir nie-blankes naby Johannesburg en Port Elizabeth gebruik.

Een van die grootste fabrikante van handvatsels en stele in die Unie het vergunning verkry om die merk op 12 soorte handvatsels en stele te gebruik. Dit is die eerste keer dat handvatsels en stele met die merk daarop op die Suid-Afrikaanse mark verskyn. Groot kopers-figgame koop hulle in al hoe groter hoeveelhede, waar vroeër slegs die ingevoerde artikel in aanmerking gekom het.

Die spesifikasie vir bouhout, wat 'n hersiening is van Afdeling 5 van die spesifikasie vir gegradeerde Suid-Afrikaanse naaldhout is voltooi en goedgekeur. 'n Belangrike wysiging is dat slegs twee in plaas van die drie grade van die oorspronklike spesifikasie voorgeskryf word, wat heelwat vereenvoudiging uit die oogpunt van standaardisering beteken.

'n Spesifikasie vir plankies vir sitruskissies is voltooi. Die belangrikheid hiervan is daarin geleë dat die Suid-Afrikaanse Koöperatiewe Sitrusbeurs 'n tyd lank al spesifiseer dat sy kispalkies die merk moet dra. Spesifikasies vir houtstele vir byle, hamers en handbyle het die finale stadium bereik, terwyl daar vordering gemaak is met dié vir die algemene soort piksteel. Hiermee is die reeks spesifikasies vir 13 soorte stele en handvatsels klaar.

Die gebruikskode vir houtterme en -definisies is voltooi. Hierdie kode het 'n geweldige hoeveelheid werk gekos, aggesien byna 400 terme wat algemeen in die nywerheid gebruik word, behandel is, en byna elke term uit die plaaslike agtergrond afkomstig is of daarop toegepas is. Die publikasie van sewe permanente standaarde vir kreosoot en houtverduursamingsmiddels met 'n kreosootbasis, het die noodgrade vir hierdie verduursamingsmiddels vervang.

Gedurende die jaar het die merk op miljoene telefoon-, krag- en kragoortrengingspale en -spanpaaltjies, heiningpale en priëlpale verskyn.

Die beslissing van die Sagtevrugteraad om slegs kispalkies wat die merk dra, te spesifiseer vir die behoeftes van die seisoen sal die land tussen £1 en £1½ miljoen aan buitelandse valuta bespaar. Besoeke van die lede van die Houtinspeksie-afdeling aan 'n hele paar van die groot pakhuse het die lof wat die plaaslike produk te beurt geval het, bevestig. By die dokke was die amptenare dit eens dat die kissies waarin vanjaar se uitvoerappels, -druie en -pere verpak is, baie beter is as die wat in vorige jare gebruik is.

and the South African Railways Administration specify structural timber graded to S.A.B.S. standards wherever wood of this type is required. A further interesting feature was that thousands of cubic feet of mark-bearing softwood were used in the building of 10,000 railway trucks for cattle and fruit.

There was a healthy demand for well-graded South African pine bearing the mark, and this timber was used in the large scale Non-European housing scheme near Johannesburg and Port Elizabeth.

One of the largest wooden handle manufacturers in the country obtained permission to use the mark on twelve kinds of handle. This is the first time that mark-bearing handles have appeared on South African markets. The large purchasing bodies are buying increasing quantities of these handles where formerly only the imported article was considered.

The specification for structural timber which is a revision of Section 5 of the specification for graded South African softwood timber was completed and approved, an important amendment being that it specifies only two grades as against three laid down in the original specification, thus bringing about considerable simplification from the point of view of standardization.

A specification for box shooks for citrus boxes was completed. Its particular importance lies in the fact that the South African Co-operative Citrus Exchange has, for some time, specified that its shooks should bear the mark. Specifications for wooden handles for axes, hammers and hatchets reached the final stage, while progress was made with that for universal type pick handles. This completes the series of specifications for thirteen types of handle.

The code of practice for timber terms and definitions reached completion. This code represents a tremendous volume of work, as nearly 400 terms common to the industry have been covered, and nearly every term has been collected from, or adapted to, the local background. By the publication of seven permanent standards for creosotes and wood preservatives with a creosote basis, the emergency grades for these preservatives were superseded.

During the year the mark appeared on millions of creosoted telephone, power and transmission poles, droppers, fence posts and trellis poles.

The Deciduous Fruit Board's decision to specify only mark-bearing shooks for the season's needs will save the country between £1 and £1½ million in foreign currency. Visits to several of the large packhouses by members of the Timber Inspectorate confirmed the praise for the local product. Official opinion at the docks was unanimous that the boxes carrying this year's export apples, grapes and pears were greatly superior to those used in previous years.

Papieronderafdeling: Heelwat aandag word geskenk aan 'n nuwe fotokopieproses wat koolpapier uitkakel en tikpersoneel verminder. Die papier wat vir die proses gebruik word, is uiters duursaam—ook wat die beeld op die afskrifpapier betref. Dit het trouens geblyk dat die papier wat op die oomblik vir amptelike rekords gebruik word, in party gevalle ongeskik is om sulke rekords vir geruime tyd te bewaar.

Die nuwe, ligte en goedkoper bewysboekies vir die Naturelle wat die swaarder tipes van vroeër vervang, blyk duursaam te wees en het 'n sterker band. Hierdie eienskappe sorg daarvoor dat die nuwe boekies netjies bly en dat die belangrike gegewens op die bewysblaai aangegee, helder is.

Die Onderafdeling was o.a. besig met die waarde-bepaling van verskillende soorte papier t.o.v. gebruiksprestasie, deur middel van fisiese en chemiese toetse. Hieronder ressorteer bv. kraftpapier vir elektriese isolering; dekking- en riffelmediumpapier vir die maak van riffelborddose; handgemaakte papier van S.A. Pinus Patula en toilet papier, bord, kraftpakpapier en maskeerband.

Met die totstandkoming van die Onderafdeling Papier is die moontlikheid geskep om 'n begin te maak met 'n spesifikasie vir skoolskrifte. Die provinsiale onderwysdepartemente het heelwat belangstelling en gewilligheid tot samewerking getoon. Die grootste moeilikheid by die verkryging van eenvormigheid t.o.v. skoolskrifte is dat die verskillende provinsies baie jare lank elk sy eie groottes en lineerings gebruik het. Eenstemmigheid oor eenvormige groottes en lineerings vir die spesifikasie is bereik en daar word vertrou dat met die samewerking van die provinsies, slegs een stel standaard skoolskrifte in die nabye toekoms in die Unie en Suidwes-Afrika gebruik sal word.

Die tegniese komitee wat besig is met 'n spesifikasie vir toilet papier het aan die lig gebring dat die plaaslike bedrywe wat toilet papier maak, 'n uitstekende artikel produseer maar dat strenger fabrieksbeheer nodig is om groter eenvormigheid van die produk te verseker.

Onderafdeling Leer en Skoelisel: In die onderhawige tydperk is volle gebruik gemaak van die nuwe, ruimer perseel wat die Onderafdeling verlede jaar betrek het. Met 'n volledige fisiese toetslaboratorium tot sy beskikking, het hy vir die nywerheid van veel groter nut as ooit tevore geword, veral wat die toetsing van nuwe materiaal vir skoeliselonderdele betref.

Die Transvaalse en Vrystaatse Kamer van Mynwese het looiers dringend aangeraai om 'n meer waterdigte boeler te ontwikkel wat terselfdertyd sweet kan absorbeer en waarvan die vetgehalte nog laag genoeg is om die sole van die stewels of daaraan te kan vasplak of volgens 'n regstreekse vulkaniseermethode daaraan te kan vassit. Al die Transvaalse looiers en 'n looier uit die Oostelike Provinsie wat goeie leer probeer maak, het

Paper Section: Considerable attention is being given to a new photo-copying process which eliminates carbon paper and reduces typewriting personnel. The paper used in this process has a high permanence and the image on the copy paper has excellent durability. It has, in fact been found that the paper used currently for official records is in some instances unsuitable for preserving such records for any lengthy period.

The new, lighter and more economical Bantu reference books to replace the former heavier types, were found to be durable and had a stronger binding than the former types. These properties ensure that the new books retain their neatness and the clarity of the pertinent data contained in the reference pages.

Included in the activities of the Section was the assessment of various papers for performance in use by means of physical and chemical testing. These included kraft paper used in electrical insulation; liners and corrugating media in the construction of corrugated-board boxes; the quality of hand-made papers from South African Pinus Patula and the quality of toilet papers, boards, kraft wrapping papers and masking tapes.

The establishment of the Paper Section made it possible to make a start with a specification for school exercise books. Considerable interest and co-operation were shown by the provincial education departments. The main difficulty in obtaining uniformity in school exercise books is that, for many years, the various provinces have used their own sizes and rulings. Differences in the ruling particularly, is confusing to a child passing from one province to another. Agreement was reached on uniform sizes and rulings for the specification and it is confidently expected that with the co-operation of the provinces, only one set of standard school exercise books will in the near future be used in the Union and South West Africa.

The technical committee engaged on a specification for toilet paper brought to light that local industry making toilet tissue paper produced an excellent article but that closer plant control is necessary to ensure greater consistency in production.

Leather and Footwear Section: Full use was made during the period under review of the new and more spacious premises to which the Section moved last year. With a complete physical testing laboratory at its disposal it has become of far greater use to industry than ever before, especially where the testing of new materials for footwear components is concerned.

The Transvaal and Orange Free State Chamber of Mines have urged tanners to develop a more waterproof upper leather which can at the same time take up perspiration and have a low enough grease content to enable the soles of the boots to be either stuck on or attached by the direct vulcanization method. All the Transvaal tanners and one from the Eastern Province

die Buro se laboratoria gebruik om elke opvolgende produksielot te toets. Uitstekende resultate is verkry.

Die S.A. Spoorweë en die Verdedigingsmag het albei die Buro versoek om private spesifikasies vir stewels met sole wat regstreeks aangevulkaniseer is. Die stewels wat Verdediging nodig het, het besonder interessant geblyk, aangesien hulle van 'n tipe vir gevegsdoeleindes is, met 'n beenhoogte van elf duim. Albei departemente het die Onderafdeling se werk in hierdie verband gelooft.

Feitlik al die skoeisel wat die staatsdepartemente en inrigtings in die jaar nodig gehad het, is of kragtens die merkskema of volgens private spesifikasies onder die Buro se beheer gemaak.

Die spesifikasies vir mynwerkerstewels, allerlei tipes beskermende stewels en skoene, randleer en leer-eters is voltooi en sal binnekort in drukvorm te kry wees. Die verpligte spesifikasie vir die vervaardiging, produksie, verwerking of behandeling van buitesooleer is hersien en die hersiene spesifikasie na die Departement van Handel en Nywerheid vir afkondiging gestuur. Behalwe gedurende die vakansie maande Desember en Januarie, het Buro-inspekteurs by elke leerlooierij en skoeiselfabriek in die Unie gereeld minstens een keer per maand inspeksies uitgevoer.

DEPARTEMENT CHEMIESE DIENSTE EN TEGNOLOGIE

Afdeling Chemiese Tegnologie

Hierdie Afdeling se breë tegnologiese veld omvat o.a. petroleum, verf, rubber en plastika.

Die verbruiker van petroleumprodukte kom voor 'n uitgebreide reeks produkte te staan ten opsigte waarvan die fabrikante op baie deugdelikhede aanspraak maak. Hoewel die verbruikerseise in sekere gevalle aanleiding gegee het tot 'n mate van vereenvoudiging, het 'n besliste beweging hom laat geld om te vereenvoudig en deur die gebruik van standaarde op inkoop te bespaar.

Hierdie beweging het oral ingang gevind by aankoop-organisasies. Die Buro het veel hiertoe bygedra deur middel van die nuttige dienste wat hy liggame soos die Unietenderraad en die provinsiale administrasies bewys.

Inspeksie is 'n logiese bydrae tot doeltreffende aankoop. As voorbeeld kan genoem word: die Buro se toepassing hiervan en sy ondersoek van probleme i.v.m. stralerbrandstof en die kontrolering daarvan vir die Departement van Verdediging, het aanleiding gegee tot die inwerkingstelling deur die Departement van 'n landswye kontroleringstelsel in die Unie.

Onlangse ontwikkelings in die bemerking van vloeibare petroleumgas is goed dopgehou en binnekort word 'n nasionale standaard gepubliseer vir hierdie veelsydige gas wat vir die verbruiker op tallose maniere nuttig is.

who endeavour to make a satisfactory leather have used the Bureau's laboratories to test each progressive batch. Some outstanding results have been achieved.

Both the South African Railways and the Defence Force requested the Bureau to write private specifications for boots with direct vulcanized soles. The boots required by Defence have proved particularly interesting as they were of the combat type with an eleven inch high leg. The Section's work in this connection was praised by both departments.

Practically all the footwear required by state departments and institutions during the year was either made under the mark scheme or to private specifications controlled by the Bureau.

The specifications for miners' boots, various types of protective boots and shoes, wetting leather and leather laces were completed and will shortly be available in published form. The compulsory specification for the manufacture, production, processing or treatment of outer sole leather was revised, and the revised specification sent to the Department of Commerce and Industries for promulgation. Except for the holiday months of December and January, Bureau inspectors carried out regular inspections at every tannery and footwear factory in the Union at least once each month.

CHEMICAL SERVICES AND TECHNOLOGY DEPARTMENT

Chemical Technology Division

The broad technological field covered by this Division includes petroleum, paints, rubber and plastics.

The consumer of petroleum products is confronted by a wide range of products for all of which many claims are made. Altogether in certain cases consumer demands have resulted in some degree of simplification, only recently has a strong move to simplify and economize on purchases by making wider use of standards emerged.

This trend has spread over a broad sector of purchasing organizations and the Bureau has done much to stimulate it by the useful services it renders such bodies as the Union Tender Board and the provincial administrations.

Inspection is a logical contribution to efficient buying. To give an example—its application and the investigations carried out by the Bureau on jet fuel problems and control for the Department of Defence have led to the implementation of a Union-wide control system by the Department.

Recent developments in the marketing of liquefied petroleum gas have been closely followed and a national standard will shortly be published for this versatile fuel which can be used for endless consumer purposes.

Activities in the Paint Section have shown considerable expansion. Many organizations as well as the

In die Onderafdeling Verf het die werksaamhede heelwat uitgebrei. By baie organisasies en ook die Goewermentskoper is dit die algemene gebruik om verf volgens spesifikasie te koop en aflewings alleen na inspeksie aan te neem. Die Buro het in die afgelope iwaalf maande heelwat aandag bestee aan die vervanging van baie private spesifikasies deur nasionale standaarde vir verf, waarvan ses reeds in ver gevorderde stadium opgestel is.

Die koms van „plastiekemulsieverf” het ’n geweldige indruk op die verfnwyerheid gemaak en onlangs is nog twee fabriek vir die produksie van grondstowwe opgerig.

Die Buro het tred gehou met hierdie nuwe ontwikkeling en nasionale standaarde vir hierdie verftipe het reeds die finale stadium bereik.

In die rubber- en plastieknywerheid het fenomenale ontwikkelings plaasgevind, veral op die gebied van plastiekbewerking vir die produksie van die groot verskeidenheid gebruiksartikels, bybehore vir nywerheidsdoeleindes en speelgoed wat nou aangebied word. Een van die belangrike dienste wat die Buro hierdie nywerheid kon bied, is die toetsing van hierdie produkte en hy het reeds, terwille van groter doeltreffendheid, ’n spuitvormapparaat en ’n apparaat vir druktoets op pype aangeskaf.

Om die moeilikhede in verband met die werwing van geskikte ervare personeel die hoof te bied, het die Buro ’n opleidingstelsel ingestel deur ’n gegradueerde lid oorsee te stuur om ’n intensiewe, gespesialiseerde kursus in rubber-en-plastiektegnologie by te woon.

Afdeling Chemiese Dienste

Hierdie Afdeling bestaan uit al die analitiese dienste, nl. fisies, organies en anorganies. Daaronder ressorteer die Fisies-chemiese, Algemeen Analitiese, Metallurgiese, Waterontledings- en Keramiekafdelings. Hulle sorg vir analitiese diens aan die tegniese onderafdelings van die Buro. Sowat 50 persent van die huidige werk word in hierdie verband gedoen. Baie van die orige werk word uitgevoer vir individuele opdraggewers van buite en in verband met chemiese produkte deur die standaardspesifikasies gedek. Toets word ook uitgevoer t.o.v. kontrakte vir die inspeksie van besendings. Vandag koop talle groot verbruikers, waaronder staatsdepartemente en provinsiale administrasies, baie van hulle benodighede onder die voorwaarde dat hulle deur die Buro ondersoek en getoets word.

As gevolg van die omvang van die werk wat hierdie beleid meegebring het, is spesiale aandag aan vinnige, akkurate toetsmetodes geskenk. Fisiese metodes word maklik gewysig om vinnige resultate te besorg en om dié rede is geriewe in werking gestel om X-straal-diffraksie- en fluoressensiewerk, spektrofotometriese toets in die sigbare, ultraviolet en infrarooi veld van

Government Buyer make a general practice of buying paints to specification and of accepting deliveries only on inspection. The Bureau has devoted much attention during the past twelve months to replacing the many private specifications by national standards for paints, six of which are now in an advanced stage of preparation.

The advent of “plastic” emulsion paints has made a considerable impact on the paint industry and two additional factories for the production of raw materials have recently been established.

The Bureau has kept pace with this new development and national standards for this type of paint have reached their final stages.

Developments in the rubber and plastics industries have been phenomenal, especially the processing of plastics for the production of the great variety of utility articles, industrial accessories and toys now available. The testing of these products is one of the important services the Bureau has been able to offer this industry, and, for the sake of greater efficiency, an injection moulding unit and an apparatus for the pressure testing of piping have been acquired.

In an attempt to overcome the difficulties of finding suitably experienced staff the Bureau has initiated a system of training by sending a graduate member overseas to attend an intensive, specialized course in rubber and plastic technologies.

Chemical Services Division

This Division consists of all the analytical services, physical, organic and inorganic. It comprises the Physico-Chemical, General Analytical, Metallurgical, Water Analysis and Ceramics Sections. These provide the technical sections of the Bureau with analytical services, about 50 per cent of the work at present done being for that purpose. Much of the remaining test work is done for individual outside sponsors, and on the chemical products covered by standard specifications. Tests are also conducted in respect of consignment inspection contracts. Numbers of large consumers, including government departments and provincial administrations, today buy many of their requirements subject to inspection and test by the Bureau.

One consequence of the volume of work resulting from this policy has been the special attention given to rapid, accurate methods of test. Physical methods are easily adapted to give rapid results and therefore facilities for doing X-ray diffraction and fluorescent work, spectrophotometric tests in visible, ultra-violet and infra-red fields of the spectrum, gaschromotography

die spektrum en toetse met behulp van gaschromatografie en polarografie uit te voer. Hierdie vinnige toetsmetodes is veral nuttig by die toepassing van die goedkeuringsmerkskema, terwyl die Suid-Afrikaanse Speurdiens hulle ook ten volle gebruik.

Die chemiese ontleding en metallurgiese ondersoek van metaaltipes en metaalprodukte word deur 'n aparte onderafdeling behartig en aankooporganisasies vir wie private spesifikasies opgestel word, maak heelwat gebruik daarvan. Latere inspeksie van besendings vorm deel van hierdie onderafdeling se werk. Ook 'n belangrike werk hier is die kontrolering van kentekens vir die Departement van Verdediging, die Suid-Afrikaanse Polisie en die Suid-Afrikaanse Verpleegsteraad.

'n Interessante ontwikkeling is die oprigting van 'n Onderafdeling Water, om die Buro in staat te stel om sy statutêre verpligtings ingevolge die Waterwet, No. 54 van 1956, na te kom en die nodige diens aan die Departement van Waterwese te lewer. Aanbevelings vir 'n nasionale standaardspesifikasie vir die gehalte van nywerheidsafvalwater is opgestel en voorgelê.

Die werksaamhede van die Onderafdeling Water dek ook die aanbevelings, by die Departement van Waterwese, wat gespesifiseer moet word in die permitte wat nywerhede vrystelling van voldoening aan die vereistes van die nasionale standaardspesifikasie verleen en sluit die toetsdiens in wat vir die beheer oor die permitte nodig is.

Die Onderafdeling bly in noue voeling met die Nasionale Instituut vir Waternavorsing in al sy werk.

Die Tegnieuse Hoofbeampte van die Afdeling is op 'n uitgebreide reis in die buiteland gestuur om ontwikkelings op die gebied van laboratoriumkontrole en -ontwerp, die toepassing van inspeksieskemas en die status en aanwending van moderne analitiese tegnieke te ondersoek.

Onderafdeling Verf: In die jaar is twaalf komiteevergaderings oor agt spesifikasieprojekte gehou en die volgende is deur al die stadiums geloods en persklaar gemaak: dakverf, dekverf vir boustaal, grondverf vir hout, aluminiumverf, stopverf vir die insit van ruite in staal- en houtrame, en waterdigte aluminiumverf. Op die oomblik het tien spesifikasies en een gebruikskode vir die voorbereiding van staal vir verf die finale stadium bereik en word persklaar gemaak. Die meeste van die standaardtoetsmetodes vir verf is klaar en die eerste afdeling is reeds in die pers.

Die werk aan die spesifikasie vir emulsieverf het gevorder en is byna klaar. Vir die gewone verfsorte wat die meeste gebruik word, soos bv. olieverf, emalje, hoëglansverf, en verf vir eierglans- en dowwe afwerkings is daar twee spesifikasies. Een van die twee, sierverf vir binnewerk, is reeds in 'n gevorderde stadium terwyl die sierverf vir buitewerk ook byna klaar is. Ander projekte waaraan aandag geskenk word, is bitumineuse

and polarographic tests have been brought into service. These quick methods of test are particularly useful in the administration of the certification mark scheme while the South African Criminal Bureau also makes full use of them.

The chemical analysis and metallurgical examination of all types of metal and metal products is the work of a separate section, much used by purchasing organizations for which private specifications are prepared. Subsequent inspection of consignments forms part of the work of this section. The control of badges for the Department of Defence, the South African Police and South African Nursing Council is an important activity here.

One interesting development has been the establishment of a Water Section to enable the Bureau to fulfil its statutory obligations under the Water Act, No. 54 of 1956, and to render the relevant services to the Department of Water Affairs. Recommendations for a national standard for the quality of industrial effluents have been prepared and submitted.

Further activities of the Water Section cover the recommendations to the Department of Water Affairs to be specified in permits exempting industries from compliance with the requirements of the national standard, and include the testing services necessary for administering these permits.

The Section maintains close collaboration with the National Institute for Water Research in all its work.

The Principal Technical Officer of the Division has been sent overseas on an extensive tour to investigate developments in laboratory control and design, the administration of inspection schemes, and the status and adoption of modern analytical techniques.

Paint Section: Twelve committee meetings were held on eight specification projects during the year and of these the following were taken through all the stages and are being prepared for publication: roof paint, finishing paint for structural steel, primers for wood, aluminium paint, glazing putty for steel and wood sash, and water-resistant aluminium paint. At present ten specifications and one code of practice for the preparation of steel for painting have reached the final stage and are being prepared for publication. The majority of the standard test methods for paint have been completed and the first section is already being printed.

Work on the emulsion paint specification progressed and is nearing completion. The more common and popularly used paints such as oil paints, enamels, high-gloss, eggshell and flat finishes are covered by two specifications, one of which, interior decorative paints, has reached an advanced stage, while exterior decorative paints is also nearing completion. Bituminous paints,

verf, bakverf vir die nywerheid, en padmerkverf. Laasgenoemde behoort vir fabrikante, munisipale en provinsiale besture van betekenis te wees. Die bepaling van prestasie-eienskappe word uitgevoer met behulp van 'n toetsapparaat vir slytasieweerstand, wat in die laboratorium gemaak is, terwyl 'n toestel om die sigbaarheid by nag van padmerkverf te meet, onlangs aangekom het. Dit is van die grootste belang by die opstel van 'n realistiese spesifikasie.

In die bedryf vir vergrondstowwe was die onlangse oprigting van twee polivinielasetaatfabrieke in Durban en Oos-Londen 'n interessante ontwikkeling, aangesien daar nou nie minder as vier maatskappye in die Unie in werking is nie. Hulle oefen beslis 'n invloed op die vervaardiging en toenemende gewildheid van plastiek-emulsieverf uit.

Die werk in verband met kontrakte vir besendings-inspeksie by twee groot organisasies het met sowat tien persent toegeneem. Daarbenewens is monsters vir die toekenning van verfenders met 'n totaal van sowat 20,000 gelling vir 'n verbruiker getoets.

Vir die eerste keer is monsters vir die toekenning van tenders vir die Unietenderraad se verkontrakte vir 1959 in die Buro getoets, terwyl die Onderafdeling ook tendermonsters van isoleervernis en -emalje vir die S.A. Spoorwegadministrasie en padmerkverf vir die Transvaalse Provinsiale Administrasie getoets het.

Ook die fabrikante en verbruikers van verf en vergrondstowwe het voortdurend en in al hoe groter mate toetsdienste van die onderafdeling aangevra. Dit was veral merkbaar t.o.v. toetse bv. vir versnelde verwerking, soutmis- en vogweerstand, reflektansie, glans en kleur, wat gespesialiseerde en dikwels duur toerusting vereis. Om die vraag na hierdie soort werk die hoof te bied, is 'n vierde inrigting vir versnelde verwerkingstoetse geïnstalleer. Verdere hulp is aan die nywerheid verleen deur hulle te voorsien van standaardolies vir die kalibrering van verviskosimeters, deur kleur- en reflektansiestandaarde en deur ander tipes apparate vir hulle te kalibreer.

Benewens die verftoetse is baie ander toetse uitgevoer t.o.v. materiaal soos droënde olies, pigmente en aanvullers, stopverf, distempers en pigmentpastas, waarvoor daar twintig spesifikasies bestaan wat reeds gepubliseer is. Die Onderafdeling het ook klaargemaakte geveerde produkte getoets, soos bv. hospitaalbeddens en ander meubeltipes, gewoonlik in samewerking met ander onderafdelings.

Duisende toetse op honderde monsters is uitgevoer in verband met die toetsprogram vir spesifikasies en die resultate is gereeld aan die tegniese komitees gestuur. In die onderhawige jaar se roetine-werkzaamhede is verder sowat 2,000 verfpanele blootgestel op die blootstellingsterrein te Durban en te Pretoria, terwyl 'n

industrial baking enamels and road marking paints were further projects receiving attention. The last should prove of great interest to manufacturers, municipal and provincial authorities. The assessment of the performance characteristics is done by an accelerated abrasion resistance machine developed in the laboratory, while a unit for measuring the night visibility of road marking paints, of paramount importance for developing a realistic specification, has recently arrived.

An interesting development in the paint raw materials industry was the recent establishment of two polyvinyl acetate factories at Durban and East London so that no less than four companies are now operating in the Union. They are exerting a decided influence on the manufacture and growing popularity of "plastic" emulsion paints.

Work in connection with consignment inspection contracts with two big organizations showed an increase of about ten per cent. In addition, samples for the allocation of paint tenders totalling about 20,000 gallons were tested for a user.

For the first time, tender samples for the allocation of the 1959 paint contracts of the Union Tender Board were tested at the Bureau, while the Section also tested tender samples of insulating varnishes and enamels for the South African Railways Administration and road marking paint for the Transvaal Provincial Administration.

A continual and growing demand for the testing services of the Section was experienced from the paint and paint raw material manufacturers as well as consumers. This was especially marked in the case of tests such as accelerated weathering, salt fog and humidity resistance, reflectance, gloss and colour which require specialized and often expensive equipment. A fourth accelerated weathering unit was installed in order to cope with the demand for this type of work. Industry was further assisted by the supply of standard oils for the calibration of paint viscometers, the supply of standards for colour and reflectance and by the calibration of other types of apparatus.

In addition to tests on paints, numerous tests were conducted on related materials such as drying oils, pigments and extenders, putty, distempers and pigment pastes, for which twenty published specifications are available. The Section also carried out tests on painted finished products such as hospital beds and other types of furniture, usually in collaboration with other sections.

Thousands of tests on hundreds of samples were performed in support of the specification test programme and their results regularly passed on to the technical committees. The routine exposure of approximately 2,000 paint panels at the Durban and Pretoria exposure sites was a further activity during the year, while an investigation of the influence of climatic

ondersoek na die invloed van klimaatstoestande op die blootstelling van verf in die verskillende sentra die inligting oplewer wat die betrokke komitees nodig het.

Petroleumonderafdeling: Die Onderafdeling was meestal besig met sy vernaamste werk, d.w.s. die ontwikkeling van spesifikasies en die kontroletoetswerk van merkdraende produkte. Die kwaliteit van laaggenoemde is gewoonlik gehandhaaf.

Permithouers het ook gebruik gemaak van die Onderafdeling se dienste om probleme i.v.m. gehalte en produksie op te los. Aanneeminspeksies is vir staatsdepartemente en -ondernemings opgelos. Groot getalle standaardmonsters is vir opdraggevers berei.

Die spesifikasies vir swaardiensmotorolie en vloeibare petroleumgas het goed gevorder en hulle is byna klaar.

Die Onderafdeling het twee buitengewone opdragte uitgevoer: die een 'n ondersoek na die swigting van opgeboude dakvilt, waar die oorsaak van die moeilikheid na baie toetse vasgestel is, die ander die versoek wat ontvang is om twee monsters sand, wat na bewering olie bevat, uit plekke in Suidelike Afrika te ontleed. In albei monsters is klein hoeveelhede vloeibare koolwaterstof gevind.

'n Lang reeks kleurbepalings t.o.v. smeerolie is vir die Nasionale Chemiese Navorsingslaboratorium in verband met die navorsingsprogram vir filterklei uitgevoer.

Met die oog op die opstel van 'n spesifikasie, is in samewerking met die Onderafdeling Entomologie, verskeie metodes op die proef gestel om die ontplofings- en brandgevaar vas te stel wat met die gebruik van insekdoerende aerosole gepaard gaan. By die een metode, van die Verenigde State afkomstig, is daar gebruik gemaak van 'n drom van 45 gelling wat dit moontlik gemaak het om brandgevaarproefnemings of in die opelug of in ingeslote ruimtes uit te voer.

Op versoek van die Krygsproduksiekantoor het die Onderafdeling die Suid-Afrikaanse Lugmag met 'n probleem gehelp in verband met die swigting van die stootlaers in die brandstofpompe van straalvegvliegtuie. In sekere gevalle het geblyk dat die brandstof die betrokke silweroppervlakte korrodeer. Intensiewe ondersoek het aan die lig gebring dat sekere mikro-organismes in stralerkeroseen lewe as daar ook water aanwesig is en aktiewe swawel laat ontstaan uit die onaktiewe swawel wat die brandstof bevat. Die teenmiddel wat toegepas is, is gereelde ondersoek van die bewaringstoestande. 'n Gebruikskode is opgestel en sedertdien het die moeilikheid hom nie weer voorgedoen nie.

Voorrade brandstof vir vliegtuigturbines, wat by 'n lugstasie gebêre word, is gereeld ondersoek.

Onderafdeling Metallurgie: Die Metallurgiese Onderafdeling bestaan uit twee laboratoria—die een

conditions on paint exposure in the various centra is now providing the information required by the relevant committees.

Petroleum Section.—The primary tasks of specification development and the control testing of mark-bearing products occupied much of the Section's time. The quality of the latter was generally well maintained.

Permit holders also made use of the testing services of the Section for the solution of quality and production problems. Acceptance inspections were carried out for State departments and undertakings. Large numbers of standard samples were prepared for sponsors.

Good progress was made with the specifications for heavy duty motor oil and for liquefied petroleum gas, which have almost reached completion.

Two unusual assignments were undertaken by the Section—one an investigation of the failure of built-up roofing felt where the causes of the trouble were established after many tests; the second being requests received for the analysis of two samples of sand alleged to be oil-bearing, from localities in Southern Africa. Both samples were found to contain small quantities of liquid hydrocarbons.

A long series of colour determinations on lubricating oil was done for the National Chemical Research Laboratory in connection with a research programme on filtering clays.

For the purpose of preparing a specification, various methods for assessing the explosion and fire hazards associated with insecticide aerosols were tried in collaboration with the Entomology Section. One method, emanating from the United States, made use of a 45-gallon drum, modified, which enabled fire hazard experiments to be carried out in open or closed spaces.

At the request of the Defence Production Office the Section assisted the South African Air Force in a problem concerning the failure of thrust-bearings in fuel pumps of jet fighters. The fuel in certain cases was found to be corrosive to the silver surfaces involved. Intensive investigation disclosed that certain micro-organisms live in jet kerosene when water is also present and produce active sulphur out of the inactive sulphur contained in the fuel. The remedy adopted was the regular inspection of storage conditions. A code of practice was drawn up, since when there has been no recurrence of the trouble.

Regular examinations were conducted on stocks of aircraft turbine fuel stored at an air station.

Metallurgical Section: The Metallurgical Section consists of two laboratories—one equipped to conduct

ingerig om fisiese metallurgiese ondersoek van metale en legerings uit te voer en die ander 'n chemiese laboratorium.

Albei laboratoria was deur die jaar voltyds besig met werk vir verskillende staatsdepartemente, provinsiale administrasies en verskillende nywerheidsfirmas.

Verder is die vereiste inspeksies uitgevoer en die produkte ondersoek van die 62 permithouers wat onder hierdie Onderafdeling ressorteer.

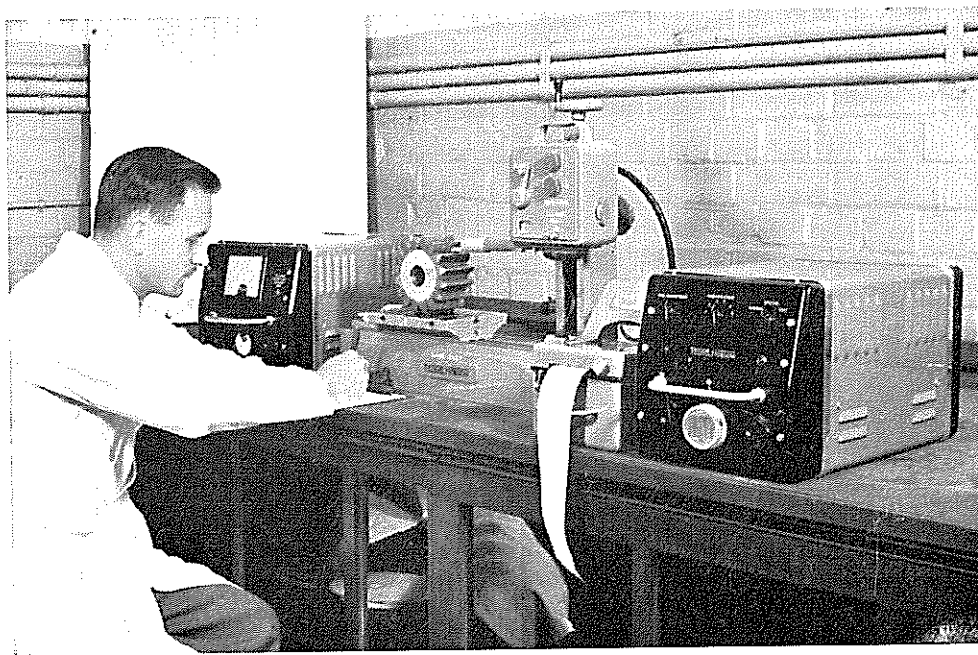
Twee spesifikasies word opgestel en een spesifikasie word hersien.

physical metallurgical examinations of metals and alloys, the other a chemical laboratory.

Both laboratories were fully employed during the year with work for various government departments, provincial administrations and various industrial firms.

In addition, the necessary inspections were carried out and the analyses made of products from the 62 permit holders that fall under this Section.

Two specifications are in the course of preparation, and one is under revision.



Die gladheid van rattande word op die Talysurf-vlakmeetinstrument getoets

Smoothness testing of gear teeth on the Talysurf surface measuring instrument

Aanneeminspeksie van die galvanisering van elektriese geleierbuise is vir twee firmas onderneem. Namens die Elektrisiteitsvoorsieningskommissie is die gegalvaniseerde hoekysters ondersoek wat vir die torings vir oorbreningslyne gebruik word.

Die Provinsiale Administrasie het die Onderafdeling genader i.v.m. die analise van die muurbekleding van aluminiumlegering vir die nuwe Administrasiegebou in Pretoria. 'n Private spesifikasie is opgestel en die Buro is versoek om die inspeksie en analise van die aluminiumlegering wat gebruik moet word, te onderneem. Dit sal ongeveer drie jaar se werk kos.

Acceptance inspection of the galvanizing of electrical conduit was undertaken for two firms. An inspection made on behalf of the Electricity Supply Commission was of the galvanized angles used for towers for transmission lines.

The Section was approached by the Provincial Administration authorities in connection with the analysing of the aluminium alloy wall curtain for the new Administration Building in Pretoria. A private specification was drawn up and the Bureau was requested to undertake the inspection and analysis of the aluminium alloy to be used. This entails approximately three years work.

Talle analises is van ysterhoudende en nie-ysterhoudende materiaal gemaak. Van besondere belang is 'n kontrole-analise van die eerste sirkoniakonsentraat wat in Suid-Afrika namens 'n groot mynsaak uitgevoer is.

Met die oog op die versnelling van roetine-analises is ondersoek ingestel na die toepassing van ioonuitruilingsharse en stowwe wat komplekse vorm by die analisering van nie-ysterhoudende materiaal. 'n Vinnige metode vir die analisering van fosforbronslegerings en 'n vinnige metode vir die bepaling van sink of geelkoper is ook vasgestel.

Dat daar 'n neiging bestaan in lande buite die Unie om van die Buro se dienste gebruik te maak, blyk uit die feit dat die Federal Power Board van die Rhodesiese Federasie die Buro genader het om 'n inspekteur na Noord-Rhodesië te stuur om 'n besending gegalvaniseerde hoekyster te ondersoek.

Onderafdeling Water: Hierdie Onderafdeling is op 1 April 1958 ingestel om die statutêre verpligtings van die Buro vir Standaarde met betrekking tot die Waterwet, No. 54 van 1956 na te kom.

Die werk van die Onderafdeling het o.a. bestaan uit die opstel van 'n nasionale norm vir die gehalte van nywerheidsafvalwater ingevolge artikel 21 (1) van die Waterwet wat binnekort deur die Departement van Waterwese afgekondig word.

By die Departement is verskeie gematigde norme aanbeveel vir opname in permitte waarin aansoek gedoen is om vrystelling van artikel 21(1) en (2) ingevolge artikel 21 (5) van die Waterwet.

Om hierdie norme en ander voorwaardes vir permitte te kan aanbeveel, is verskeie inspeksies vir dié doel uitgevoer en is vergaderings met die applikante en belanghebbende partye gehou.

'n Begin is gemaak met die oprigting van 'n waterlaboratorium vir roetinekontrolering van die afvalwater wat aan die nasionale norm, of aan die gematigde norme kragtens 'n uitgereikte permit moet voldoen.

Onderafdeling Rubber en Plastika: Die werkvermeerdering van 7½ persent in vergelyking met die Onderafdeling se syfers vir verlede jaar was 'n aanduiding van die waarde van die groter toetsgeriewe wat aangebied word.

Daar is baie werk aan spesifikasies gedoen en dit het o.a. behels die uitvoer van toetse om die Afdeling Elektrotegniese Ingenieurswese te help met die hersiening van verskeie spesifikasies vir kables.

Spesifikasies vir P.V.C.-slange, P.V.C.-vloerteëls en materiaal vir herboude bande het goed gevorder. Die werk i.v.m. die hersiening en uitbreiding van die spesifikasie vir beskermende rubberstewels, waarvoor daar drie permithouers is, is voortgesit.

Daar was o.a. 'n versoek om 'n private spesifikasie vir rubberproppe vir entstof vir 'n tender om meer as 'n miljoen van hierdie artikels aan te koop. Daarop

A great number of analyses was made of ferrous and non-ferrous materials. Of particular interest was a check analysis on the first zirconia concentrate produced in South Africa, done on behalf of a big mining house.

Some investigations were made on the application of ion exchange resins and complex forming substances in the analysis of non-ferrous materials with a view to speeding up routine analysis. A rapid method of analysing phosphor bronze alloys and a rapid method for determining zinc or brass was also established.

The approach to the Bureau by the Federal Power Board of the Rhodesian Federation to send an inspector to Northern Rhodesia to inspect a consignment of galvanised angle iron indicated the trend in countries outside the Union to avail themselves of the Bureau's services.

Water Section: This Section was inaugurated on 1st April 1958 in order to fulfil the statutory obligations of the Bureau of Standards in relation to the Water Act, No. 54 of 1956.

The work of the Section included the preparation of a national standard for the quality of industrial effluents in terms of Section 21 (1) of the Water Act shortly to be promulgated by the Department of Water Affairs.

Several relaxed standards were recommended to the Department for inclusion in permits issued to applicants who applied for exemption from Section 21 (1) and (2) in terms of Section 21 (5) of the Water Act.

To be in a position to recommend these standards and other conditions for permits, several *ad hoc* inspections and meetings were held with applicants and interested parties.

A start was made with the establishment of a routine water laboratory to control the effluents which have to comply with the national standard, or with relaxed standards issued under a permit.

Rubber and Plastics Section: The increase of 7½ per cent over last year's figures shown in the work of the Section indicated the value of offering increased testing facilities.

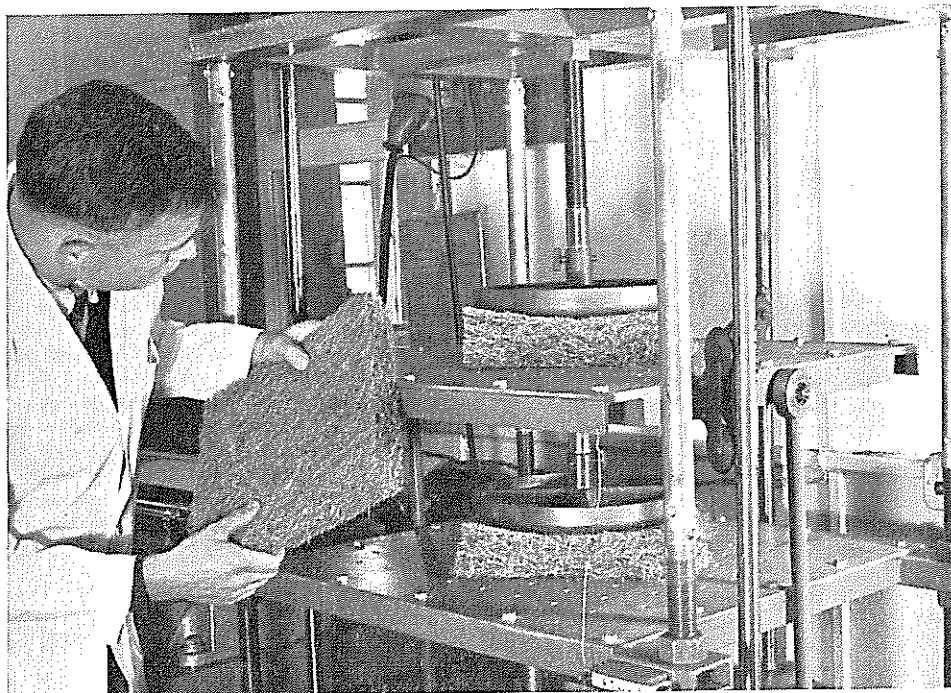
Specification work was heavy and included assistance to the Electrical Engineering Division in the way of tests for the revision of several cable specifications.

Satisfactory progress was made with the specifications for P.V.C. hose, P.V.C. floor tiles and materials for reconditioning tyres. Work continued on the revision and extension of the specification for protective gum boots for which there are three permit holders.

Among the requests for private specifications was one for rubber vaccine stoppers for a purchase on tender

het 'n spesifikasie gevolg vir butielproppe vir ampulle wat deur bevriësing gedroog is. Nog 'n belangrike spesifikasie was dié vir plastiekbekkers vir kafferbier vir gebruik in munisipale biersale, wat opgestel is na goeie samewerking met die onderafdeling van die Nasionale Chemiese Navorsingslaboratorium wat navorsing in verband met kafferbier doen.

of more than a million of these articles. This was followed by a further specification for butyl stoppers for freeze-dried ampoules. Another of importance was for plastic kaffir beer mugs for use in municipal beer halls, which was the result of successful collaboration with that section of the National Chemical Research Laboratory which carries out research into kaffir beer.



Die terugspringvermoë van gerubberiseerde haarmateriaal vir stoffering word in die Onderafdeling Rubber getoets

Rubberized hair material for upholstery is tested for resiliency by the Rubber Section

Samewerking met die Nasionale Navorsingslaboratorium vir Meganiese Ingenieurswese en die Werkwinkels het weer aanleiding gegee tot die ontwerp en installering van 'n groot toestel vir die bepaling van die bars- en bedryfsdruk van rubber- of plastiekslange en -pype. Hoewel die apparaat eintlik bestem is om poliëtileenpype vir kouwaterleidings en riole op grond van die standaardspesifikasie te toets, is hy vir die nywerheid in baie opsigte van diens.

Nog 'n apparaat wat onlangs aangeskaf is, is 'n spuitvormtoestel vir die vervaardiging in fabriekstoestande van 'n reeks toetsmonsters uit plastiekgrondstowwe.

Verder belangrike toetsapparate wat aangekoop is, behels 'n mikrohardheidstoetstoestel, 'n tripsometer om die veerkragtigheid van rubber te bepaal en 'n

Co-operation with the National Mechanical Engineering Research Institute and the Workshops also resulted in the design and installation of a big apparatus for the determination of the bursting and working pressure of rubber or plastic hoses and pipes. Although primarily intended for testing against the standard specification for polyethylene pipes for cold water services and drains, this apparatus also serves private industry in many ways.

A further apparatus recently acquired is an injection moulding apparatus for the manufacture of a range of test specimens from plastic raw materials under factory conditions.

Other important testing apparatus purchased included a micro-hardness tester, a tripsometer for measuring the resilience of rubber and a torsional

wringapparaat om die styfheid van plastiek by temperatuur onder die nulpunt te bepaal.

'n Verskeidenheid rubber- en plastiekartikels is vir staatsliggame en private nywerhede getoets, soos bv. kables met rubber- en plastiekisolering, P.V.C.-houers, bewysboekies, versoolde bande en rubberpakkingringe vir asbessementype.

Onderafdeling Organies-anorganiese Analise: Hierdie Onderafdeling het baie aansoeke om toetse en ontledings van kenmerkende groter verskeidenheid as vroeër afgehandel.

Die groot aantal toetse en ontledings wat op grondstowwe en handelsartikels uitgevoer is, het o.a. die volgende gedek: kruit, dierlike lym, afvalwater, nywerheids- en toiletseep, kalkswawel, sout, kalk, transformatorolie, glasmosaïek, skuurpasta, suurstof vir hoë vlugte, vloer- en stoeppolitoer, vuurpyldryfmiddels, gehidreerde kasterolie, in water oplosbare soute in die grond, landboukalk, vetverwyderingsmiddel, dibutielftalaat, wasmengsels, koperarsenaatmengsels, uitlaagtas van dieselenjins, glasuuremaljeplate en geneeskundige suurstof.

Die Onderafdeling het, benewens die inspeksie en toetsing van besendings sagteseep en toiletseep vir die S.A. Spoorwegadministrasie, die instelling van 'n inspeksieskema waargeneem, waarby al die seep wat onder beheer van die Unietenderraad aan staatsinrigtings gelewer word, deur die Buro getoets word.

Weens die toenemende neiging om in die boubedryf boumosaïek vir versiering te gebruik, is 'n hele paar aansoeke ontvang om toetsing van hierdie handelsartikels volgens die metode deur die Nasionale Bounavorsingsinstituut ontwerp en is toetswerk ook namens fabrikante, leweransiers en bouaannemers onderneem.

Vir die Suid-Afrikaanse Vloot is kruit en dryfmiddels vir vuurpyle vir gebruik by skietoefeninge uitgevoer.

Uitvoerige toetse en ondersoeke na geskikte analitiese metodes is uitgevoer t.o.v. aerosolinsektmiddels en koperoksichloried in verband met die opstel van spesifikasies.

Die spesifikasie vir chroomkoperarsenaat vir houtverduursaming het sy finale stadium bereik. Nadat die spesifikasie vir vloeistowwe vir die merk van skape voltooi was, is 'n aansoek ontvang om die standaardmerk op so 'n vloeistof aan te bring.

Die hersiening en uitbreiding van die spesifikasie vir oplossings van natriumhipochloriet om verdunde oplossings vir huishoudelike gebruik te dek en die hersiening van die soutspeksifikasie wat verskeie tipes huishoudelike en nywerheids-sout dek, het vordering gemaak.

Onderafdeling Fisikochemiese Analise: 'n Nuwe Onderafdeling is binne die onderafdeling analitiese chemie geskep om in ontledings te spesialiseer wat op fisiko-chemiese metodes gebaseer is.

apparatus for determining the stiffness of plastics at sub-zero temperatures.

A variety of rubber and plastic commodities was tested for government bodies and private industries, among them rubber and plastic insulated cables, P.V.C. containers, reference books, retreaded tyres, and rubber jointing rings for asbestos cement pipes.

Organic-Inorganic Analytical Section: This Section dealt with numerous requests for tests and analyses, a marked feature of which was their diversity, which was considerably greater than in former years.

The many tests and analyses conducted on raw materials and commodities covered the following: gunpowder, animal glue, effluents, industrial and toilet soaps, lime sulphur, salt, lime, transformer oil, glass mosaics, scouring paste, oxygen for high flying, floor and stoep polishes, propellents for rockets, hydrogenated castor oil, water soluble salts in soil, agricultural lime, grease remover, dibutyl phthalate, wax blends, copper-arsenate mixtures, diesel engine exhaust gases, vitreous enamelled plates and medical oxygen.

In addition to the consignment inspection and testing of soft and toilet soaps for the South African Railways Administration the Section was responsible for the initiation of an inspection scheme whereby all soaps supplied to State Institutions under the Union Tender Board contract are tested by the Bureau.

Owing to the increased trend for using architectural mosaics for decorative purposes in the building trade, several requests for testing this commodity according to the procedure devised by the National Building Research Institute, were received and undertaken on behalf of the manufacturers, suppliers and building contractors.

The testing of gunpowder and propellents for use in rockets for target practice was carried out for the South African Navy.

Extensive tests and investigations for suitable analytical procedures were conducted on aerosol insecticides and copper-oxychloride in connection with the preparation of specifications.

The specification for chromated-copper-arsenate for timber preservation reached its final stage. On the completion of the specification for sheep marking fluids an application to apply the standardization mark to this fluid was received.

The revision and extension of the specification for sodium hypochlorite solutions to cover diluted solutions for domestic use and the revision of the salts specification covering several types of domestic and industrial salt made progress.

Physico-Chemical Analytical Section: A new Section has been formed within the analytical chemistry section to specialize in analyses based on physico-chemical methods.

Die Onderafdeling kan nou spektrografiese, spektrofotometriese (ook ultraviolet en infrarooi) X-straal-diffraksie, X-straalfluoressensie en polarografiese en gaschromatografiese ontledings uitvoer.

Die Onderafdeling pas geen spesifikasies toe nie, maar is ander afdelings van die Buro behulpsaam deurdat hy analitiese metodes en dienste bied waar hulle vir spesifikasiedoeleindes nodig is.

Die grootste deel van die Onderafdeling se werk het derhalwe bestaan uit die kontroletoetsing van allerlei handelsartikels van permithouers namens ander onderafdelings, omdat hierdie toetse volgens fisiese metodes vinniger en heelwat goedkoper as volgens die gewone chemiese metodes uitgevoer kan word.

In baie gevalle kan die ontledings met heel klein monsters gedoen word en dit beteken dat dié metodes vir ondersoekwerk deur die polisie die allergeeskikste is. Die Suid-Afrikaanse Speurdiens het ten volle hiervan gebruik gemaak.

Toetse deur hierdie Onderafdeling uitgevoer het o.a. bestaan uit die bepaling van die onsuiverhede in lood, loodkabelmantels, verskillende grade drukkermetaal, verskillende grade witmetaal en ander metale en legerings waarvoor die Onderafdeling Metallurgie spesifikasies het. Katoenseildoek en gechlloreerde insektmiddels is ook onder andere getoets. Fabrikante en private individue het ook van hierdie dienste gebruik gemaak.

Vir die bepaling van die kadmiumgehalte van koper in hoeveelhede binne 0.5 tot 1.0 persent, is X-straalfluoressensie met groot sukses toegepas. Weens die gebrek aan geskikte vergelykingstandaarde is die gebruik van hierdie metode vir die vinnige ontleding van roesvrye staal gestrem.

Daar is pogings aangewend om eetbare olies te analiseer deur eers die gliseriede om te sit in die metielesters van die aanwesige veture en hulle dan met behulp van gaschromatografie te bepaal.

Vloeibaar gemaakte petroleumgas is met sukses ontleed. 'n Ontledingsmetode is aan die hand gedoen vir opname in die toepaslike spesifikasie.

DEPARTEMENT SIVIELE EN WERKTUIGKUNDIGE INGENIEURSWESE

In die afgelope jaar was die breër opset van die dienste wat die Departement van Siviele en Werktuigkundige Ingenieurswese aan die nywerheid gelewer het, opvallend. Dit is duidelik te bespeur dat die verbruiker 'n kieskeuriger houding inneem namate die ekonomiese omstandighede skerper mededinging in bemarking gebiedend gemaak het. Hierdie reaksie het hom veral by ingenieurswerk en bouwerke laat geld en die wetenskaplike keuring van goedere deur middel van proewe op grond van erkende norme word al as die normale

The Section is now in a position to carry out spectrographic, spectrophotometric (including ultra-violet and infra-red) X-ray diffraction, X-ray fluorescence, polarographic and gas chromatographic analyses.

The Section administers no specifications but assists other sections of the Bureau by providing analytical methods and services where required for specification purposes.

The bulk of the Section's work therefore consisted of control testing of various permit holders' commodities on behalf of other sections because these tests could be done by physical methods more rapidly and much more cheaply than by the conventional chemical methods.

Analyses can, in many instances, be carried out on extremely small samples, which means that the methods employed are ideally suited to police investigational work. The South African Criminal Bureau made full use of them.

Tests carried out by this Section included the determination of impurities in lead, lead cable sheathing, various grades of printers' metals, various grades of white metals and other metals and alloys for which the Metallurgy Section holds specifications. Other commodities tested included cotton duck and chlorinated insecticides. Manufacturers and private individuals also made use of these services.

X-ray fluorescence techniques were used to determine cadmium in copper in the range 0.5 to 1.0 per cent, with great success. The possibilities of using this method for the rapid analysis of stainless steels have, however, been hampered by the lack of suitable reference standards.

Attempts were made to analyse edible oils by first converting the glycerides to the methyl esters of the fatty acids present and then analysing them on the gas chromatograph.

Liquefied petroleum gas was successfully analysed and a method for analysis suggested for incorporation in the relevant specification.

CIVIL AND MECHANICAL ENGINEERING DEPARTMENT

The past year has accentuated the broadening of the services rendered to industry by the Civil and Mechanical Engineering Department. It is evident that as economic circumstances have dictated keener competition into marketing, a more selective attitude has been adopted by consumers. Engineering and building projects in particular have been affected by this reaction and scientific assessment of goods by testing to recognized standards is becoming accepted as the normal routine in the award of important tenders.

handelwyse beskou wanneer belangrike tenders toegeken moet word.

Nog 'n belangrike feit is dat bestellings vir uitvoer dikwels geplaas word onder voorwaarde dat die Buro die besedings moet ondersoek en goedkeur. Daar is duidelike tekens dat die Unie besig is om sy status as die werkwinkel vir swaar werktuigkundige diens op die vasteland van Afrika te konsolideer.

Hier te lande het staats- en plaaslike owerhede in toenemende mate van die Buro se toetsdiens gebruik gemaak—nie alleen vir laboratoriumtoetse van materiaal nie, maar ook vir die toetsing van standaardstruktuur en vir voltydse inspeksiewerk in die fabriek. Belangstelling het ook toegeneem vir die fasiliteite wat die Verpakkingslaboratoria bied; hulle is enig in hul soort in Afrika en dra 'n belangrike deel by om die verpakkingsnywerheid in Suid-Afrika te ontwikkel en uit te brei.

Afdeling Siviele Ingenieurswese

'n Noemenswaardige aangeleentheid in verband met die jaar se werksaamhede was die diens wat aan die groot plaaslike en die provinsiale owerhede gelewer is, nie alleen deur die Afdeling se ervare toetspersoneel met hul toerusting nie, maar ook deur middel van dokumente wat tegniese komitees opgestel en aan hulle voorgelê het.

'n Reeks toetse is vir die Durbanse Stadsraad uitgevoer in verband met wonings wat as deel van 'n natuurlebehuisingskema opgerig is: onder andere die aanwending van dwarsbelasting op klaargeboude strukture om die uitwerking van winde van stormsterkte en ook reënindringing deur buitemure in nabootsing van swaar buie oor 'n lang tydperk te ondersoek.

Dwarsdeur die jaar is die munisipaliteit van Port Elizabeth bygestaan met inspeksiewerk i.v.m. plaaslik vervaardigde betonpype van voorgespanne beton en toesig oor die vervaardiging en toetsing daarvan. Die pype word gebruik om die watervoorsiening uit die Churchilldam, sowat 80 myl van die stad af, te vergroot. Oorspronklik is die Buro se dienste aangevra t.o.v. die sogenaamde tweede gedeelte van die pyplynprojek, maar in die loop van die jaar is daar besluit om hierdie inspeksie- en toetsdiens vir die derde en later vir die vierde deel van die werk te behou, wat dan die grootste gedeelte van die skema tot voltooiing sal bring. Sesduisend vyfhonderd reguit pype van 23 voet elk is van die kontrakterende fabrikant aangeneem en ook 'n groot aantal spesiale stukke vir verbindings en buigstukke.

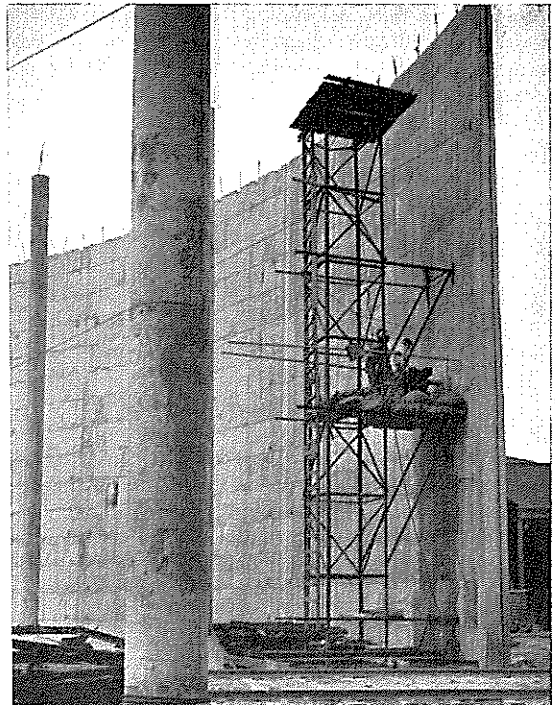
Vir die Pretoriase Stadsraad het die Afdeling die gehalte van die beton in die mure getoets van 'n ronde

Of significance also is the fact that orders for export are frequently being placed subject to consignment inspection and acceptance by the Bureau. Many indications that the Union is firmly establishing its position as the heavy engineering workshop of the continent of Africa are apparent.

At home, increased use of the Bureau's testing services has been made by government and local authorities—not only for laboratory tests on material but also for prototype structural testing and full time inspection at factories. Interest has also grown in the facilities available in the Packaging Laboratories, which are the only ones of their type in Africa and which are contributing a noteworthy share to the growth and development of the packaging industry in South Africa.

Civil Engineering Division

A noteworthy feature of the year's activities was the service rendered to some of the larger local and provincial authorities, not only by use of the Division's experienced testing staff and equipment but also by furnishing documents produced by technical committees.



Algemene gesig op 'n reservoir terwyl kerns uitgeboor word

General view of a reservoir showing core drilling taking place

reservoir van voorgespanne beton, wat $6\frac{2}{3}$ miljoen gelling moet bevat. Hiervoor is kerns van 4 dm. deursnee met 'n diamantboor uitgeboor en getoets. Die kerns aldus verkry, is met die blote oog ondersoek en die breeksterkte vasgestel.

Baie plaaslike owerhede het kalkmonsters en sandmonsters vir laboratoriumtoetse ingestuur en hulle het in toenemende mate hulle belangstelling in die Modelbouregulasies getoon. Uit navrae ontvang van die Durbanse Munisipaliteit, die Natalse Munisipale Vereniging, die Kaapse Provinsiale Administrasie en andere het geblyk dat die inhoud van die verskillende hoofstukke van die Modelbouregulasies voorgestelde wysigings van die plaaslike ordonnansies beïnvloed. Soortgelyke navrae is ook van verskeie Rhodesiese munisipaliteite en van die Standards Institution of Rhodesia and Nyasaland ontvang.

Die Departement van Publieke Werke in Nairobi het 'n bestelling geplaas by 'n Suid-Afrikaanse fabrikant vir 'n besending van meer as 22,000 erdepype met sout geglasmuur. Volgens die opdrag moes die pype aan die vereistes van 'n oerseese standaardspesifikasie voldoen en die Buro se dienste is aangevra om die inspeksie- en toetswerk te doen voordat die pype versend is.

Benewens roetinetootswerk t.o.v. materiaal, wat dwarsdeur die jaar uitgevoer is, het die aantal ondersoeke na die eienskappe van hol betonboublokke na die publikasie van die standaardspesifikasie vir hierdie eenhede gestyg. Verder is monsters vir handelsfirmas ontvang en toetse uitgevoer op muurpaneel wat namens 'n staatsdepartement in die buiteland opgestel is.

Omvattende Modelbouregulasies: Veertien gedeeltes van die Modelbouregulasies, wat in sy geheel uit negentien hoofstukke en dele sal bestaan, is nou reeds gepubliseer. In die jaar is die hoofstukke oor verligting, ventilasie, Administrasie vir Natal en die hoofstuk oor gewapende en ongewapende beton voltooi. Die enigstes wat oorbly is dié wat die vereistes vir die Administrasie van die Oranje-Vrystaat, beskerming teen brand, openbare veiligheid en messelwerk behandel. Laasgenoemde is reeds in die finale stadium van regskundige hersiening.

Wanneer al die hoofstukke klaar is, sal 'n hoofstuk oor definisies opgestel word.

A series of tests was carried out for the Durban City Council on dwellings erected as part of a native housing scheme. These included the application of lateral loads on completed structures to examine the effect of winds of gale force as well as rain penetration on external walls to stimulate heavy downpours over a long period.

The full-time assistance to the Municipality of Port Elizabeth in the form of inspecting and supervising the manufacture and testing of locally made prestressed concrete pipes continued throughout the year. These pipes are required for the augmentation of the water supply from the Churchill Dam, some eighty miles from the city. Originally, the Bureau's services were obtained for what was known as Stage 2 of the pipe-line project, but during the year it was agreed to retain this inspection and testing service for Stage 3 and later for Stage 4 which will complete the main portion of the scheme. Six thousand five hundred straight pipe lengths of 23 feet each were accepted from the manufacturing contractor, together with a large number of specials for junctions and bends.

For the Pretoria City Council the quality of the concrete in the walls of a $6\frac{2}{3}$ million gallon circular prestressed concrete reservoir was investigated by diamond drilling and the testing of 4-inch diameter cores. The cores obtained were visually examined and their crushing strength ascertained.

Many local authorities submitted samples of lime and sand for laboratory tests and showed an increasing interest in the Model Building Regulations. It is evident from approaches made by the Durban Municipality, the Natal Municipal Association, the Cape Provincial Administration, and others, that proposed amendments to local by-laws are being influenced by the contents of the various chapters of the Model Building Regulations. Enquiries of a similar nature have also been received from several Rhodesian municipalities and the Standards Institution of Rhodesia and Nyasaland.

The Public Works Department in Nairobi placed an order on a South African manufacturer for a consignment of over 22,000 salt-glazed earthenware pipes. The pipes were specified in accordance with the requirements of an overseas standard specification and the Bureau's services were engaged for the inspection and testing of this order before despatch could be effected.

In addition to the routine testing of materials which continued throughout the year, the number of investigations into the properties of hollow concrete building blocks increased after the publication of the standard specification for these units. Samples were also received from commercial firms, and tests carried out on wall panels erected in the open on behalf of a government department.

Comprehensive Model Building Regulations: Fourteen sections of the model building regulations, the complete set of which will consist of nineteen chapters and parts,

Daar is 'n bestendige vraag na hierdie publikasies en aangesien hulle tans uit regs-kundige oogpunt nagegaan en die nodige wysigings aangebring word, word die algehele aanvaarding daarvan deur plaaslike besture vergemaklik. Hoewel die groot stede miskien verkies om slegs gedeeltes van die Modelboureulasies te gebruik om hulle eie verordenings te moderniseer of andersins te verbeter, is die kleiner dorpe geneig om hulle onveranderd in die geheel oor te neem.

Spesifikasies vir Boumateriaal en Gebruikskodes: Die spesifikasies wat gepubliseer is, behels o.a. dié vir hol boublokke van klei en vir betonboublokke. Eersgenoemde boueenhede word opgeneem in sowel betonvloerkonstruksies as in skeidsmure, terwyl laasgenoemde as plaasvervanger dien vir die gewone kleibakstene, in die reël waar dié stene te duur is of plaaslik nie vervaardig kan word nie omdat daar geen geskikte grondstowwe verkry kan word nie.

'n Nuttige kode wat gedurende die jaar opgestel is, behandel die bevestiging van betondakpanne.

Spesifikasies wat klaar en in die pers is, is o.a. dié vir asbessementplate, betondrukpepe, betonpepe vir gebruik sonder druk en vir portlandsement. Gebruikskodes wat reeds in 'n gevorderde stadium is, is dié wat die waterdigmaking van geboue en voorwerk vir geboue behandel.

Standaardspesifikasies wat nog opgestel word, dek 'n verskeidenheid boumateriaal soos asbessement, riool- en vuilwaterpepe, kleidakpanne, hol kroonlyste van gips, toeslae vir beton en vir paaie, gladde paneeldeure, skoolmeublement en houtlere.

Die hersiening van die spesifikasie vir metaalmuur-ankers en die opstel van nuwe spesifikasies vir portlandhoogoondsement en vir gemaalde hoogoondsfakke is goedgekeur. Daar is ook 'n begin gemaak met 'n gebruikskode in verband met die konstruksie van hout-raamwerk, 'n onderwerp wat toenemende belangstelling van die kant van die boubedryf gaande gemaak het.

Laboratorium vir Materiaaltoetsing: Die jaar se werk is gekenmerk deur 'n verskeidenheid toetse wat uitgevoer is en die verspreide gebiede waaruit versoeke gekom het. Daar is dikwels monsters getoets wat uit Angola, Oeganda, Njassaland en die Rhodesië ontvang is, terwyl opdraggewers in die Unie toetse aangevra het vir materiaalmonsters soos stene, dakpanne, beton, gietersand, pepe, toeslae, hol blokke, boubord en vloermateriaal. Toetse van buitengewone aard was o.a. die bepaling van die eienskappe van uitdydakboute

have now been published. During the year the chapters on lighting, ventilation, Administration for Natal and the chapter on plain and reinforced concrete were completed. The only remaining chapters are those dealing with the Orange Free State Administration requirements, fire protection, public safety and masonry, the latter having reached the final stages of legal review. A chapter on definitions will be produced when the above are all completed.

A sustained demand for these publications has been shown and as they are now submitted to legal scrutiny with such amendments as may be necessary their complete adoption by local authorities is facilitated. Although the major cities may elect to use only portions of the building regulations as a means of modernising or otherwise improving their own by-laws, the smaller towns are tending towards their adoption *in toto*.

Building Material Specifications and Codes of Practice: Among the specifications published were those for hollow clay building blocks and for concrete building blocks. The former building units are incorporated in concrete floor constructions as well as in partition walls, while the latter provide a substitute for the conventional use of burnt clay bricks, generally where these are of prohibitive cost or impossible to produce locally on account of the unsuitability of available raw materials.

A useful code published during the year was that for the fixing of concrete roofing tiles.

Completed specifications in the process of being printed include those for asbestos cement sheets, concrete pipes for pressure and non-pressure respectively and Portland cement. Codes of practice which have reached an advanced stage are those dealing with waterproofing to buildings and facings to buildings.

Standard specifications still under preparation cover a variety of building materials such as asbestos-cement, soil and waste pipes, clay roofing tiles, gypsum cove cornices, aggregates for concrete and for roads, flush panel doors, school furniture and wooden ladders.

Approval was given for the revision of the specification for metal wall ties, and for the preparation of new specifications for Portland blastfurnace cement and for milled blastfurnace slag. The preparation of a code of practice relating to timber frame construction, a subject in which building circles have shown great interest, has also commenced.

Materials Testing Laboratory: Significant features of the year's work were the variety of tests performed and the widely flung areas from which requests originated. Lime and cement samples received from Angola, Uganda, Nyasaland and the Rhodesias were frequently tested while sponsors within the Union required tests on samples of materials including bricks, roof tiles, concrete, foundry sand, pipes, aggregates, hollow blocks, building boards and flooring materials. Tests of an unusual nature included the determination of the

vir myne en asbesveselpakkingmateriaal. Soos reeds vermeld, is uitgeboorde betonkernmonsters vir 'n plaaslike bestuur getoets en soortgelyke werk is vir handelsfirmas uitgevoer.

Behalwe die reeds genoemde monsterneming van beton vir 'n plaaslike bestuur deur die uitboor van kerns uit bestaande bouwerke is soortgelyke toetse ook vir handelsfirmas uitgevoer.

Die inspeksie en toetsing van besendings dakplate van asbesement vir die Bantoe-herbevestigingsraad vir gebruik in Meadowlands is voortgesit. Meer as 125,000 plate van verskillende lengtes is ondersoek.

Routine-inspeksies in die fabriek van al die fabrikante wat permitte het om die Buro se merk te gebruik, is uitgevoer en monsters van hulle produkte is getoets. Verskeie firmas het aansoek gedoen om die Buro se goedkeuringsmerk op allerlei bouprodukte te gebruik.

Onder nuwe apparate wat afgelewer is, was daar 'n 40-ton-masjien vir die toetsing van druk- en buigvasheid en 'n gasapparaat vir die uitvoer van standaardvlamverspreidings-toetse t.o.v. boumateriaal. Om stabiele werktoustande te handhaaf, is die sement- en kalklaboratorium van lugversorging voorsien.

Boukundige Onderafdeling: Die hervatting van die werk in verband met die standaardisering van meubels, deure en plaasmelkerygeboue is moontlik gemaak deur die skepping van hierdie Onderafdeling onder leiding van 'n argitek. Daarbenewens het die Onderafdeling die verantwoordelikheid oorgeneem vir die ondersoek en toets van meubels ter waarde van byna £100,000 deur provinsiale en ander administrasies bestel.

Die werk in hierdie Onderafdeling behartig deur die inspeksiepersoneel, wat gekies is om hulle onontbeerlike praktiese kennis van die prosesse van meubelmakery, sal klaarblyklik heelwat uitbrei.

Nuwe Geboue: Die Afdeling Siviele Ingenieurswese was behulpsaam met die versameling en koördinerings van gegewens vir die firma argitek aan wie die ontwerp opgedra is van die nuwe geboue wat op die Scientia-terrein vir die Buro opgerig gaan word.

Afdeling Werktuigkundige Ingenieurswese

Die fasiliteite en dienste wat die Afdeling Werktuigkundige Ingenieurswese bied, word in al hoe wyer kringe bekend en op prys gestel, nie alleen deur fabrikante en verbruikers in die Unie nie, maar ook deur organisasies ver buite die Unie se grense; inspeksies is bv. uitgevoer op versoek van die Britse Kroonagente wat namens die regerings van Ghana, Ciprus en Nigerië optree.

Die Cipruskontrak by 'n firma in Kaapstad geplaas, het sowat 25 myl staalpype vereis van 16½ tot 18 dm. deursnee, met 'n bitumenvoering en 'n omhulsel van bitumenasbessamestelling met 'n veselglasbedekking versterk. Die pype is nodig vir 'n waternetwerkstelsel te Nikosië. Die staal vir die pype is uit Duitsland

properties of mine roofing bolts with expanding shells and of asbestos-fibre jointing material.

In addition to the sampling of concrete for a local authority by drilling cores from existing structures already mentioned, similar tests were carried out for commercial firms.

Continued inspection and testing was conducted on consignments of asbestos-cement roofing sheets required by the Native Resettlement Board for use at Meadowlands. Over 125,000 sheets of various lengths were inspected.

Routine inspections at the factories of all the manufacturers who hold permits to apply the Bureau's mark were carried out and samples of their products tested. Requests were received from several firms applying for permission to use the Bureau's mark of approval on a variety of building products.

Among the items of new apparatus delivered was a 40-ton compression and transverse strength testing machine and gas-fired equipment for carrying out standard spread-of-flame tests on building materials. Air-conditioning was installed in the cement and lime laboratory in order to maintain stable working conditions.

Architectural Section: The creation of this Section staffed by an architect has enabled work to be recommended on standards for furniture, doors and farm dairy buildings. In addition it has taken over the responsibility for the inspection and testing of furniture ordered by provincial and other administrations, the total value of articles in the consignments ordered being almost £100,000.

It is apparent that the work handled by the inspecting staff of this Section, which was selected for practical knowledge of the furniture manufacturing processes required for such work, will develop considerably.

New Buildings: The Civil Engineering Division has assisted in the collection and assembly of data required by the architectural firm responsible for the design of the new buildings to be erected for the Bureau on the Scientia site.

Mechanical Engineering Division

The facilities and services provided by the Mechanical Engineering Division are becoming more widely known and appreciated, not only by manufacturers and consumers in the Union, but also by organizations far beyond the Union's borders, for example inspections were carried out at the request of the British Crown Agents acting on behalf of the governments of Cyprus, Ghana and Nigeria.

The Cyprus contract, placed with a firm in Cape Town, was for some 25 miles of 16½ and 18 in. diameter steel piping, lined with bitumen and sheathed with a bitumen-asbestos compound reinforced with a fibre glass wrapping. The pipes are required for a water

ingevoer, deur Buro-inspekteurs gekeur, in die laboratorium van die Afdeling Werktuigkundige Ingenieurswese getoets en vir gebruik vrygestel nadat daar vasgestel is dat dit aan die betrokke vereistes voldoen. Voltydse inspekteurs is by die fabriek gestasioneer om al die produksie-aspekte te kontroleer en seker te maak dat elke pyp aan die vereistes van die spesifikasie voldoen. Hierdie kontrak is gedurende 1958 voltooi.

'n Kontrak vir verkeerstekens vir gebruik in Ghana is by 'n Johannesburgse firma geplaas. Die tekens was van allerlei aard, vir spooroorange, snelheidsgrense en voetgangersoorange. Hulle is van 'n hoëgraadse aluminiumlegering van voorgeskrewe kleur gemaak. Die ligweerkaatsingsoppervlak van die teken self is op die emaljebedekking met hitte ingebrand om hom heeltemal waterdig te maak. Al die tekens is voor verskeping na Ghana ondersoek en gemerk.

Voorafvervaardigde watertanks van persstaal met 'n inhoudsmaat van 'n miljoen gelling elk, word deur 'n firma in Germiston op bestelling van die regering van Nigerië gemaak. Hierdie kontrak is ook toegewys onder voorwaarde dat die Buro die inspeksie- en toetswerk waarneem.

Dat die werk tevredenheid gegee het, blyk uit die feit dat die Kroonagente al hoe meer gebruik maak van die Buro se dienste.

Die Afdeling dra trouens heelwat by om Suid-Afrika se goeie naam by oorsese klandisie op te bou.

Laboratorium vir Werktuigkundige Ingenieurswese: Staatsdepartemente, provinsiale administrasies en private ondernemings het baie gebruik gemaak van die toetsfasiliteite wat die laboratorium bied. Die werk het gewissel van vergelykende toetse i.v.m. metale vir laers tot prestasietoetse t.o.v. 'n broeikas vir te vroeg gebore of swak babas.

Werk vir die S.A. Spoorwegadministrasie het 'n al hoe groter deel van die werksaamhede uitgemaak. Hieronder was bv. die kalibrering van die rymeters wat gebruik word om die aantal stampe of stote te registreer wat 'n goederetrek en sy vrag ondervind. Vergelykende toetse is uitgevoer van verskillende soorte bekledingstowwe vir spoorwasitplekke. 'n Apparaat is gebou wat om die beurt 'n beswaarde voorwerp (wat die menslike liggaam moes voorstel) op die toetsitplekke wat ingestuur is, laat val en weer oplig. Hierdie beweeglike gewigte moes 'n afstand van baie duisende myle, wat 'n uiters stamperige reis nageboots het, meemaak en die toets het duidelik bewys watter materiaal die duursaamste, en watter stofferingsmetode die beste is.

Vergelykende prestasietoetse vir staalvle en metaal-saaglemme is op versoek van 'n groot myngroep uitgevoer om hulle met die toekenning van tenders behulpzaam te wees.

reticulation scheme at Nicosia. Steel for the pipes was imported from Germany, sampled by the Bureau's inspectors, tested in the Mechanical Engineering Laboratory, and after compliance with the relevant requirements had been established, released for use. Full-time inspectors were stationed at the factory to inspect all phases of production and to ensure that every pipe complied with the specification. This contract was completed during 1958.

A contract for traffic signs for use in Ghana was placed with a Johannesburg firm. The signs included all types, for level crossings, speed limits and pedestrian crossings. They were made from a high grade aluminium alloy of a specified colour. The light reflecting surface comprising the sign, was heat-pressed on to the enamel coating thus ensuring that it was completely water-proof. All signs were inspected and marked before shipment to Ghana.

Pre-fabricated pressed steel water tanks of one million gallon capacity are being made by a firm in Germiston to the order of the government of Nigeria. This contract was also placed subject to inspection and testing by the Bureau.

Satisfaction with the work appears evident from the fact that the Crown Agents are making increasing use of the Bureau's services.

The Division is, in fact, contributing substantially to the building up of South Africa's good name with overseas customers.

Mechanical Engineering Laboratory: The testing facilities provided by the Laboratory were extensively used by government departments, provincial administration and private industries. Work done ranged from comparative tests on bearing metals to performance tests on an incubator for premature or delicate babies.

An increased proportion of the work was on behalf of the South African Railways Administration. This included the calibration of ride meters used to record the number of severe jolts or impacts suffered by a goods truck and its consignment. Comparative tests were carried out on different types of upholstery for railway coach seats. An apparatus was built that alternately raised and dropped weighted objects (representing the human body) on to the test seats supplied. These lively performing weights must have covered the equivalent of many thousands of miles of extremely rough travelling, and the tests clearly indicated which was the most economical and durable material and the best method of upholstery.

Comparative performance tests on steel files and hacksaw blades were conducted at the request of a large mining group in order to assist in the allocation of tenders.

Kontroletoeuse i.v.m. die merkskema t.o.v. sweis-elektrodes, staalpipe, toebehore van smeebare gietyster, waterkrane en suieringe is uitgevoer.

Metrologie: Meer aansoeke as in die vorige jaar om toets- en kalibreerwerk is ontvang. Die groot verskeidenheid artikels wat vir toets ingestuur word, bewys dat verbruikers en nyweraars al hoe meer bewus word van die dienste wat die Buro bied. Die handelsartikels wat getoets is, bestaan o.a. uit enjinkleppe, hortjiewensters, metaalkolfplate, skaapskêrlemme, onderhuisde spuiter, liasseerkabinette en drankdopmate.

Reguit en skroeftandwiele is getoets, en interessantheidshalwe kan gemeld word dat, by gebrek aan toets-toerusting vir tandratte, die meeste van die toets tog met behulp van die universeelmeetapparaat gedoen kon word.

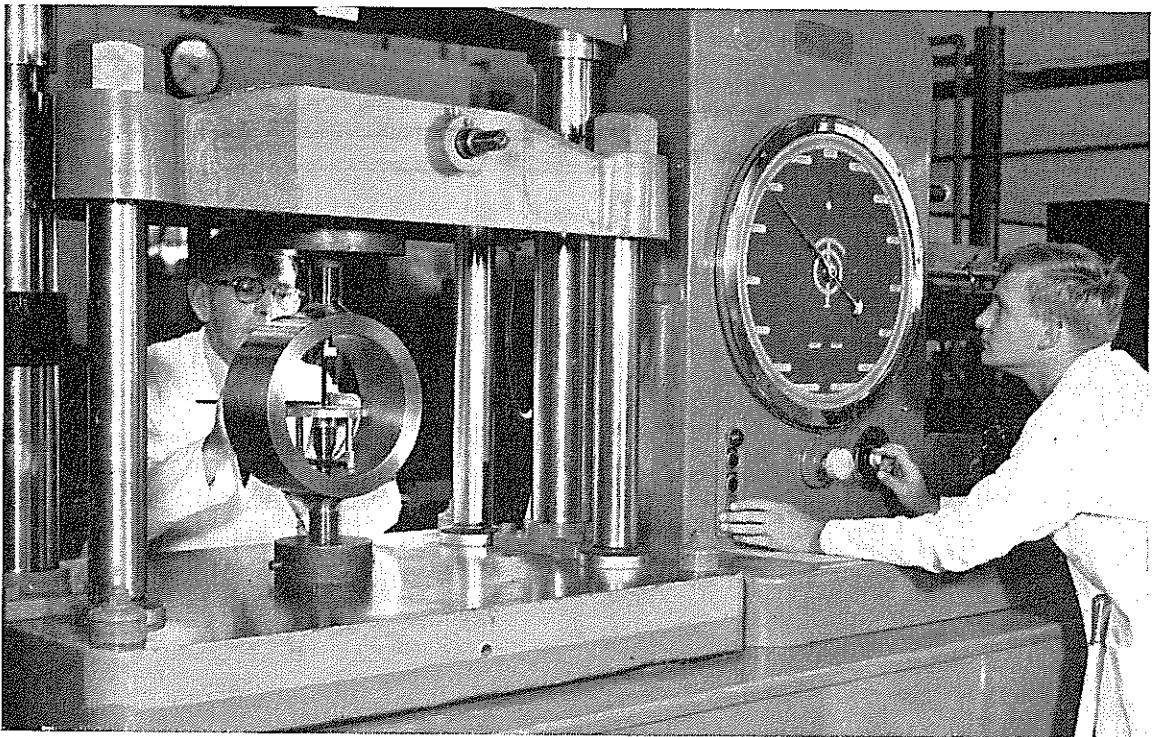
Sifdraad en 'n glasbuis het ook interessante toets opgelewer. Normaalweg is sifdraad 'n moeilike ding om te toets, maar die gebruik van 'n projektor het die metode makliker gemaak. Die boring van 'n glasbuis is op halfduimafstande gemeet. Sy binne-maat was ongeveer $\frac{1}{32}$ dm. en die straalbreking van

Tests for control purposes under the mark scheme were carried out on welding electrodes, steel conduit, malleable cast iron fittings, water taps and piston rings.

Metrology: The number of requests received for tests and calibrations showed an increase over the previous year. It is evident from the great variety of articles submitted for test that consumers and industrialists are becoming better aware of the services offered by the Bureau. Commodities tested included engine valves, louver windows, metal heel plates, sheep-shearing blades, hypodermic syringes, filing cabinets and liquor tot measures.

Tests were also conducted on spur and helical gears and it is of interest to note that although no gear testing equipment was available, most of the tests could be done on the universal measuring machine.

Other interesting tests done were on screening wire and a glass tube. Screening wire is normally a difficult item to test but the method was simplified by using a projector. The bore of a glass tube was measured at intervals of half an inch. The bore was approximately $\frac{1}{32}$ inch in diameter and difficulty was experienced



'n Standaardproefring word in die Laboratorium vir Meganiese Ingenieurswese gebruik om 'n universele toetsmasjien te verifieer

A standard proving ring being used to verify a universal testing machine in the Mechanical Engineering Laboratory

die buis se kromming het moeilikheid gegee. 'n Metode is in die laboratorium uitgewerk om die moeilikheid te bowe te kom.

Inspeksiewerk is gereeld volgehou. Van die artikels wat ondersoek is, het hospitaalmeubels 'n taamlike groot deel uitgemaak. Die konkurrensie op die gebied van fabrieksgoedere, veral hospitaaltoerusting, het 'n toenemende vraag na keuringsdienste geskep.

Toetsenjins: In die afgelope jaar is die brandstofnavorsingsenjin op uitgebreide skaal gebruik en sowat 66 oktaangetalle en 21 setaangetalle is bepaal.

Toetse is uitgevoer op vyf verskillende mengsels dieselandstof met behulp van 'n industriële dieselenjin. Die toetse is 80 uur lank onder konstante belasting en teen konstante snelheid vir elke brandstof volgehou. 'n Nuwe stel inspuitstukke is vir elke toets gebruik en mikroskopies vir gonneerslag ondersoek.

Met behulp van die Lauson-enjins met enkelcilinder en waaierbelasting is laerkorrosietoetse elk 60 uur lank uitgevoer.

'n Plan is voltooi om die moontlikheid vas te stel om die toetsenjins vir toetse op swaardienssmeerolie op die hoogte van Pretoria (4,370 vt.) in plaas van die algemeen gebruiklike seespieëlhoogte te laat loop. Vir hierdie doel is die olienavorsingsenjin van die twee-en-'n-half-ton Caterpillar met al sy bybehore, waaronder ook 'n dinamometer van anderhalf ton, na Durban toe oorgeneem en is toetse op swaardienssmeerolie uitgevoer. Die werklike tyd wat die toetse in Durban in beslag geneem het, was twaalfhonderd uur.

Die Buro het deelgeneem in 'n wêreldwye korrelasieskema en die laaste proefneming in Durban het, in vergelyking met dié wat in oorsese laboratoria uitgevoer is, baie gunstige resultate opgelewer. Toetse om hierdie resultate te herhaal, nadat die enjin na Pretoria teruggebring is, het duidelik bewys dat die hoogte wel 'n uitwerking op die resultate gehad het. Daarom is reëlings getref om 'n kamer met drukreëling in Pretoria te bou, waarin toestande by seespieël nageboots kan word.

Sowel vir die Suid-Afrikaanse nywerheid as vir vervoerorganisasies is dit van die grootste belang om hierdie toetse uit te voer volgens die gevestigde gebruik wat in die buiteland aanvaar word, omdat dit die enigste algemeen erkende metode is om te bepaal of swaardienssmeerolie, waarna die vraag gestadig toeneem, wel aan die vereistes van die toepaslike spesifikasies voldoen.

Spesifikasies: Komiteewerk het baie tyd in beslag geneem en daar is goeie vordering gemaak. Die finale stadium is reeds bereik met die spesifikasies vir steriliseerders vir chirurgiese instrumente, beskermende helms en deefvloei-oliefilters, sowel as met die hersiening van spesifikasies vir opwasbakke van vlekvrystaal en vir bedkassies. Die komiteewerk in verband met die hersiening van die gebruikskode vir die toets van waterboorgate is ook afgehandel. Die spesifikasie vir die

owing to the refraction of the curvature of the tube. A method of overcoming this difficulty was devised in the laboratory,

Inspections were maintained at a high level. Hospital furniture provided a fairly large percentage of the items inspected. Competition in the manufacturing field, particularly of hospital equipment has resulted in an increased demand for inspection and test services.

Test Engines: During the past year the fuel research engine was extensively used and some 66 octane ratings and 21 cetane ratings were done.

Tests on five different blends of diesel fuel were carried out, using an industrial diesel engine. The tests were run continuously for 80 hours at constant load and speed for each of the fuels. A new set of injection nozzles was used for each test and they were examined microscopically for gum deposits.

Bearing corrosion tests each of 60 hours duration were carried out using the fan loaded single cylinder Lauson engines.

A programme of assessing the feasibility of running the heavy duty lubricating oil test engines at the Pretoria altitude (4,370 ft.) instead of at the universally adopted sea level altitude, was completed. For this purpose the two and a half ton Caterpillar oil research engine together with all its accessories, including a one and a half ton dynamometer, was transported to Durban and tests on heavy duty lubricating oil were done. Actual testing time at Durban amounted to twelve hundred hours.

The Bureau participated in a world-wide correlation scheme and the last test at Durban showed very favourable results compared with those obtained in overseas laboratories. Tests made to reproduce these results when the engine was returned to Pretoria indicated clearly that the altitude had a determining effect on the results. Consequently, arrangements have been made for the construction of a pressurized test chamber in Pretoria in which sea level conditions can be reproduced.

It is of the utmost importance to South African industry as well as transport organizations that these tests should be run in accordance with established and accepted overseas practice as they are the only universally recognized methods of determining whether heavy duty lubricating oils, for which the demand is steadily increasing, comply with the relevant specifications.

Specifications: A great deal of time was devoted to committee work and considerable progress was made. There was a significant tendency shown by manufacturers to insist on the need for strict quality requirements in specifications. Specifications for surgical sterilizers, protective helmets and partial flow oil filters, as well as the revisions of stainless steel sinks and bedside lockers, reached their final stages. The committee work on the revision of the code of practice

bepaling van trekkerperdekrag het sy finale stadium bereik. Hierdie spesifikasie skryf geen minimum vereistes voor nie, maar voorsien in 'n algemene grondslag vir die vasstelling en vergelyking van die kragliewering van verskeie trekkers in beheerde en reproduceerbare toestande.

'n Begin is gemaak met die spesifikasie vir elektries gesmeltsweste pype van sagtestaal. Hierdie dokument dek die afmetings- en gehaltevereistes vir staalpype van 7 tot 72 dm. deursnee, benewens die vereistes vir die voering en bedekking van pype.

Wysigings is aangebring in bestaande spesifikasies vir hospitaalbeddens, waterkrane en staalgeleipype met skroefdraad en daar is 'n begin gemaak met die herieningswerk aan die spesifikasie vir deurslotte.

Agtien private spesifikasies vir verskillende kombuis-artikels is vir die Unieraad vir Tenders opgestel, o.a. vir tee- en koffiepote, braaipanne, eierkelkies, groentekottels, broodblikke en ketels.

Die spesifikasies vir hospitaaltoerusting het gevorder en daar is ywerig getrag om die bestaande aantal soorte te verminder en so min moontlik tipes te standaardiseer. In verskeie gevalle is daar besluit om die prototipes van die artikel eers in gebruik te neem voordat die dokumente finaal afgehandel word. Die proeftyd waarin die waarde van die prototipes vasgestel is, het sy nut gehad.

Onderafdeling Verpakking: Toetswerk gedurende die jaar het 'n groot verskeidenheid houers en verpakkings gedek. Die Laboratorium het heelwat van sy tyd bestee aan die toets van monsters uit besodnings meerwaardige papiersakke vir bemestingstowwe. Papiersakke vir ander handelsartikels soos sement, kalk, suiker en insektemiddels is ook getoets. Daar is proewe uitgevoer om te bepaal of papiersakke wat gemaak is van plaaslik vervaardigde sakkraft, gunstig vergelyk met dié wat van ingevoerde materiaal gemaak is. Die projek is nog aan die gang.

Riffelbord en dose van verskillende patrone en basisgewig is ondersoek om die eienskappe van die bord te bepaal of die geskiktheid van die doos te bereken. Onder andere was daar dose vir plofstowwe, botter, ingemaakte voedsel en bottels. 'n Verpakking is ontwerp wat bestaan uit 'n binnesak van poliëtileen en 'n buitesak van going. Hy is getoets en uiteindelik deur die Kuswagdiens van die V.S.A. aangeneem vir die uitvoer van fynverdeelde mineraalerts wat effens radio-aktief is.

Vir die Oliesaadbeheerraad is die prestasie van agt verskillende tipes jutesakke vir die vervoer van grondboontjies getoets terwyl verskeie soorte sakkies vir die versending van aartappels vir die Aartappelraad vergelyk is. Die sterkte van enkeldraadsisalgaring en dubbel-draadjutegaring is vergelyk met die oog op die toewerk van jutesakke vol mielies.

for testing water boreholes was also completed. The specification for the determination of tractor horse-power reached its final stage. This specification does not lay down minimum requirements but provides a common basis for assessing and comparing the power output of various tractors under controlled and reproduceable conditions.

Work started on the specification for electric fusion-welded mild steel pipes. This document covers the dimensional and quality requirements for steel pipes with diameters of 7 to 72 inches, as well as the requirements for lining and coating pipes.

Existing specifications for hospital beds, water taps and screwed steel conduit were amended and work started on the revision of the specification for doorlocks.

Eighteen private specifications for various items of kitchenware were drawn up for the Union Tender Board, the items including tea and coffee pots, frying pans, egg cups, vegetable dishes, bread bins and kettles.

Progress was made with specifications for hospital equipment, a keen desire being shown to reduce the existing number of varieties and to standardize on as few types as possible. In several cases it was decided that prototypes of the article should be put into service before the documents were finalized. The trial period during which the prototypes were assessed has proved its value.

Packaging Section: Testing undertaken during the year covered a wide range of containers and packages. A large proportion of the Laboratory's time was spent on testing specimens drawn from consignments of multiwall paper sacks for fertilizers. Tests were also undertaken on paper sacks used for other commodities such as cement, lime, sugar, and insecticides. Work was done to determine whether paper sacks made from the locally produced sack kraft compared favourably with those made from imported materials. This project is still under way.

Various styles and basis weights of corrugated board and boxes were examined for determination of the properties of the board or estimation of the suitability of the box. Boxes for explosives, butter, canned foods and bottles were included in this category. A package consisting of an inner polyethylene sack and an outer hessian bag was designed, tested and finally accepted by the U.S. Coast Guard Service for the export of a finely divided mineral ore which was slightly radioactive.

The performance of eight different types of jute bag for the conveyance of ground-nuts was tested for the Oil Seed Control Board while various types of pockets for the consignment of potatoes were compared for the Potato Board. The strength of sisal thread of single strand and jute thread of double strand were compared for the sewing up of jute bags containing mealies.

The thermal insulating properties of three packs designed for the transportation of frozen semen were

Die hitteisoleringseienskappe van drie soorte verpakings vir die vervoer van bevrore semen, is vergelyk vir tydperke van tot 72 uur namens die K.I.-Afdeling van die Onderstepoortse Veeartsenynavorsingslaboratorium.

Toetse is onderneem om te bepaal of die grootte en koste van die houtkissies vir die vervoer van bruiswaterbottels verminder kan word sonder om die voorkoms van die bottels deur skuring te skaad. Hiervoor is padvervoerproefnemings met behulp van geskikte skokregistreerinstrumente uitgevoer en deur laboratoriumtoetse opgevolg.

Verskillende grade ontlaaide vermikuliet is t.o.v. hul buffereienskappe en vloeistofabsorpsie getoets. Proefnemings is ook gedoen om die uitwerking van beskermende kokers van maasplastiek vir glasbottels as buffers vas te stel.

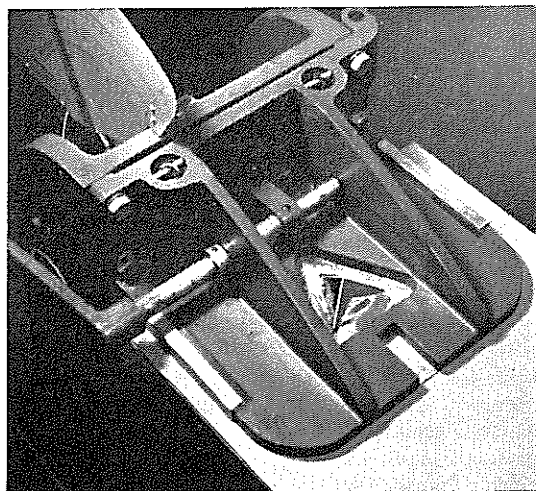
Roetinetoetse is onderneem in verband met sakkraft met bitumen en met poliëtileen gelamelleer, toedraaipapier vir sitrusvrugte, papier vir piesangkratte, pap vir die vasplak van etikette op houtkissies vir vrugte, gegalvaniseerde vuilgoedblikke, poliëtileenbottels, vir elektroliet, metaaldromme van 4 gelling inhoudsmaat, houers vir vloeibare petroleumgas, en suurstofsilinders.

Monsters uit produksielotte riffelborddose vir plofstowwe wat kragtens die merkskema vervaardig word, is getoets. In die jaar is gesweiste gassilinders vir die eerste keer in die Unie gemaak en hierdie silinders vir vloeibare gas word kragtens die Buro se merkskema vervaardig.

'n Grootse proefneming is op tou gesit om inligting in te win vir die spesifikasie vir houtplankies vir kassies vir sagtevrugte. Plankies van verskillende houtsoorte van verskillende diktes en breedtes wat volgens verskillende metodes gemaak is, is gebruik om kassies aanmekaar te sit, teneinde vergelykende prestasietoetse in die laboratorium uit te voer. Proefnemings

is vergelyk vir periodes tot 72 uur op behalf van die A.I.D. afdeling van die Onderstepoortse Veterinêre Reserch Laboratorium.

Toetse is onderneem om te bepaal of die grootte en koste van die houtkassies vir die vervoer van bruiswaterbottels verminder kan word sonder om die voorkoms van die bottels deur skuring te skaad. Hiervoor is padvervoerproefnemings met behulp van geskikte skokregistreerinstrumente uitgevoer en deur laboratoriumtoetse opgevolg.



Die deurslagtoets. Die deurslagkop op die oomblik wanneer dit die riffelbord deurdring.

The puncture resistance test. The puncture head is shown at the moment of penetration through the corrugated board.

Various grades of exfoliated vermiculate were tested for their cushioning and absorption of liquid properties. The cushioning effect of protective plastic mesh sleeves for glass bottles was also investigated.

Routine tests were undertaken on bitumen laminated and polyethylene laminate sack kraft, citrus wrappers, paper for banana crates, pastes for labels for wooden boxes for fruit, galvanized refuse bins, polyethylene bottles for electrolyte, metal drums of 4 gallon capacity, containers for liquefied petroleum gas and on oxygen cylinders.

Specimens from batches of corrugated board boxes for explosives made under the mark scheme were tested. During the year welded gas cylinders were manufactured for the first time in the Union and these cylinders for liquefied gas are being manufactured under the Bureau's mark scheme.

is ook gedoen ter vergelyking van verskillende maniere om bondels kislankies vir vervoer saam te pak.

Die spesifikasie vir die verpakking van ander gevaarlike goedere as plofstowwe is byna klaargemaak. Daar is ooreengekom oor die definisies vir die verskillende klasse gevaarlike goedere, alternatiewe verpakkings vir elke gevaarlike soort goedere is aangegee en kort spesifikasies is vir elke soort verpakking opgestel. Die gebruike wat in die Verenigde State of in Groot Brittanje as aanneemlik geld, het as basis vir hierdie spesifikasie gedien, maar van tyd tot tyd is geringe wysigings oorweeg om rekening te hou met plaaslike toestande of gebruike.

Werk is aangepak met die oog op gegewens vir die opstel van spesifikasies vir meerwandige papiersakke vir sement en vir kunsmis. Dieselfde moeilikhede wat in ander lande geld, is ook hier ondervind, nl. dat die resultate t.o.v. afsonderlike sakke wat terselfdertyd gemaak is, van dieselfde rolle papier, hemelsbreed verskil het wat die eienskappe van die papier en die prestasiepeil van die klaar sak in die valtoets betref. Die aantal sakke wat gebruik moet word om 'n redelik akkurate gemiddelde te verkry, is so groot dat die toetswerk onmoontlik word. Saam met die Onderafdeling Statistiek van die Buro is toe 'n nuwe valtoetsmetode ontwerp wat dit tot dusver moontlik gemaak het om 'n beter gemiddelde bepaling met betreklik minder sakke te maak.

DEPARTEMENT VAN FISIKA EN ELEKTROTEGNIESE INGENIEURSWESE

Nie-vernietigende toetswerk bly nog steeds een van die Afdeling Fisika se belangrikste werksaamhede weens die regstreekse invloed daarvan op onderhoud ter beveiliging in die nywerheid.

Afgesien van die werklike toetswerk wat die Buro uitgevoer het, het sy voorligtingswerk om die waarde van nie-vernietigende toetswerk te demonstreer, baie daartoe bygedra om onderhoudsmetodes dwarsdeur die land te verbeter. Die uitbreiding van die bedrywighede van die Onderafdeling Ontploffingsgevaar kan toegekry word aan die hulp deur die Staatsmyningenieur verleen. Dit het 'n besoek van die hoof van die Afdeling Fisika aan die buiteland nodig gemaak, om die ontwikkeling op hierdie gebied te bestudeer met die oog op die belangrike hersieningsprogram wat t.o.v. spesifikasies nog voorlê.

A large scale experiment was undertaken for the purpose of obtaining information for the specification for wooden shooks for boxes for deciduous fruit. Shooks of different species of timber, different thickness, different width and different method of manufacture were used to assemble boxes for comparative laboratory performance tests. Tests were also undertaken to compare different methods of bundling shooks for transport.

The specification for the packaging of dangerous goods, other than explosives was almost completed. Definitions for the various classes of dangerous goods were agreed upon, alternative packs were listed for each dangerous commodity and brief specifications were prepared for each style of pack. Practices acceptable in the United States or in Great Britain were used as the basis for this specification but minor modifications were considered from time to time to cater for local conditions or customs.

Work was undertaken to obtain information for the preparation of specifications for multiwall paper sacks for cement and for fertilizer. The same difficulties were experienced here as in other countries, namely, that results obtained from individual bags made at the same time from the same rolls of paper gave widely differing results both in the properties of the paper and in the performance level of the complete sack in drop tests. The number of sacks which has to be used in order to arrive at a reasonably accurate average is so large that testing becomes unpracticable. A new drop test method was therefore developed in conjunction with the Statistical Section of the Bureau which, so far, enables a better average assessment to be made with relatively fewer sacks.

PHYSICAL AND ELECTRICAL ENGINEERING DEPARTMENT

Non-destructive testing continues to be one of the most important activities of the Physics Division because of its direct effect on preventative maintenance in industry.

Apart from the actual testing carried out, the work of the Bureau in propagating the value of non-destructive testing has done much to improve maintenance methods in industry throughout the country. That the activities of the Explosion Hazard Section showed such expansion can be attributed to the amount of support received from the Government Mining Engineer. This necessitated a visit overseas to study the latest developments in this field by the head of the Physics Division, in view of the important programme of specification revision which lies ahead.

The Electronics Section has organized the local electronic industry and consumers of electrical apparatus into a useful and active technical committee of

Die Onderafdeling Elektronika het die elektroniese nywerheid hier te lande en die verbruikers van elektriese apparate tot 'n nuttige, bedrywige tegniese komitee van die Internasionale Elektrotegniese Kommissie georganiseer. Vir Suid-Afrika is die internasionale standaardisering van elektroniese dele besonder belangrik weens die rol wat kommunikasies in oorlogstyd speel en die land se afhanklikheid van invoere op hierdie gebied.

Die samestelling van die Engels-Afrikaanse Elektrotegniese Nomenklatuur, wat vir die land van die grootste belang is, het gestadig gevorder. Aandag is op voorlopige lysste van die Afrikaanse terme gekonsentreer en ses daarvan is klaar, terwyl die sewende reeds sy finale stadium bereik het. Dit was aangenaam om so baie steun van verskillende organisasies en private individue te ondervind. Beter verteenwoordiging as dié in die Afrikaanse subkomitee is skaars denkbaar.

Dit is aangenaam om 'n verhoging in die uitvoer van sekere elektriese toerusting, veral kables, aan te kondig. Een van die plaaslike fabrikante het 'n hoeveelheid telefoonkables vir die Nieu-Seelandse poskantoor gemaak en die Buro het op versoek die inspeksiewerk namens die Nieu-Seelandse regering uitgevoer. Reëlins is met die fabrikant getref om te verseker dat die produksie en aflewering nie te ernstig vertraag word nie, en die Nieu-Seelandse regering het die firma vir sy snelle aflewering bedank.

Kables vir Ghana is ook ondersoek en die uitvoer van miniaturstroomverbrekers met die merk op, na Australasië en die Verre Ooste, gaan steeds voort.

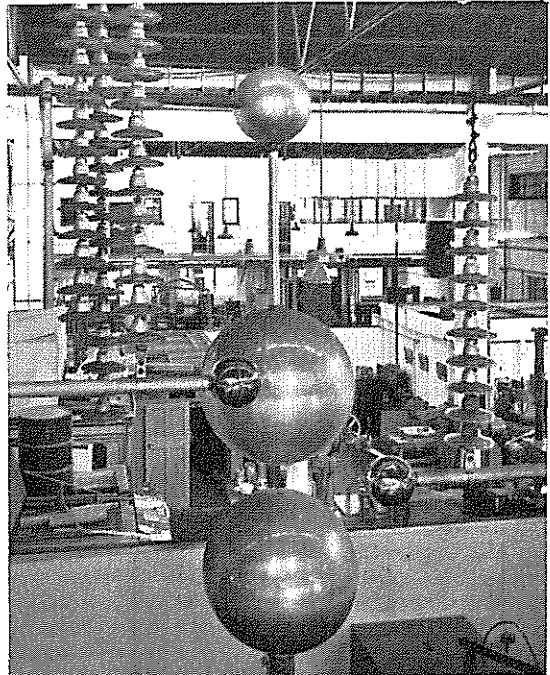
Op die gebied van impulstoetsing was daar 'n betekenisvolle uitbreiding. Die plaaslike transformatorbedryf het so vinnig gegroei dat party van die transformators wat vir impulstoetse gestuur word, nou te groot is om in die hoogspanningslaboratorium in te kom en in die buitelug getoets moet word.

Die opstel van gerasionaliseerde spesifikasies vir toepassing in besondere nywerhede, begin reeds die beoogde doel, nl. vereenvoudiging, bereik. Daar is

the International Electrotechnical Commission. International standardization of electronic parts is particularly important to South Africa because of the part played by communications in war-time and because of its dependence on imports in this field.

Work of the utmost importance to the country is the compilation of the English and Afrikaans Electro-technical Nomenclature, which progressed steadily. Attention was centred on preliminary lists of Afrikaans terms and six of these have been completed, the seventh being in its final stages. A gratifying feature is the tremendous assistance given by various organizations and private individuals. The Afrikaans sub-committee could hardly be more representative.

It is pleasing to be able to report an increase in the export of certain electrical equipment, particularly cables. A quantity of telephone cable was made by one of the local cable manufacturers for the New Zealand Post Office, the Bureau being requested to carry out the inspection on behalf of the New Zealand Government. Arrangements were made with the manufacturer to ensure that production and delivery would not be unduly delayed by the inspection, and the



Gesig op die Laboratorium vir Elektrotegniese Ingenieurswese

A view of the Electrical Engineering Laboratory

bv. 'n algemene spesifikasie vir kookapparate van toepassing op die bedryf wat elektriese kooktoestelle vervaardig; daar is egter ook individuele spesifikasies vir kookplate, skakelaars, oondtermostate en tans skakelaars vir wisselbare energie opgestel. Hierdie ontwikkeling maak aankope vir die fabrikant heelwat eenvoudiger.

Afdeling Fisika

Nie-vernietigende Toetswerk: In die tweede helfte van die jaar was daar 'n skielike toename in die vraag na nie-vernietigende toetswerk en het navrae van feitlik elke tak van die nywerheid ingekom. In hierdie tyd is dringende toetswerk soms vertraag en die personeel, weens 'n tekort aan toetsapparaat, oorbelaas.

Die goud- en diamantmyne, uraanreduksiefabriek, sementfabriek, ingenieursfirmas, petroleummaatskappye, suikerfabriek, skeepsreparasiewerwe, munisipaliteite, YSKOR en SASOL het baie gebruik gemaak van die fasiliteite wat die Onderafdeling Nie-vernietigende Toetswerk bied. Radiografiese toetse is op gietstukke, sweislasse van drukvate, stoomketels, pype, petroleum-bewaartens, bewaartens vir sure, sementoende en koeëlwalserye uitgevoer. Die vraag na ultrasoniese toetse vir mynhysers, suikermeulasse, generators en krukasse het onveranderd voortgeduur. Radio-aktiewe isotope is in die vuurvaste stene van YSKOR se nuwe vlamboogond ingelaat om die verslegting van die bakstene te bepaal. In Bulawayo is ook stoomketels vir die Rhodesiese Spoorweë getoets.

Die Onderafdeling het verbruikers en fabrikante gesteun en gehelp met die opstel van private toets-spesifikasies en aanneemstandaarde. Baie van die fabrieksartikels, veral gesweiste konstruksies, is enig, en nasionale norme of spesifikasies is dus nie van toepassing nie.

In die jaar is toetstechniek en aanneemstandaarde op grond van die radiografiese ondersoek van die sweislasse van laermeulens, waterpyplyne en reservoirs opgestel en deur fabrikante en verbruikers aangeneem. Ondersoeke in verband met 'n metode waarop norme gebaseer kan word vir die interpretasie van ultrasoniese toetse op asse is aan die gang.

firm concerned was thanked by the New Zealand Authorities for prompt delivery.

Cable for Ghana was also inspected, and miniature circuit breakers bearing the mark continued to be exported to Australasia and the Far East.

A significant increase was shown in the impulse testing field. The growth of the local transformer industry has been so rapid that some of the transformers sent for impulse testing are now too large to be accommodated in the high voltage laboratory and have to be tested out of doors.

The preparation of rationalized and related specifications for particular industries is beginning to accomplish its fundamental task of simplification. For the electric cooker industry, for instance, there is an overall specification for cookers, but individual specifications covering cooking plates, switches, oven thermostats and now variable energy switches, have also been drawn up. This new development considerably simplifies buying for stove manufacturers.

Physics Division

Non-Destructive Testing: There was a sudden increase in the demand for non-destructive testing during the second half of the year when enquiries were received from practically every branch of industry. During this period urgent tests were sometimes delayed and personnel over-burdened owing to the shortage of test apparatus.

The gold and diamond mines, uranium reduction works, cement mills, engineering firms, petroleum companies, sugar mills, ship repair yards, municipalities, ISCOR and SASOL made extensive use of the facilities offered by the Non-Destructive Section. Radiographic tests were done on castings, welded joints on pressure vessels, boilers, pipes, petroleum storage tanks, acid storage tanks, cement ovens and ball mills. The steady demand for ultrasonic tests on mines' hoist gear, sugar mill axles, generator and crankshafts remained unchanged. Radio-active isotopes were embedded in the fireproof bricks of ISCOR's new arc furnace to determine the rate of deterioration of the bricks. Tests were also conducted on boilers in Bulawayo for the Rhodesian Railways.

The Non-Destructive Testing Section encouraged and assisted consumers and manufacturers in drawing up private test specifications and acceptance standards. Many of the manufactured articles, especially welded constructions, are unique, and national standards or specifications are therefore not applicable.

Testing techniques and acceptance standards based upon radiographic examination of welded joints on ball mills, water pipe lines and reservoirs were drawn up during the year and were accepted by manufacturers and consumers. Investigations are in progress in

Die Onderafdeling het ook opleidingskursusse in die tegniek van nie-vernietigende toetswerk aangebied. Tot dusver is reeds twee kursusse oor die tegniek en die interpretasie van die resultate by die radiografie van sweislasse gehou. Hierdie skema is die eerste in sy soort wat in Afrika aangepak is, want opleiding op hierdie gebied kon voorheen slegs in die Verenigde Koninkryk, Duitsland, Japan of die Verenigde State verkry word. Die kursus het drie weke geduur en na afloop daarvan is 'n skriftelike eksamen afgeneem. Die getal studente was tot ses beperk om te sorg vir 'n redelike mate van praktiese ondervinding, wat dan ook as die vernaamste aspek daarvan benadruk is. Die nywerheid het gunstig hierop gereageer en twaalf persone het die kursusse bygewoon.

Die Buro se uitstalling op die Randse Paastentoonstelling het op hierdie aangeleentheid van sy werk nadruk gelê om nie-vernietigende toetsmetodes meer beslis onder die aandag van fabrikante en die algemene publiek te bring.

Lede van die personeel het gedurende die jaar verskeie lesings oor nie-vernietigende toetswerk aan ingenieursinstitute in Durban, Port Elizabeth, Johannesburg en Bulawayo gegee.

Fotometrie: Aangesien die verkeersordonnansie wat die gebruik van truकाaters reël en op 1 Januarie 1959 in werking getree het, 'n geweldige vraag na toetse geskep het, moes die Onderafdeling heelwat van sy tyd daaraan bestee.

Interessantheidshalwe kan gemeld word dat die destydse instroming in die land van ingevoerde truकाaters van minderwaardige kwaliteit, as gevolg van die ongunstige verslae wat die Buro uitgereik het, feitlik tot stilstand gekom het.

Die nywerheid het in groot mate die kalibreerfasiliteite wat die Buro bied, te baat geneem en veral treffend was die vraag na kalibrering van ligmeters en optiese pirometers.

Soos in vorige jare, is die kontroletoeising van truकाaters en elektriese lampies op groot skaal voortgesit.

Ontploffingsgevaar: Aangesien hierdie Onderafdeling regstreeks gemoed is met die allerbelangrikste saak van veiligheid in gasmyne, was hy gedurende die jaar baie bedrywig. Sodra sekere goudmyne, veral in die Vrystaat, tot gasmyne verklaar is, het die werk daarheen uitgebrei en 'n groter omvang aangeneem as toe dit met die steenkoolmyne alleen in verband gestaan het.

'n Uitgebreide program van spesifikasieherziening is aangepak. 'n Aanvang is gemaak met die werk aan die voorgestelde gebruikskode vir die onderhoud van vlamdigte toerusting, wat vir myningenieurs van waarde behoort te wees. As toerusting van hierdie aard nie versigtig onderhou word nie, kan dit 'n bron van gevaar word.

connection with a method upon which standards could be based for the interpretation of ultrasonic tests on axles.

The Section also offered training courses in non-destructive testing techniques. To date two courses have been conducted on the techniques and interpretation of results in radiography of welded joints. It is the first scheme of its kind to be presented in Africa, and training in this field could previously only be obtained in the United Kingdom, Germany, Japan or the United States. The duration of the courses was three weeks and a written examination was taken at the end of it. The number of students was limited to six per course to ensure that a reasonable amount of practical experience was gained, upon which aspect emphasis was laid. Industry's reaction to this scheme was favourable and twelve persons attended the courses.

In order to bring non-destructive testing methods more prominently to the notice of manufacturers and the general public the Bureau's exhibit at the Rand Easter Show concentrated on this feature of its work.

Several lectures on non-destructive testing were given by members of the staff during the year to engineering institutes in Durban, Port Elizabeth, Johannesburg and Bulawayo.

Photometry: Work in connection with the traffic ordinance governing the use of cycle retro-reflectors which came into effect on 1st January, 1959, took up much of the Section's time as it brought about a heavy demand for tests.

It is of interest to note that the influx of imported retro-reflectors of inferior quality which came into the country at that time was practically brought to a standstill as a direct result of the unfavourable reports issued by the Bureau.

Industry made extensive use of the calibrating facilities offered, the demand for the calibration of light meters and optical pyrometers being particularly marked.

As in former years the control testing of retro-reflectors and electric lamps continued on a large scale.

Explosion Hazards: Because this Section has a direct bearing on the all important question of safety in fiery mines, it was extremely active during the year. As certain gold mines, notably in the Orange Free State were declared fiery mines, work extended to them, making a considerable addition to that already done for the coal mines.

An extensive programme of specification revision was undertaken. Work was started on the proposed code of practice for the maintenance of flameproof equipment which should prove valuable to mining engineers. If such equipment is not carefully maintained it may possibly become a source of hazards.

'n Ander ontwikkeling, nl. die opstel van spesifikasies vir die gebruik van toerusting in omstandighede waar algehele vlamdigtheid nie onontbeerlik is nie, maar waar die toerusting in sekere omstandighede vervang kan word deur goedkoper maar nogtans veilige toerusting, het 'n besoek aan die buiteland deur 'n senior beampte van die Onderafdeling nodig gemaak, met die oog op toeligting van die punte wat nog nie heeltemal duidelik is nie.

Elektronika: Die Onderafdeling het sy tyd hoofsaaklik gewy aan kalibreerwerk oor 'n uitgebreide gebied, o.a. in verband met oudiometers, stopoorlosies en 'n gehoorstoelstel vir spraakoefening. Skynbaar het daar 'n sekere mate van onkunde onder spesialiste omtrent die vergelykingsnorm van oudiometerkalibrering geheers. Die vergelykingsdrumpel van die gehoor kan 'n lewensbelangrike rol by die diagnose van die oorsake van doofheid speel. Met die beperkte middele tot sy beskikking het die Onderafdeling sy bes doen om hierdie kennis te bevorder, maar blykbaar sou nouer voeling met die geneeskundige professie hier tot wedersydse voordeel strek. 'n Interessante stuk werk wat o.a. vir verkeersbeheerbelange gedoen is, was die ondersoek na 'n snelheidsmeetapparaat wat volgens die Döpplerbeginsel werk. Hoewel die beskikbare toerusting nie juis geskik was vir hoë-frekwensiewerk nie, is 'n allesomvattende ondersoek uitgevoer, met die uitslag waarvan die opdraggewer baie tevrede was; die kalibrering van 'n spoedkontroleapparaat van die tipe wat verskeie verkeersbeheerliggame gebruik, is vir 'n kliënt uitgevoer. Artikels wat gekalibreer en getoets is, behels o.a. 'n „Audigageapparaat”, nippelvoltmeters en 'n projektor. Ondersoeke i.v.m. beskerming teen weerlig is vir kliënte uitgevoer.

Die Transvaalse Provinsiale Administrasie het die Onderafdeling genader om 'n spesifikasie op te stel vir radio-ontvangertoerusting. Tydens die opstel van die spesifikasie is heelwat waardevolle inligting bymekaar gemaak, wat nou opgeneem word in 'n verdere spesifikasie vir skoolradio's en 'n gebruikskode vir basiese elektroniese toetsprosedures.

Die plaaslike tegniese komitees van die Internasionale Elektrotegniese Kommissie was gedurende die jaar baie bedrywig en is vergroot met die doel om hulle meer verteenwoordigend te maak van die menings wat daar oor die belangrike saak van die standaardisering van elektroniese onderdele bestaan.

Herstel van Instrumente: Twee nuwe masjiene, nl. 'n freemasjien en 'n bandsaag, is ontvang. Albei het heelwat tot die doeltreffende werking van die Onderafdeling bygedra.

Hoewel die Buro se instandhouding van sy eie toerusting die vernaamste taak was, is 'n spesiale, buitengewoon gevoelige fotometer vir die Onderafdeling Fotometrie om truakaatsers te toets en ook allerlei

A further development, namely the preparation of specifications for the use of equipment under circumstances where fully flameproof gear is not essential but can be substituted under certain conditions by less expensive but nevertheless safe equipment, necessitated an overseas visit by a senior officer of the Division for the purpose of elucidating points which are not as yet quite clear.

Electronics: Calibration work covering a wide field occupied most of the Section's time and included audiometers, stopwatches, and a speech-training hearing aid. It appeared that a certain amount of ignorance existed among specialists about the reference standard of audiometer calibration. The reference threshold of hearing can play a vital part in the diagnosis of causes of deafness. By the limited means at its disposal the Section has tried its best to propagate this knowledge, but it would seem that a closer medium of communication with the medical profession would be of mutual advantage here. Among the interesting jobs done for traffic control interests was the investigation of a speed measuring apparatus working on the Döppler principle. Although the available equipment was not suited to very high frequency work, an exhaustive investigation was carried out, the result being very satisfactory to the sponsor; a speed checking apparatus of the type used by various traffic control bodies was calibrated for a client. Among other articles calibrated and tested were an audigage apparatus, nipple voltmeters and a projector. Investigations were made for clients on lightning protection.

The Section was approached by the Transvaal Provincial Administration to draw up a specification for hospital radio receiving equipment. During the preparation of this specification much valuable information was accumulated which is now being incorporated in a further specification for school radios and a code of practice for basic electronic testing procedure.

The local technical committees of the International Electrotechnical Commission were very active during the year, and were enlarged in order to voice more representative opinion on the important question of the standardization of electronic parts.

Instrument Repairs: Delivery was taken of two new machines, namely a milling machine and a bandsaw, both of which have contributed considerably to the efficient working of the Section.

Although the maintenance of the Bureau's own equipment was a major task, a special, very sensitive photometer for testing retro-reflectors was constructed for

klein apparate vir gebruik deur ander onderafdelings gebou.

Afdeling Elektrotegniese Ingenieurswese

Elektriese Toerusting: Dwaarsdeur die jaar is gereelde inspeksies volgehou by die talle fabriek wat waterverwarmers, elektriese stowe, kookplate, elektriese stryksters, broodroosters, ketels, lugverwarmers, termostate en dompelverwarmers kragtens die merkskema vervaardig. Benewens die kontroletoets op monsters wat in die fabriek geneem is, het die Onderafdeling heelwat laboratoriumtoetswerk uitgevoer i.v.m. allerlei soorte elektriese toestelle wat ingestuur is.

Die laboratorium vir elektriese toestelle is reeds goed toegerus om huishoudelike elektriese toestelle te toets en die enigste groot stuk toerusting wat hy in die jaar aangeskaf het, was 'n twaalfpuntige temperatuur-registreerder. Hierdie instrument was nodig om die strenger vereistes te toets wat in die hersiene spesifikasie vir die oonde van elektriese stowe en warmplate (gedurende die jaar gepubliseer) voorgeskryf word. Die hersiene spesifikasie vir vaste elektriese opgaarwaterverwarmers is ook gepubliseer. Die spesifikasie vir elektriese verwarmingskussings en -komberse is voltooi.

Bedradingsbybore: In die afgelope jaar was die belangstelling in die Buro se spesifikasie vir allerlei tipes elektriese skakelaars, kontakstoppe, kontakuitgange en geleibuse van die kant van die munisipale elektrisiteitsdeskundiges, bouers en argitekte baie bemoedigend. Weens hierdie neiging het die hoeveelheid toetswerk op allerlei skakelaars en ander bedradingsbybore heelwat toegeneem. Die gewone roetine-inspeksie en toetsing van bybore wat die merk dra, is voortgesit.

Die spesifikasies vir muuruittlaatkassies en dekplate, lamphouers en verbindingskassies vir bogronde toevoerlyne is klaargemaak en word binnekort gepubliseer. 'n Begin is gemaak met die werk aan 'n spesifikasie vir energiereëlaars vir elektriese verwarmingseenhede. Hierdie spesifikasie sluit, saam met dié wat reeds vir skakelaars, kookplate, termostate en hittebestande kables gepubliseer is, die reeks spesifikasies af wat die meeste onderdele vir gebruik by die vervaardiging van elektriese stowe dek.

Soos in vorige jare het die Onderafdeling verskillende toets- en ondersoeke namens die Approvals Committee of the Association of Municipal Electrical Undertakings onderneem.

Kables en Oorbringing: Vir die Onderafdeling Kables en Oorbringing was dit 'n baie besige jaar. Weens die toename in ondersoekwerk en die moeilikheid om geskikte personeel vir die opstel van spesifikasies te werf, is die werk op laasgenoemde gebied ingekort. Die hersiening van die spesifikasie vir elektriese kables met papierisolering vir algemene

the Photometry Section and various small apparatuses built for use by other sections.

Electrical Engineering Division

Electrical Appliances: Regular inspections were continued throughout the year at the many factories producing water heaters, electric stoves, cooking plates, electric irons, toasters, kettles, air heaters, thermostats and immersion heaters under the mark scheme. In addition to the control testing of samples selected at the factories a considerable amount of laboratory test work was conducted on various types of electrical appliances submitted.

The electrical appliances laboratory is already well-equipped for carrying out tests on domestic electric appliances and the only major item of equipment acquired during the year was a 12-point temperature recorder. This instrument was required for conducting the more severe test requirements stipulated for the ovens of electric stoves in the revised specification for electric stoves and hotplates published during the year. The revised specification for fixed electric storage water heaters was also published. The specification for electric heating pads and blankets was completed.

Wiring Accessories: A most encouraging feature noted during the past year was the increasing interest shown by municipal electricity authorities, builders and architects in the Bureau's specification covering all types of electric switches, plugs, socket-outlets and conduit. Owing to this trend the amount of test work conducted on all types of switches and other wiring accessories increased considerably. The usual routine inspection and testing of mark-bearing accessories were continued.

The specifications for wall outlet boxes and cover plates, lampholders and overhead service line connector boxes, were finalized and will be published in the near future. Work was commenced on a specification for energy regulators for electric heating units. This specification, together with those already published for switches, cooking plates, thermostats and heat-resisting cables, will complete the range of specifications covering most of the components used in the manufacture of electric stoves.

As in previous years the Section conducted various tests and investigations on behalf of the Approvals Committee of the Association of Municipal Electricity Undertakings.

Cables and Transmission: For the Cable and Transmission Section the year was one of great activity. Owing to the increase in the amount of inspection work and the difficulty of obtaining suitable staff for the preparation of specifications, work in the latter field was curtailed. The revision of the specification for paper insulated electric cables for general purposes

gebruik is egter afgehandel en 'n sekere hoeveelheid ondersoekwerk in verband met die huidige ontwerpwaardes vir kables is uitgevoer vir die gebruikskode wat met hierdie spesifikasie gepaard sal gaan.

Die inspeksie van besendings vir verskeie staatsdepartemente en ander organisasies het die kern gevorm van die vernaamste werksaamhede van die Onderafdeling. In Vereeniging het die werk so toegeneem dat die teenwoordigheid van 'n permanente inspekteur nodig geword het en 'n assistent moes vir hom aangestel word. Weens groot kontrakte vir telefoonkables uit Nieu-Seeland, moes gereelde besoeke aan Port Elizabeth gebring word. Verder moes 'n besending kragkables vir Ghana voor verskeping te Port Elizabeth ondersoek word. 'n Nuwe, gereelde kliënt is die Departement van Verdediging wat te Port Elizabeth, Pietermaritzburg en Vereeniging gebruik gemaak het van die Onderafdeling se fasiliteite om kables te ondersoek.

Munisipaliteite versoek in toenemende mate die Buro om toesig te hou oor besendings wat deur die fabriek gaan. Te Pretoria word toesig gehou oor 'n groot kontrakbesending vir die Departement van Pos- en Telegraafwese wat feitlik daelike besoeke aan die betrokke fabriek vereis.

Die kabelnywerheid brei teen 'n geweldige tempo uit en dit is een van die nywerhede wat sterk beïnvloed word deur die nuwe plastiekstowwe. Derhalwe moet spesifikasies gedurende, dinamiese hersiening ondergaan, wat 'n swaar las op die personeel plaas.

As gevolg van die ontwikkeling van nuwe sintetiese rubbers het dit dringend geword om die spesifikasies vir kables met gevulkaniseerde rubberisolering vir telekommunikasie- en seindoeleindes te hersien en die voorbereidende werk daarvoor word reeds gedoen om beter verouderings-, vlambaarheids-, en koudvloeiings-toetse te ontwikkel.

Meters en Instrumente: Die nywerheid het volgehou met die goeie gebruik van die beskikbare fasiliteite vir die toets en yking van allerlei soorte elektriese meetinstrumente. Die verskeidenheid en aantal instrumente wat gehanteer word, neem jaarliks toe. Die aantal volledige stelle elektriese instrumente vir aanneemtoetse t.o.v. opwekinstallasies vir kragstasies wat in die laboratorium getoets is, was nog groter as in vorige jare.

Die werk het vir die grootste deel egter bestaan uit die kalibrering en kontrolering van Buro-instrumente.

Batterie en Droë Selle: Die panele vir die laai en toets van batterye is gewysig en hoër laaivermoë is geïnstalleer om aan die toetsbehoefes van die hersiene spesifikasie vir motorvoertuigbatterye te voldoen. Ten behoeve van die Unie-Tenderraad en die S.A. Spoorwegadministrasie is toetse uitgevoer vir die doeleindes van goedgekeurde toetse vir motorvoertuigbatterye wat op grond van die hersiene spesifikasie gelewer sal word.

was, however, completed and a certain amount of investigatory work into the current ratings of cables was carried out for the code of practice which will accompany this specification.

Major activities centred round the inspection of consignments for various government departments and other organizations. Work in Vereeniging increased to an extent that necessitated the presence of a permanent inspector for whom an assistant has now had to be appointed. As a consequence of very large contracts for telephone cables from New Zealand, regular visits had to be paid to Port Elizabeth. A consignment of power cable for Ghana was also inspected at Port Elizabeth prior to shipment. A new but regular user of the Section's facilities was the Department of Defence for which cable was inspected at Port Elizabeth, Pietermaritzburg and Vereeniging.

More and more requests were received from municipalities for the Bureau's supervision of consignments through the factories. A large contract for the Department of Posts and Telegraphs is being supervised at Pretoria which involves almost daily visits to the factory concerned.

The cable industry is expanding at a tremendous rate and it is one of the industries closely affected by the development of new plastics. For this reason constant and dynamic revision of specifications is necessary, and this imposes a heavy burden on the staff.

As a result of the development of new synthetic rubbers there is urgent need to revise the specifications for vulcanized rubber insulated cables for telecommunications and signalling purposes for which preparatory work is being done in order to develop better ageing, flammability and cold flow tests.

Meters and Instruments: Industry continued to make good use of the facilities offered for the testing and calibration of all types of electrical measuring instruments. The range and number of instruments handled increase yearly. The number of complete sets of electrical instruments for acceptance testing of power station generating plant calibrated in the laboratory was greater than in previous years.

The major part of the work, however, consisted of the calibration and checking of Bureau instruments.

Batteries and Dry Cells: The battery charge and test panels were modified and increased charging capacity was installed to meet the test requirements of the revised specification for motor vehicle batteries.

Complete tests were carried out on behalf of the Union Tender Board and the South African Railways Administration for approved test purposes for the motor vehicle batteries to be supplied against the revised specification.

Batterye wat die merk dra, het 'n hoë kwaliteits- en prestasiestandaard gehandhaaf.

Laboratorium vir Hoëspanning: Die vernaamste werk in hierdie laboratorium verrig, is o.a. die roetine-toetse op hoëspannings-, transformator- en laespanningsisolators vir telefone. Soms was die drukte om die toetswerk vir fabrikante klaar te kry, sonder om die produksieaflewering te vertraag, so groot dat die hele laboratorium daarvoor nodig was.

Die vraag na impuls-toetse vir kragtransformators, kragisolators en bliksembrekers het heelwat toegeneem en ontwerpe moes geteken word vir 'n beweegbare impuls-generator, wat in die laboratorium gebou sal moet word, om die ekstra werk te hanteer. Vir die nywerheid behoort dit beter diens te lewer omdat dit toetse vir ontwikkelingswerk in fabriek en ook buite-toetse op geïnstalleerde toerusting moontlik sal maak. Die ontwerp beoog 'n stel van groter vermoë as dié van die reeds bestaande generator in die laboratorium, om tred te hou met die fenomenale groei van die transformatornywerheid in die land.

Al hoe meer munisipale elektrotegniese ingenieurs vra om impuls-toetse vir kragtransformators aler hulle aangeneem word, en dit word reeds 'n roetine-toets.

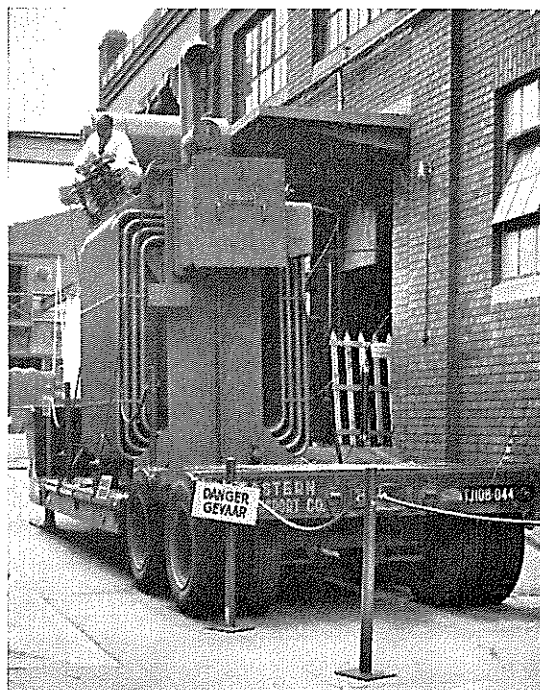
Met die toetsing van bliksembrekers was daar 'n mate van ophoud weens wysigings om aan die finale goedgekeurde spesifikasie vir laespanningsbliksembrekers te voldoen. 'n Gestandaardiseerde toetsstel is egter voltooi en is ter beskikking van fabrikante gestel vir vinnige roetine- en ontwikkelings-toetse.

Fasiliteite vir hoëspanningsmeting is weens die aflewering van nuwe toerusting uitgebrei. Die kalibrerings wat met impuls-toetsing gepaard gaan, is heelwat versnel. Die nuwe toerusting het hom ook geleen tot gespesialiseerde opsporing van foute in transformatorontwikkelings.

'n Groot geïsoleerde glasveseltenk het die fasiliteite vergroot vir toetse onder olie, waaraan daar in toenemende mate 'n behoefte is, weens die bestanddele

Batteries bearing the mark maintained a high standard of quality and performance.

High Voltage Laboratory: Routine tests on high voltage insulators, transformer bushings and low voltage telephone insulators were among the main functions



Transformator van 2,750 kVA wat in Suid-Afrika vervaardig is, was so groot dat hy buite die laboratorium getoets moes word

So large was a 2,750 kVA locally manufactured transformer, which was submitted for testing that it was necessary for it to remain outside the laboratory

of this laboratory. At times the rush to complete testing for manufacturers, without delaying production deliveries, required the full resources of the laboratory.

The demand for the impulse testing of power transformers, power insulators and lightning arresters expanded considerably, necessitating the drawing up of designs for a portable impulse generator to be built up in the laboratory to meet the increase. This should render better service to industry by enabling tests to be carried out for development work in factories, as well as field tests on installed equipment. The design envisages a set of larger capacity than that of the existing

met hoër spannings wat tans in die Unie vervaardig word.

Weens die beperkte werktoestande is daar strawwe eise aan die laboratorium gestel en die groter kragtransformators wat nou in die Unie vervaardig en vir impuls-toetsing aangebied word, moes in die buitelig getoets word, terwyl die lewering van die impuls-generator verhoog moes word om by die toestand aan te pas. Dit het ernstige probleme in verband met die veiligheid van ander Buropersoneel meegebring en boonop heelwat demping en vervorming van die impuls-golf self veroorsaak. Ten spyte van hierdie moeilikhede is die toetse vinnig en behoorlik uitgevoer.

Met die toetse wat opgeneem moet word in die spesifikasie vir die standaardisering van kragtransformator- en hoëspanningsisolators wat binnekort gepubliseer word, is goeie vordering gemaak. Hierdie spesifikasies het, weens die vinnige groei en ontwikkeling van die nywerheid, van nasionale belang geword.

Elektriese Masjiene: Die nuwe klasse isolering wat die Internasionale Elektrotegniese Kommissie vasgestel het, het al hoe meer belangstelling gewek en daar is baie gewerk om hulle vir die nywerheid te verhelder. Die Onderafdeling Isolering het goeie vordering gemaak en kan nou byna alle diëlektriese en aanverwante toetse op isolerings onderneem, wat vir die nywerheid in Suid-Afrika al hoe nuttiger behoort te wees. Isolering vorm die grondslag van die meeste elektriese toerusting en die studie daarvan en van die prestasievermoë behoort die aandag van enige standaardiserings-liggaam te geniet.

Heelwat toetswerk is in die jaar gedoen, veral t.o.v. die epoksieharse wat in toenemende mate gebruik word om wikkels en kabellasse te omhul. Die wisseling van die diëlektriese arbeidsfaktor met bedryfstemperatuur is vir die nywerheid van besondere belang.

Vir opdraggewers is spesiale toetse uitgevoer, soos bv. die bepaling van die rendement van elektriese

generator in die laboratorium te meet die fenomenal groei van die transformator industrie in this country.

More and more municipal electrical engineers are calling for impulse testing of power transformers before acceptance, and this is now becoming a routine test.

The testing of lightning arresters was delayed by modifications to comply with the final approved specification for low voltage lightning arresters. A standardized test set was, however, completed and was available for rapid routine and development tests for manufacturers.

High voltage measurement facilities were extended by the delivery of new equipment. The calibrations associated with impulse testing were speeded up considerably. The new equipment also lent itself to the specialized location of faults in transformer windings.

A large insulated glass-fibre tank widened the under-oil testing facilities for which there has been increased demand because of the higher voltage components now manufactured in the Union.

Cramped working conditions severely strained the resources of the laboratory and the larger power transformers now being manufactured in the Union and submitted for impulse test had to be tested out of doors with the output of the impulse generator extended to suit conditions. This raised serious problems about the safety of other Bureau personnel, besides causing substantial attenuation and distortion of the impulse wave itself. In spite of these difficulties, however, the tests were carried out satisfactorily without delay or inconvenience to other sections or to the sponsors.

Progress was made with the tests required for incorporation in the specification for the standardization of power transformers and high voltage insulators and bushings which will shortly be published. These specifications have become of major national importance in view of the rapid growth and development of this industry.

Electrical Machines: Growing interest is being shown in the new classes of insulation established by the International Electrotechnical Commission and much work has been done to clarify them for local industry. The Insulation Section has made good progress and is now in a position to undertake most dielectric and associated tests on insulations, which should prove of increasing use to South African industry. Insulation is the basis of most electrical equipment and its performance and study should receive the close attention of any standardizing body.

Much test work was carried out during the year, particularly on the epoxy resins which are being increasingly used for encapsulating windings and cable jointing. The variation of dielectric power factor with operating temperature is of particular importance to industry.

motore volgens verskillende metodes, en die onder-vinding wat daarmee opgedoen is, sal te pas kom by die opstel van die spesifikasie vir induksiemotore waaraan tans gewerk word.

Baie aanneemtoetse t.o.v. verskillende soorte toerusting, soos bv. transformators, is uitgevoer.

Die kontroletotse in verband met miniaturstroomverbrekers kragtens die merkskema uitgevoer, is voortgesit en op versoek van die fabrikante is vergelykende toetse op 'n aantal ingevoerde miniaturstroomverbrekers gedoen. Die hersiening van die spesifikasie vir miniaturstroomverbrekers vir installering in woonhuise is aan die gang.

STREEKSKANTORE

Kaapstad

'n Kenmerk van die jaar was die aanmerklike toename in skakelwerk wat die Kaapstadse Kantoor namens die Buro en die nasionale navorsingslaboratoria en -institute onderneem het. Nie alleen het die Kaapstadse Kantoor beamptes wat amptelike pligsbesoeke aan Kaapstad gebring het, van kantoorgeriewe en vervoer voorsien en hulle met hulle reëlings gehelp nie, maar hy het ook in toenemende mate inspeksie- en monsternemingswerk vir verskeie onderafdelings van die Buro gedoen; verder het hy beslis meer navrae en versoeke om inligting, ondersoeke, toetse en inspeksiewerk van nywerars, fabrikants-agente en aankoops- en verkoopsorganisasies in die Kaap, van meer uiteenlopende aard, ontvang. Versoeke om toetse en inspeksiewerk is na die betrokke laboratoria deurgestuur en inligting is vir navraers ingewin of hulle is van raad gedien omtrent die institute of laboratoria aan wie hulle hulle probleme kon voorlê. Die kantoor het W.N.N.R.-publikasies en -inligtingsbrosjures onder die nywerhede, die handels- en tegniese blaaike, professionele liggame en universiteitsdepartemente versprei.

Hoewel hierdie meer uitgebreide erkenning en aanvaarding van die Kaapstadse Kantoor as skakel tussen die nywerheid, die handel, tegniese en wetenskaplike organisasies van die Westelike Provinsie en die Buro die omvang van die Kaapstadse personeel se pligte vergroot het, het die vaste funksies van die kantoor en die omvang van die werk in verband met inspeksie- en monsterneming nie afgeneem nie; dit het trouens toegeneem en groter verskeidenheid getoon.

Die ondersoek van ingemaakte vleis en vleisprodukte, ingemaakte vis en kreef op grond van die verpligte spesifikasies het glad verloop. Die inspekteurs by die 15 inmaakfabrieke langs die Weskus en in die Kaapse Skiereilandgebied het nog steeds die samewerking van fabrieksbesture ondervind. Gedurende Augustus is

Special tests such as the determination of the efficiency of electric motors by various methods were carried out for sponsors, and the experience gained will be of value for the specification for induction motors now in course of preparation.

Many acceptance tests were carried out on behalf of clients on various types of equipment such as transformers.

Control tests continued on the miniature circuit breakers manufactured under the mark scheme and comparative tests were carried out on a number of imported miniature circuit breakers at the request of manufacturers. A revision of the specification for miniature circuit breakers for domestic installation is in progress.

REGIONAL OFFICES

Cape Town

The year was notable for the marked increase in the liaison activities undertaken by the Cape Town Office on behalf of the Bureau and the national research laboratories and research institutes. In addition to providing officers visiting Cape Town on official duty with office facilities and transport and assisting them with their arrangements, the Cape Town Office undertook an expanding volume of inspection and sampling work for various sections of the Bureau and received a markedly increased and varied number of enquiries and requests for information, investigations, tests and inspection from industrialists, manufacturers' agents, and selling and purchasing organizations in the Cape. Requests for tests and inspections were routed to the laboratories concerned and information was obtained for enquirers or they were advised to which of the institutes and laboratories to refer their problems. C.S.I.R. publications and information brochures were distributed to industries, trade and technical journals, professional bodies and University departments.

While this wider recognition and increased acceptance of the Cape Town Office as the link between industry and commerce and technical and scientific organizations in the Western Province and the Bureau and Headquarters in Pretoria brought about an expansion in the scope of the duties undertaken by the staff in Cape Town, there was no diminution in the established functions of the office nor lessening of the volume of the work in connection with inspection and sampling, which in fact, grew in quantity as well as in range.

The inspection of canned meat and meat products and canned fish and rock lobster against the compulsory specifications proceeded smoothly. The inspectors at the 15 canneries along the West Coast and in the Cape Peninsula area continued to receive co-operation from factory managements. During August, the annual quota of 250,000 tons of pilchards and maasbanker

die jaarlikse kwota van 250,000 ton sardyne en maasbankers vir die eerste keer sedert 1952 weer bereik; maar aangesien 'n groot hoeveelheid van die sardyne wat aan wal gebring is, nie vir inmaak geskik was nie, was die ingemaakte hoeveelheid nie aanmerklik groter as dié van die vorige seisoen nie. Ten spyte van groot aantalle kreef wat weer in die Valsbaaigebied hulle verskyning gemaak het, is min ingemaakte kreef geproduseer, weens 'n geweldige vraag na bevrore kreefsterte, wat dan ook hoofsaaklik na die dollarmarkte uitgevoer is.

Plaaslike invoerders van ingemaakte vis- en vleisprodukte het nog steeds met die Buro saamgewerk by die monsterneming uit besendings vir die toetse op grond van verpligte spesifikasies en goeie onderlinge betrekkinge is met die groothandelaars se Grocery Agents' and Distributors' Association aangeknoop. Dit het die instelling van 'n stelsel vergemaklik waarby alle ingevoerde besendings slegs by die eerste aanleg-hawe van die skip wat die besendings aflaa, gekeur word. Nie alleen is monsterneming uit hierdie besendings deur hierdie reëlings vergemaklik nie, maar die vrystelling van die besendings het vlotter en vinniger verloop.

In fabriek wat ingemaakte en snelbevrore vis kragtens die standaardmerkskema produseer, is die daelike inspeksies voortgesit, waardeur die goeie kwaliteit van die ingemaakte artikels wat die merk dra, konsekwent gehandhaaf is. As gevolg van die instelling van 'n gehaltekontrolestelsel in een van die betrokke fabriek se afdeling vir snelbevriësing (onder leiding van die Buro), is die kwaliteit op bevredigende peil gehandhaaf, ten spyte van 'n geweldige produksietoename. Die eerste permit wat vir die gebruik van die merk op ingemaakte vissmeer toegestaan is, is aan 'n firma op die Weskus uitgereik en die ingemaakte vissmeer wat die merk dra, sal binnekort die verbruikerspubliek bereik.

Roetinekontrole-inspeksie na permituitreiking in voedselabriek wat tamatiesous, bruiswater, vrugtedrank, roomys en waterlekkers produseer, is volgehou en monsters van die produkte is gereeld vir chemiese, fisiese en mikrobiologiese toetse geneem. Ondersoek en monsterneming is in 'n woltekstielabriek te Worcester en 'n handdoekabriek te Wellington uitgevoer. Die Kaapstadse personeel het o.a. monsters vir kontroletoetse geneem van wasvloerpolitoer, meubels, stoep- en skoenpolitoer, hoendervoer, kowaterdistemper, boukalk, gloeilampe vir algemene gebruik, goud- en silwerartikels en riffelborddose vir plofstowwe.

'n Belangrike gedeelte van die werk wat vir verskeie onderafdelings van die Buro uitgevoer is, was gereelde monsterneming t.o.v. verf en verfkwaste, meerwandige papiersakke, seep en tekstielware, aanneemtoetswerk vir die Spoorwegadministrasie, staatsdepartemente,

was bereik vir die eerste keer sedert 1952, but as a large percentage of the pilchards landed were unsuitable for canning, the quantity canned was not significantly higher than that of the previous season. Despite the reappearance of large numbers of rock lobster in the False Bay area, very little canned rock lobster was produced because of the enormous demand for frozen rock lobster tails which were exported mainly to dollar markets.

Local importers of canned fish and canned meat products gave the Bureau their continued co-operation in the sampling of consignments for testing against the compulsory specifications and close liaison was developed with the wholesale Grocery Agents' and Distributors' Association. This facilitated the adoption of the system whereby all imported consignments were sampled only at the first port of call of the vessel discharging consignments. This arrangement not only simplified the actual drawing of the samples but facilitated and speeded up the release of these consignments.

Daily inspections continued at factories producing canned and quick-frozen fish under the standardization mark scheme and promoted the maintenance of a consistently high quality in the packs bearing the mark. As a result of the establishment (under the guidance of the Bureau) of a system of quality control at the quick-freeze department of one of the factories concerned, the quality was maintained at a satisfactory level even though a tremendous increase in production took place. The first permit granted for the use of the mark on canned fish paste was issued to a firm on the west coast and the packs of its fish spread labelled with the mark will shortly reach consumers.

Routine post-permit control inspection at food factories producing tomato sauce, mineral waters, fruit squashes, ice cream and water suckers, was continued and samples of the products were drawn regularly for chemical, physical and microbiological testing. Examination and sampling were carried out at a woollen textile mill at Worcester and a towelling factory at Wellington. Other control sampling conducted by the Cape Town staff included wax floor, furniture, stoep and boot polishes, poultry feeds, cold water distemper, building lime, G.S. electric lamps, gold and silver-ware articles and corrugated cardboard boxes for explosives.

An important facet of the work carried out on behalf of the various sections of the Bureau was the regular sampling of paint and paint brushes, multi-wall paper sacks, soap and textiles, the acceptance testing for the Railways Administration, government departments, provincial administrations and a chemical manufacturing company. The volume of work in connection with textile inspection alone can be deduced from the fact that during the year under review, over 1,000,000

provinsiale administrasies en 'n maatskappy wat chemiese stowwe vervaardig. Die omvang van die werk in verband met die keuring van tekstielware alleen, kan afgelei word uit die feit dat meer as 100,000 jaart stof en 'n verdere 144,000 afsonderlike artikels gedurende die jaar ondersoek is voor aflewering.

Behalwe die aanneeminspeksie- en kontrole-inspeksiewerk het die Kaapstadse inspekteur al die plaaslike werk in verband met die regulasies vir woletikettering van die Handelswaremerkewet gedoen. Mikrobiologiese opnames op verskillende stadiums van die bottel- vulproses is maandeliks in die bruiswaterfabrieke uitgevoer en die monsters is na die mikrobiologiese laboratorium van die Buro vir uitkenning en verslagdoening gestuur.

Buro-beamptes belas met kontrole-inspeksies, by die fabrieke van merkhouders wat bouhout, kisplankies, warmwatersilinders en ander elektriese toestelle, asbesement- en betonpype, boukalk, gipspleisterbord en skoeisel vervaardig, het gereelde besoeke aan die Westelike Provinsie gebring.

Skoolmeubels en hospitaaltoerusting gemaak deur firmas naby Kaapstad, is namens die Administrasies van Transvaal en die Kaapprovinsie ondersoek sodra besendings vir lewering gereed was. Beamptes van die Onderafdeling Nie-vernietigende Toetse het by 'n paar geleenthede Kaapstad besoek om radiografiese ondersoeke en ultrasoniese toetse uit te voer. Lesings is gehou oor verskillende aspekte van die Buro se werk en aan 'n aantal belanghebbende liggame en verbruikersorganisasies is films vertoon.

Naslaanstelle Suid-Afrikaanse en Britse Standaardspesifikasies wat in die Kaapstadse Kantoor gehou word, is heelwat geraadpleeg en die kantoor het baie bestellings vir spesifikasies en gebruikskodes ontvang.

Durban

In die jaar onder bespreking het die betrekkings tussen hierdie kantoor en die publiek aanmerklik uitgebrei en dit was interessant om te bespeur dat die navrae meer oor bepaalde probleme gegaan het as oor die algemene dienste wat die kantoor bied.

Die Natalse Sakekamer het uittreksels uit S.A.B.S.-berigte wat vir sy lede van besondere waarde was, gepubliseer. Die Hoofbeampte het op 'n vergadering van die Natalse tak van die Instituut van Elektrotegniese Ingenieurs 'n verhandeling voorgedra oor nie-vernietigende toetse en hy het die Buro ook verteenwoordig op die eerste algemene vergadering van die S.A. Instituut van Rubberywerhede. Op hierdie vergadering het 'n senior beampte van die Onderafdeling Rubber 'n praatjie gelewer.

In die Durbanse gebied word miljoene ponde aan nuwe nywerhede uitgegee en navrae wat in die Durbanse Kantoor ontvang is, het die volgende produkte gedek, wat 'n aanduiding is van die omvang van plaaslike nywerheidsbelange: aluminiumsoldeersel, ontleding

yards of fabric and a further 144,000 individual items were examined prior to delivery.

In addition to acceptance inspection and control inspection work, the Cape Town inspector carried out all local work in connection with the wool-labelling regulations of the Merchandise Marks Act. Microbiological surveys along the flow lines of the bottling plants were performed monthly at two of the mineral water factories and the samples sent to the Bureau's mycological laboratory for identification and report.

Periodic visits were paid to the Western Province by Bureau officers carrying out control inspections at factories of markholders producing structural timber and box shooks, hot water cylinders and other electrical appliances; asbestos cement and concrete pipes, building lime, gypsum plasterboard and footwear.

School furniture and hospital equipment manufactured by firms near Cape Town were inspected on behalf of the Transvaal and Cape Provincial Administrations as and when consignments were ready for delivery. Officers of the Non-Destructive Testing Section visited the Cape on a number of occasions to carry out radiographic examinations and ultrasonic tests. Lectures on various aspects of the work of the Bureau were given and films shown to a number of interested bodies and consumer organizations.

Extensive use was made of the reference sets of South African and British Standards held at the Cape Town Office and many orders for specifications and codes of practice were placed through this office.

Durban

During the year reviewed there was a noticeable widening of the liaison between this office and the public and an interesting aspect was that enquiries were aimed much more at specific problems than at the general services available at the office.

The Natal Chamber of Commerce published extracts of S.A.B.S. news of special value to members of the Chamber. A paper on non-destructive testing was read at a meeting of the Natal branch of the Institute of Electrical Engineers by the Officer in Charge who also represented the Bureau at the first general meeting of the S.A. Institute of Rubber Industries. At this meeting a talk was given by a senior officer of the Rubber Section.

Many millions are being spent on new industries in the Durban area and enquiries received at the Durban Office covered the following products which indicate the range of the local industrial interests: aluminium solder, analysis of mineral oil for trace elements,

van mineraalolie vir spoorelemente, asbes, babavoedsel, bitumineuse padbindmiddels, bronspyttoebehore, sement, die chlorinering van swembadwater, die korrodering van waterpype, die korrodering van groot kospotte, watefilters vir sigarette, beskadiging van tapyte deur swamme en insekte, beskadiging van produkte van vlekvyre staal en veselglas, vlamvaste steenkoolmynskakelaars, reddingsbaadjies, spieëls, die voedingswaarde van hospitaalgroente, oorjasse, plastiektande, motorvoertuie met koelinrigting vir voedselvervoer, rubberdele vir elektriese kontakstoppe, plakband, leiklip, vonkproppe vir motorvoertuie, leksout vir vee, toetsmetodes vir manna, termostate, tyk en die volgehalte van tekstielstof.

Uit hierdie lys blyk dit dat baie van die navrae wat ontvang is, gegaan het oor goedere afkomstig uit die kleiner bedrywe en oor tussenprodukte.

Inspeksies i.v.m. ingevoerde vis- en vleisprodukte kragtens die toepassing van die verpligte standaard-spesifikasies het gestadig toegeneem. Dit geld ook vir die plaaslik geproduseerde artikels, waarvan die produksie voortdurend gestyg het. By vyf fabriek is meer as 600 produksielotte ondersoek en monsters daaruit geneem. In vyf voedsel-en-voerfabrieke is gereelde inspeksies uitgevoer. In een van hulle is maandelikse mikologiese opnames gedoen.

Tydens inspeksietoetse op besendings tekstielstowwe is uit ongeveer anderhalf miljoen jaart materiaal en 'n halfmiljoen stukgoedere monsters geneem en ondersoek.

Die Hoofkantoor is bygestaan in sy toetswerk i.v.m. enjolie vir swaardiensmotorvoertuie en die toetse op huise vir nie-blankes vir 'n nuwe behuisingkema.

Monsters is gereeld vir die Pretoriase laboratoria geneem uit die volgende produkte: narkose-eter, silwerartikels, remvloeistowwe, katoenseildoek, watte, ont-smettingsmiddels, distemper, stoflappe, rubberstewels, houtverduursamingsmiddels, papiersakke, drukkersmetaal, hergeraffineerde olies, trukaatsers, dakvielt, sersje, sokkies, handdoeke, witsel, breiwool, bruiswater en pluimveevoer. Aansoeke is ontvang om die merk op vonkproppe vir motorvoertuie en op vloeistowwe vir die merk van skape aan te bring.

Nie-vernietigende toetse was die belangrikste werk van die Durbanse kantoor, en die behoefte hieraan het gedurig toegeneem. Toetse en inspeksiewerk is uitgevoer op 871 suikermeulasse, die sweislasse van 12 olietenks en van 73 steunballe van die aanbou van die kragstasie te Umgenirivier. Veral interessant was twee toetse waarby die sweislasse van 'n bolvormige suurbewaringsvat van 50 vt. en 29 warmtebespaarderbuise vir twee plaaslike bedrywe ondersoek moes word. Onderdele wat getoets is volgens die ultrasoniese metode, die metode van die magnetiese deeltjie, radiografiese of ander metodes, behels o.a. stoomketels, boulers, krinkasse, krukasse, suikermeulrotorasse,

asbestos, baby foods, bituminous road binders, bronze pipe fittings, cement, chlorination of swimming bath water, corrosion of water pipes, corrosion of food-cooking cauldrons, cottonwool filters for cigarettes, damage to carpets by fungi and insects, damage to stainless steel fibre-glass products, flame-proof coal mine switches, life-jackets, mirrors, nutritive values of hospital vegetables, overalls, plastic teeth, refrigerated motor vehicles for food transport, rubber parts for electric contact plugs, scotch tape, slate, spark plugs for motor vehicles, stocklicks, test methods on millet, thermostats, ticking and wool content of textile materials.

From this list, it can be seen that many of the queries received were in connection with goods associated with the smaller industries and with intermediate products.

The inspection of imported fish and meat products under the administration of the compulsory standards showed a steady increase. The same applied to local products where the output continued to expand. Over 600 production batches were inspected and sampled at five factories. Five foods and feeds factories were regularly inspected. Mycological surveys were conducted monthly at one of these factories.

Consignment inspection tests on textiles involved the sampling and inspection of approximately one and a half million yards of material and half a million piece goods.

Assistance was given to head office staff in carrying out tests on heavy duty motor vehicle engine oils and tests lasting several weeks on Non-European houses in a new housing scheme.

Samples of the following products were regularly drawn for the Pretoria laboratories: anaesthetic ether, articles of silver, brake fluids, cotton duck, cotton wool, disinfectants, distemper, dusters, gum boots, wood preservatives, paper bags, printers' metals, re-refined oils, retro-reflectors, roofing felt, serge, socks, towels, whitening, knitting wool, mineral waters and poultry feeds. Applications to apply the mark on motor vehicle spark plugs and sheepmarking fluids were received.

Non-destructive testing was the most important of the Durban Office activities, and one for which there was a constantly growing demand. Tests and inspections were carried out on 871 sugar mill shafts, on the welds of 12 oil tanks and on the welds of 73 structural girders at the Umgeni Power Station extension. Of special interest were two tests entailing the inspection of the welds on a 50-ft. spherical acid storage vessel and of 29 heat economizer tubes for two local industries. Other components tested by ultrasonic, magnetic particle, radiographic and other methods included boilers, structural girders, stubaxles, crankshafts, sugar mill rotor shafts, turbine rotor shafts, welds, cylinder

turbinerotorasse, sweislasse, silindervoerings, stoomdromme, mure en beskotte t.o.v. muurdikte, tapse skagte en walsskagte.

Tweehonderd-en-vyftig suikermeulwalsskagte is getoets, sommige tot in Mauritius.

Agtien tekstiefabriekes in Natal en die Vrystaat is gereeld geïnspekteer en ses is op gesette tye in Oos-Kaapland besoek.

Verfpanele by die twintigtalle is op die stellasies op die verfpancelterrein blootgestel en gedurig dopgehou. 'n Aantal truukaatsers is ook op hierdie stellasies blootgestel.

Melding kan gemaak word van die vordering van die nuwe geboue op die Universiteitsterrein wat deur die Nasionale Waternavorsingsinstituut en die Buro vir Standaarde albei gebruik sal word.

Baie navrae in verband met S.A.B.S.- en B.S.I.-standaardspesifikasies is afgehandel en van albei is heelwat eksemplare verkoop.

Port Elizabeth

Dat die vraag na die aangebode dienste en die belangstelling wat te bespeur is, soveel groter geword het, is die aangenaamste aspek van die jaar se werk. Versoeke om toets- en ondersoekwerk het heelwat toegeneem en die verskeidenheid produkte wat vir toetsing aangebied is, gee 'n beeld van die uiteenlopende aard van die liggame en organisasies wat hierdie dienste te baat neem. Groter getalle kopers spesifiseer reeds die S.A.B.S.-norme en hulle koop dan ook produkte wat die merk dra.

Dit was bemoedigend om van die Midland Chamber of Industries, Border Chamber of Industries, Border Scientific and Technical Association, die Chamber of Commerce, die Tegnieuse Kollege, die Stadsraad van Port Elizabeth, die plaaslike nywerheid en die gemeenskap in sy geheel ondersteuning en hulp te ervaar. Dit het duidelik bewys dat hierdie dienste tegnies as 'n verifiëring van die vervaardigde produk beskou kan word. 'n Aantal groot nywerhede in hierdie gebied wat in die verlede min gebruik van die Buro se dienste gemaak het, het hulle veel meer daarop beroep.

Tydens 'n onlangse besoek wat die oorsese direkteur van 'n plaaslike fabriek aan hierdie gebied gebring het, het hy sy bestuur opdrag gegee om aansoek te doen om die standaardmerk, aangesien daar gemeen word dat die fabriekskontrole wat met die toekenning van die merk gepaard gaan, van onskatbare waarde sou wees.

'n Uitsers geslaagde kursus oor die gradering van hout is in George aangebied. Op versoek van die nywerheid, word 'n soortgelyke kursus vir nie-blankes nou georganiseer.

Die Port Elizabethse kantoor het goeie betrekkinge met die plaaslike pers en die S.A. Uitsaai-korporasie gehandhaaf.

Die kantoor het die sekretariële werk waargeneem van die Middellandse Streeksnavorsingskomitee van

liners, steam drums, walls and bulkheads for wall thickness, tailshafts and roller shafts.

Two hundred and fifty sugar mill roller shafts were tested as far afield as Mauritius.

Eighteen textile factories in Natal and the Orange Free State were regularly inspected, and six in the Eastern Cape Province visited at regular intervals.

Many scores of paint panels were placed on the stands at the paint panel exposure site, which was kept constantly under supervision. A number of retro-reflectors was also exposed on these stands.

Progress can be reported on the new buildings on the University site which will be shared by the National Institute for Water Research and the Bureau of Standards.

Many enquiries in connection with S.A.B.S. and B.S.I. standards were dealt with and considerable sales of both were made.

Port Elizabeth

The most gratifying aspect of the year's work was the increased demand and interest shown in the services offered. Requests for test work and inspections increased substantially and the variety of products submitted for testing indicated the widely differing nature of the bodies and organizations making use of these services. Many more buyers are specifying S.A.B.S. standards and are buying mark-bearing products.

The support and assistance received from organizations such as the Midland Chamber of Industries, Border Chamber of Industries, Border Scientific and Technical Association, Chamber of Commerce, Technical College, City Council of Port Elizabeth, local industry and the community as a whole, were encouraging, and clearly indicated that these services were regarded as a technical audit on the product manufactured. A number of large industries in this area which have made little use of our services in the past made greatly increased demands on them.

On a recent visit to this area the overseas director of a local factory instructed his executives to apply for the standardization mark because it was felt that the factory control associated with the granting of the mark would be of invaluable assistance.

A most successful course on timber grading was conducted at George. A similar course is now being organized for Non-Europeans at the request of Industry.

The Port Elizabeth office maintained good relationship with the local press and the S.A. Broadcasting Corporation.

The office was responsible for the secretarial work of the Midland Regional Research Committee of the S.A. Council for Scientific and Industrial Research,

die S.A. Wetenskaplike en Nywerheidsnavorsingsraad, wat welbekend is om sy uitstekende diens aan die nywerheid en die gemeenskap.

Die jonste gegewens, wat herhaaldelik geraadpleeg word en in die Port Elizabethse kantoor ter insae lê, is in die S.A.B.S.- en B.S.I.-spesifikasies en -gebruikskodes en ander literatuur vervat.

Die personeel van die Port Elizabethse kantoor waar die Afdeling Leer en Skoetsel van die Buro verteenwoordigers het, bied praktiese hulp en persoonlike aandag. Aangesien inligtingsgeriewe daar byderhand is, kan navrae dikwels onmiddellik beantwoord word.

Die produkte wat na Pretoria vir toetsing gestuur is, behels o.a. papier, stene, sand, klip, sement, staaldraad, gietyster, houtkorrelvormbord, seep, remvloeistof, motorkarbatterye, aluminiumhakke vir dameskoene, leer, reënjasse, suidwesterhoede, water, stopverf, olie, verf en grondverf, bruiswater, aluminiumplate, gom, wolvetverbindinge, beskuitjies en motorkarvere.

Reëlings is getref vir die Buro-kantoor om in hierdie gebied nie-vernietigende toetswerk uit te voer, o.a. op sweislasse, grondverskuivingstoerusting, gietstukke, krinkasse en stoomketels.

Inspeksies namens baie aankooporganisasies en fabrikante is uitgevoer t.o.v. hout, leer en skoetsel, ingemaakte voedselprodukte en pype van voorgespanne beton.

In verband met leer-en-skoetselwerk is o.a. 3,000 paar rangeerderskoene ondersoek en is maandelikse besoeke gebring aan 22 skoetselfabrieke en 7 looierye om voldoening aan die vereistes van die toepaslike spesifikasies te verseker.

Oor 'n tydperk van agt maande is houtprodukte ter waarde van £16,000 ondersoek. In Aliwal-Noord is ondersoeke van plaaslik ingemaakte voedselprodukte uitgevoer. Van 'n totaal van 668 besendings ingevoerde blikkies vis en vleis, wat uit 136 skepe in Port Elizabeth afgelaai is, is monsters uit 519 besendings geneem. Altesaam 1,968 monsters ingemaakte vis is uit 474 besendings, uit 116 skepe, geneem. Uit 19 skepe is 187 monsters ingemaakte vleis geneem. Besendings waaruit geen monsters in Port Elizabeth geneem is nie, is of entrepot oor Port Elizabeth aangestuur of elders aan monsterneming onderwerp. In Oos-Londen is 27 besendings ingevoerde ingemaakte vleis en ingemaakte vis ondersoek en 1,102 monsters daaruit geneem.

Die diens wat gelewer is in verband met die ondersoek van pype van voorgespanne beton vir die Stadsraad van Port Elizabeth is vir die derde keer weer aangevra om nog twee gedeeltes van sy uitbreidingsprojek vir watervoorsiening te dek. Die werk in hierdie verband neem binnekort 'n aanvang. Die waarde van die pype en spesiale hulpstukke vir die werk wat in die onderhawige tydperk voltooi is, was £889,928.

which is well known for its excellent service to industry and the community.

Up to date information to which frequent reference is made and which is available at the Port Elizabeth office, is contained in S.A.B.S. and B.S.I. specifications and codes of practice, and other literature.

Practical assistance and personal attention are available from the staff at the Port Elizabeth office, where the Timber and the Leather and Footwear Divisions of the Bureau have representatives. With on-the-spot information available it is frequently possible to give an immediate answer to enquirers.

Products sent to Pretoria for testing included paper, bricks, sand, stone, cement, steel wire, cast iron, wood particle form board, soap, brake fluid, motor car batteries, resin content of paper, aluminium heels for ladies shoes, leather, rain coats, souwester hats, water, putty, oil, paints and primers, mineral waters, aluminium sheeting, glue, woolfat compounds, biscuits, fatigue testing of motor car springs.

Arrangements were made for non-destructive test work to be carried out in this area by the Bureau office. This included tests on welded joints, earth moving equipment, castings, stub axles and boilers.

Inspections on behalf of many purchasing organizations and manufacturers were carried out on timber, leather and footwear, tinned food products and prestressed concrete pipes.

Leather and footwear work included the inspection of 3,000 pairs of shunters' shoes and monthly visits to 22 footwear factories and 7 tanneries to ensure compliance with the requirements of relevant specifications.

Timber products to the value of £16,000 were inspected during a period of eight months. Inspections of locally canned meat products were carried out in Aliwal North. Out of a total of 668 consignments of imported canned fish and meat, which were landed at Port Elizabeth from 136 ships, 519 consignments were subjected to sampling. A total of 1,968 samples of canned fish was drawn from 474 consignments from 116 ships. One hundred and eighty-seven samples of canned meat were drawn from 19 ships. Consignments not sampled at Port Elizabeth were either forwarded in bond via Port Elizabeth or sampled elsewhere. In East London 27 consignments of imported canned meat and canned fish were inspected and 1,102 samples drawn.

Services connected with the inspection of prestressed concrete pipes for Port Elizabeth City Council were extended for the third time to include yet another two stages of its water augmentation project. Work on these stages will begin shortly. The value of pipes and specials for the stage completed during the period under review was £889,928.

Gereelde inspeksies is uitgevoer op die persele van permithouers in Port Elizabeth, Oos-Londen, Kingwilliamstown, Queenstown, Middelburg, die George en die Knysnagebied, Aliwal-Noord, Oudtshoorn, Stutterheim en Uitenhage. Kontrole-Inspeksies van houtprodukte is vanuit die Port Elizabethse kantoor in Kaapstad en sy omgewende gebied uitgevoer.

Monsters is uit die produkte van drie permithouers in Oos-Londen, Queenstown en Middelburg, en van twee in Port Elizabeth geneem.

Ander inspeksies t.o.v. permituitreiking het monsterneming uit beskermende handskoene, pluimveevoer, drukkersmetaal, sagte soldeersel en kouwwaterdistemper vereis.

Inspeksies is in 'n bruiswaterfabriek in Somerset-Oos, in saagmeulens in Knysna en George, in die Kaapstadse gebied en in Port Elizabeth uitgevoer vir fabrikante wat om die merk aansoek wil doen.

Nuwe permitte is uitgereik vir houthandvatsels vir gereedskap, vir bou- en fabriekshout vir elektriese kables met P.V.C.-isolering en vir skemerpartyworsies en ingemaakte spekskywe.

Die permithouers in die gebied wat diens van die Port Elizabethse kantoor ontvang, tel tans 33.

Regular inspections were carried out at the premises of permit holders in Port Elizabeth, East London, Kingwilliamstown, Queenstown, Middelburg, George and Knysna areas, Aliwal North, Oudtshoorn, Stutterheim and Uitenhage. Control inspections on wooden products were carried out in Cape Town and surrounding area from the Port Elizabeth office.

Samples were drawn from three permit holders in East London, Queenstown and Middelburg and from two in Port Elizabeth.

Other permit inspections involved drawing samples of protective gloves, poultry feeds, printers' metal, soft solder and cold water distemper.

Inspections were carried out at a mineral water factory in Somerset East, at sawmills in Knysna and George, the Cape Town area, and in Port Elizabeth for manufacturers wishing to apply for the mark.

New permits were issued for wooden handles for tools and for structural and factory timber, for P.V.C.-insulated electric cables, and for cocktail sausages and canned sliced bacon.

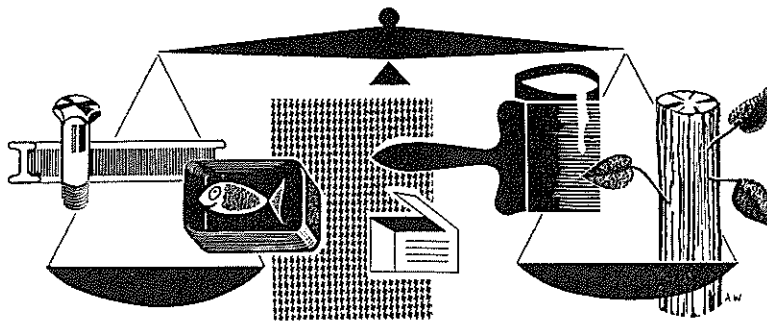
Permit holders in the area served by the Port Elizabeth office now number 33.

GEREELDE PUBLIKASIES

Suid-Afrikaanse Standaardbulletin—maandeliks.

PERIODICAL PUBLICATIONS

South African Standards Bulletin—monthly.



DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL III

NASIONALE CHEMIESE
NAVORSINGS-
LABORATORIUM

PART III

NATIONAL CHEMICAL
RESEARCH LABORATORY

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. BOX 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)

NASIONALE CHEMIESE NAVORSINGS- LABORATORIUM

Direkteur: DR. P. C. CARMAN

Die afgelope jaar is gekenmerk deur twee belangrike veranderinge in die Nasionale Chemiese Navorsingslaboratorium. Eerstens het die Waternavorsingafdeling aan die begin van die finansiële jaar die volle status van die Nasionale Instituut vir Waternavorsing verkry. Die werk van hierdie Instituut vorm dus nie meer deel van hierdie verslag nie. Tweedens het die eerste Direkteur, dr. W. S. Rapson, onder wie se leiding hierdie Laboratorium vanaf sy totstandkoming ongeveer 12 jaar gelede gestaan het, die benoeming as Vice-President van die W.N.N.R. aanvaar.

Die werksaamhede van die Laboratorium het uitgebrei, veral as gevolg van ondersteuning deur die nywerheid; dit toon dus aan dat daar 'n toenemende mate van vertroue is in die vermoë van die Nasionale Chemiese Navorsingslaboratorium om take wat aan hom opgedra word, suksesvol uit te voer. Die S.K.F.-Navorsingsbeurs word gefinansier deur die Amerikaanse artsnykundige firma Smith, Kline and French, terwyl die Superwhite Kaolin Corporation die navorsingswerk i.v.m. kaolienneerslae ondersteun. Die werk i.v.m. wynnavorsing wat 'n jaar of wat gelede deur die Nasionale Chemiese Navorsingslaboratorium begin is, word nou ook ondersteun deur die Cape Distilling Merchants' Association. Van die ouer navorsingsbeurse is dié vir kafferbier en wolnavorsing nou vir etlike jare verseker van finansiële ondersteuning; die Wattlekwekersbeurs is tans weer aktief na 'n tydperk waartydens die pos vakant was.

Voortspruitende uit die werk in die Nasionale Chemiese Navorsingslaboratorium moes 'n aantal nuwe patente gedurende die afgelope jaar uitgeneem word.

MINERAALPRODUKTE

Kleie

'n Kontrakondersoek om die suuraktiveringseenskappe van 'n plaaslike montmorillonitiese klei wat gebruik word in die gietery-industrie te bepaal, is voltooi. Daar is gevind dat die klei ekonomies geaktiveer kan word tot 'n goeie bleikaarde vir mineraalolies (vergelykbaar met ingevoerde geaktiveerde bleikaardes).

Verskeie ondersoeke na die kwaliteit van plaaslike kaolienafsettings is voltooi en gedoen vir firmas wat belang het by die ontginning en veredeling van hierdie afsettings. Die bleikeienskappe van 'n gewaste kaolien vir die papierindustrie is vasgestel en toesig is gehou

NATIONAL CHEMICAL RESEARCH LABORATORY

Director: DR. P. C. CARMAN

The past year has seen two notable changes in the National Chemical Research Laboratory. First, the Water Division attained the full status of the National Institute for Water Research at the beginning of the financial year, so that its work no longer appears in this report. Second, the first Director, Dr. W. S. Rapson, who has guided the destinies of the Laboratory from its inception a little over twelve years ago has left on his appointment as a Vice President of the C.S.I.R.

The work of the Laboratory has broadened, mainly due to sponsored work, indicative of the growing trust in the ability of the National Chemical Research Laboratory to carry out work entrusted to it. The S.K.F. Fellowship has been set up by the American pharmaceutical firm of Smith, Kline and French and the Superwhite Kaolin Corporation has set up a fellowship to study kaolin deposits. Work instituted by the National Chemical Laboratory a year or so ago in the field of wine research has now been reinforced by a fellowship set up by the Cape Distilling Merchants' Association. Of the older fellowships, financial support for work on kaffir beer and on wool is now ensured for several years ahead, and the Wattle Growers' Fellowship is now in operation again after a period of inactivity due to inability to find a fellow.

Arising out of the work in the National Chemical Research Laboratory, further patents have had to be taken out in the past year.

MINERAL PRODUCTS

Clays

A contract investigation to determine the acid-activation properties of a local montmorillonitic clay used in the foundry industry was completed. It was found that the clay could be economically treated to produce a good mineral oil bleaching earth (comparable to imported activated earths).

Several investigations were completed to determine the quality of local kaolin deposits for firms that were interested in the mining and beneficiating of these deposits. The bleachability of a washed kaolin was determined for the paper industry and the erection of a kaolin washing plant in the Western Province was

by die oprigting van 'n kaolienwasinstallasie in die Westelike Provinsie. Verder is 'n belangrike nuwe beursooreenkoms aangegaan. 'n Geoloog, in diens geneem met behulp van hierdie beurs, het 'n begin gemaak met 'n uitgebreide opname van kaolienafsettings wat die ondersteuner besit en daar word beplan om met die bykomende gegewens verkry van die monsters wat in die Laboratorium ondersoek is, die omvang en kwaliteit van hierdie afsettings te bepaal.

Verskeie klei- en skaliemonsters se mineralogiese samestelling is vir die Geologiese Opname bepaal en 'n paar vuurvaste materiale is vir 'n industriële keramiese firma ondersoek.

Fosfate

Die produksie van sitroensuur-oplosbare kalsium-magnesium-fosfate uit Phalaborwa-apatiet is verder ondersoek. 'n Literatuuroorsig het aangetoon dat 'n groot hoeveelheid werk in Japan gedoen is en vertalings is verkry. Laboratoriumtoetse is gedoen wat aangetoon het dat met die korrekte verhoudings van silika en serpentyne die vloeitemperatuur verlaag kan word en 'n goeie produk verkry kan word by temperature ver onderkant 1,500°C. Met die data so verkry, is 'n skematiese plan vir toetsaanlegproewe uitgewerk en die koste daarvan bereken. Hierdie feite het aangetoon dat elektriese verhitting die geskikste sal wees en dat dit die vernaamste faktor sal wees by die bepaling van 'n standplaas vir 'n fabriek.

Die bereiding van superfosfaat van Phalaborwa-fosfaat-konsentraat is deeglik in die Laboratorium bestudeer. Die uitwerking van fynheid, suurverhouding, suurkonsentrasies en reaksietemperatuur is gevolg, en dit het geblyk dat hulle nie sensitiewe faktore by die bepaling van die omsetting in wateroplosbare fosfate is nie. Metings van die temperatuurstyging by menging met swawelsuur het bevestig dat apatiet nie so reaktief is soos marokkaanse rotsfosfaat nie; maar superfosfaat van goeie kwaliteit word maklik verkry.

'n Intensiewe studie van die minerale met die apatiet geassosieer is onderneem. Konsentrasies van baddeleyiet kom by die skeiding van apatiet deur flottering voor en sal miskien van belang blyk.

Olie uit Steenkool

Katalisatore: Die S.A.S.O.L.-beurse wat in die vorige verslag beskryf is, is gedurende die afgelope jaar voortgesit. Aandag is eerstens geskenk aan die bereiding van suiwer ysterkarbid. Die metode wat gekies is, is dié van Jack, waarvolgens yster eers omgesit word in die nitried-vorm. Op hierdie produk word koolstof-monoksied dan toegelaat om te reageer waardeur Hägg-karbid, Fe_2C , gevorm word. 'n Vergelyking van verskillende bereidings van yster het aangetoon dat die omsetting in karbid, sowel as in nitried, grootliks vergemaklik is deur aktiewe vorms

supervised. In addition a major new fellowship contract was entered into. A geologist employed under this fellowship has started a detailed survey of kaolin deposits owned by the sponsor and with additional data obtained from samples investigated in the laboratory it is hoped to determine the extent and quality of these.

Several clay and shale samples were investigated for mineralogical composition for the Geological Survey and some refractory materials for an industrial ceramic firm.

Phosphates

The production of citric acid soluble calcium-magnesium phosphates from Phalaborwa apatite was followed up. A literature survey showed that a large amount of work had been carried out in Japan and translations were procured. Laboratory studies were carried out and these indicated that with properly chosen proportions of silica and serpentine, fluxing temperatures could be lowered and a good product could be obtained at temperatures well under 1500°C. With the data so obtained, a schematic plan for pilot plant tests was drawn up and also cost calculations were carried out. These indicated that electrical heat would be best and that this would be the main factor in deciding the site for a factory.

Preparation of superphosphate from Phalaborwa concentrates was studied extensively in the Laboratory. The effects of fineness, acid ratio, acid concentrations and temperature of reaction were followed and did not prove to be sensitive factors in deciding the conversion to water soluble phosphate. Measurements of the rise of temperature on admixture with sulphuric acid confirmed that the apatite is not as reactive as Moroccan rock phosphate; but superphosphate of good quality is readily obtained.

A closer study is being made of minerals associated with the apatite. Concentrations of baddeleyite appear in the flotation separation of apatite and may prove of importance.

Oil from Coal

Catalysts: The S.A.S.O.L. Fellowships described in the last report have continued work during the past year. Attention was directed first to preparation of pure iron carbides, the method chosen being that of Jack, in which iron is first converted to nitrides and then reacted with carbon monoxide to form Hägg carbide, Fe_2C . Comparison of various preparations of iron showed that the conversion to carbide as well as to nitride was greatly facilitated by using active forms of iron such as those produced by reducing precipitated ferric hydroxide in hydrogen. Using Jack's conditions, however, it proved

van yster, soos dié voortgebring deur die reduksie van gepresipiteerde ferrihidroksied met waterstof, te gebruik. Alhoewel van Jack se kondisies gebruik gemaak is, kon al die stikstof nogtans nie verwyder word nie. Bowendien begin vry koolstof te vorm teen die einde van die karbidreaksie. 'n Gewysigde metode is uitgewerk waarvolgens die laaste spore van stikstof deur waterstof verwyder is en sodoende is suiwer monsters Hägg-karbid berei.

'n Studie van die aard van die oppervlak van die produkte wat gevorm word in die verskillende stappe van bereiding word nou onderneem. Die karbid self is ook bestudeer ten opsigte van chemisorpsie van waterstof en koolstofmonoksied oor 'n wye temperatuurgebied, maar die ondersoek het nog nie die stadium bereik waar algemene gevolgtrekkings gemaak kan word nie.

Outoksidasie van Koolwaterstofverbindinge: 'n Ondersoek na die vatbaarheid van die verskillende koolstofposisies in 'n Fischer Tropschmodel koolwaterstof, 5-metielnonaan, vir oksidasie is onderneem. Dit is gedoen deur die outoksidasieprodukte met litium-aluminium-hidried te reduseer tot 'n mengsel van monole en diole in onveranderde koolwaterstof. Die mengsel is direk met behulp van gaschromatografie geanaliseer en uit die analise het geblyk dat by lae vlakke van outoksidasie die vatbaarheid vir aanvalle van die verskillende koolstofposisies afneem in die verwagte volgorde: tersiër > sekondêr > primêr. Die sekondêre posisies het 'n onverwagte aktiwiteitsverskil getoon; die „2” en „4” posisies was 2-3 maal meer aangeval as die posisie „3”. Berekeninge toon aan dat die waterstof gebind aan die tersiêre koolstofatoom, 19 maal makliker verwyder word as een wat gebind is aan 'n normaal-sekondêre koolstof. Die waterstowwe wat gebind is aan primêre koolstowwe was in gelyke mate aangeval, ook is gevind dat 'n waterstof wat gebind is aan 'n normaal-sekondêre koolstof 4 maal so vinnig verwyder word as een wat gebind is aan 'n primêre koolstof.

'n Groot hoeveelheid diole was teenwoordig in die reaksieprodukt, wat waarskynlik gevorm word deur α , β en γ intramolekulêre waterstofoordraging.

PLANT- EN DIERPRODUKTE

Wolwas

Vroeër ondersoekes het gelei tot die isolasie en identifikasie van 'n reeks α -hidroksi- en ω -hidroksisure in die hidroksisuurfraksie van vars wolwas. Harsagtige sure wat produkte van die outoksidasie van die triterpeenkomponente van wolwas is, was in kommersiële of gedeeltelik geoutoksideerde was gevind. Behalwe hierdie hidroksisure bevat die vars was 'n ander groep hidroksisure waarvan die samestelling tans ondersoek word.

impossible to remove all nitrogen. In addition, free carbon began to form towards the end of the carbidizing reaction. A modified method was worked out in which the last traces of nitrogen were removed by hydrogen, and pure samples of Hägg carbide were thereby prepared.

A surface study of the products in the various steps of the preparation is being made. The carbide itself has also been studied with respect to chemisorption of hydrogen and carbon monoxide over a wide range of temperatures, but the investigation has not reached the stage at which general conclusions can be drawn.

Autoxidation of hydrocarbons: A study was made of the susceptibility of the various carbon positions of a model Fischer Tropsch hydrocarbon, 5-methylnonane, to oxidative attack. This was done by reducing the autoxidation product with lithium aluminium hydride to a mixture of monols and diols in unreacted hydrocarbon. The mixture was directly analysed by means of gas chromatography, and it was found that, at low levels of autoxidation, the susceptibility of the various carbon positions to attack was in the suspected decreasing order: tertiary > secondary > primary. The secondary positions showed unexpected differences in reactivity, the “2” and “4” positions being attacked 2-3 times as much as the “3” position. It is calculated that the hydrogen attached to the tertiary carbon atom is 19 times more easily removed than one attached to a normal secondary. The hydrogens attached to primary carbons were equally attacked and hydrogen attached to a normal secondary carbon atom was found to be removed four times as fast as that attached to primary ones.

A large proportion of the reaction product was composed of diols. These are probably produced by α , β and γ intramolecular hydrogen transfer.

PLANT AND ANIMAL PRODUCTS

Wool Wax

Earlier investigations led to the isolation and identification of a series of α -hydroxy and ω -hydroxy acids in the hydroxy acid fraction of fresh wool wax. Commercial or partly autoxidised wax was found to contain in addition resinous acids, products of the autoxidation of tripterene components of the wax. Besides these hydroxy acids, the fresh wax contains another group of hydroxy acids, the constitution of which is being investigated.

Ondersoeke elders het getoon dat δ -hidroksisure in hierdie groep aanwesig is. Bevestigende gegewens is vir hierdie hidroksisure gevind en ook die aanwesigheid van pen- ω -hidroksisure $\text{CH}_3\text{CH}(\text{OH})(\text{CH}_2)_n\text{COOH}$ is bewys. Daar word tans aan die sintetisering van sommige modelkomponente gewerk wat gebruik sal word om metodes vir die skeiding en identifikasie van die natuurlike sure te ontwikkel.

Wolwesels

Hierdie werk is voortgesit deur middel van 'n beurs wat deur die Wolraad ondersteun word.

Ondersoeke i.v.m. die verskille tussen normale en kopergebrekkige wol wat in vorige verslae vermeld is, is voortgesit. Onlangse eksperimente skyn duidelik te bewys hoe uiters moeilik dit gaan wees om 'n bevredigende chemiese verklaring vir hierdie verskille te gee.

Die studies van ensimiese afbreking van wol wat in verlede jaar se verslag vermeld was, het gelei tot die meting van die verhouding van verskeie proteïenkomponente in normale en kopergebrekkige wol. As eerste stap is die verhouding van hoër en laer swael bevattende proteïenkomponente wat uit geöksideerde wol geïsoleer was, gemeet en 'n betekenisvolle verskil is tussen die twee soorte wol gevind. Die kopergebrekkige wol het minder van die swaelryke komponent bevat. Met die oog op die ander eienskappe van wol was dit onverwags, maar dit was verenigbaar met die aanname dat hierdie swaelryke proteïen 'n belangrike rol in die bepaling van die fisiese eienskappe van die vesel soos elastisiteit en die vermoë van reagense om die vesel binne te dring, speel. Die eienskappe van die swaelryke komponent en ander metodes om dit te isoleer word bestudeer met die doel om hierdie aanname te toets. Die amino-suursamestelling is volgens die metode van Moore en Stein bepaal. Die proteïen is heterogeen maar pogings om die suiwer fraksies te isoleer was onsuksesvol omdat dit 'n onreëlmatige gedrag op ioonuitruilingskolomme getoon het. Pogings om die komponent deur ander metodes uit wol te isoleer het misluk.

Met die samewerking van professor Hugo van die Universiteit van Pretoria word 'n poging aangewend om vas te stel wat die effek van dieetfaktore, behalwe kopertekort, is op die verhouding van die twee proteïenkomponente in wol. 'n Aantal skape word vir hierdie doel onder standaardkondisies grootgemaak.

Daar word ook eksperimente uitgevoer om die distribusie van sulfhidriël-groepe in kopergebrekkige wol te bepaal. Vir dié doel moes 'n nuwe sulfhidriëlreagens gesintetiseer word omdat bestaande reagense onbevredigend was. Dit lyk asof die nuwe reagens baie belowend sal wees by die bepaling van hierdie groepe.

Investigations elsewhere have pointed to the presence of δ -hydroxy acids in this group. Some information confirming this was obtained, and in addition the presence of pen- ω -hydroxy acids $\text{CH}_3\text{CH}(\text{OH})(\text{CH}_2)_n\text{COOH}$ was demonstrated. The synthesis of some model components, to assist in the development of methods of separating the acids and the identification of natural acids, is in progress.

Wool Fibres

This work was continued on a fellowship supported by the Wool Board.

Investigations on the difference between normal and copper-deficient wool described in previous reports have been continued. Recent experiments tend to emphasise how extremely difficult it will be to find a satisfactory chemical explanation for these differences.

The enzymic-degradation studies described in last year's report have led to measurements of the proportions of the various protein components in normal and copper-deficient wool. As a first step, the proportions of the high and low sulphur protein components, which may be isolated from oxidized wool, have been measured; and a significant difference between the two sorts of wool has been found. The copper-deficient fibres have less of the sulphur-rich component. This was unexpected in view of the other properties of the wool but it is consistent with the assumption that this sulphur-rich protein plays a large part in determining the physical properties of the fibre, such as the elasticity and reagent penetrability. In order to test this assumption, the properties of the sulphur-rich component and other methods of isolating it are being studied. The amino-acid composition has been determined by the method of Moore and Stein. The protein is heterogeneous but attempts at isolating pure fractions have not been successful, because it exhibits anomalous behaviour on ion-exchange chromatographic columns. Attempts at isolating it from wool by other methods have not been successful.

An attempt is being made, in collaboration with Professor Hugo of Pretoria University, to assess the effect of dietary factors other than copper deficiency on the proportions of the two protein components in wool. For this purpose a number of sheep are being reared under standard conditions.

Experiments are being made on the distribution of sulphhydryl groups in copper-deficient wool, and a new sulphhydryl reagent has been synthesized because existing reagents were found to be unsatisfactory. The new reagent promises to be very useful for the estimation of these groups.

Essensiële Olies

Die Departement van Tuinbou en die Nasionale Chemiese Navorsingslaboratorium het hulle samewerking voortgesit in verband met die kweek en die distillasie van plante wat ryk is aan essensiële olies. Daar het moeïkhede opgeduik in die pogings om plante te verkry wat ryk is aan essensiële olies, aangesien party plante goed gegroei het in die eerste jaar, maar in die tweede jaar aangeval is deur plantsiektes. Die beste variëteite van laventel was baie sensitief teenoor aalwurms en het almal gedurende die afgelope seisoen verlore gegaan.

Gedurende die vorige jaar is pepermentolies in groot hoeveelhede verkry, maar die kwaliteit was laag as gevolg van 'n te hoë mentofuraaninhoud. Daar was gehoop om in die huidige seisoen vas te stel of dit in verband staan met die intensiteit van die sonlig waarin die plante gekweek word. Die plante het egter nie in die vorige nat seisoen goed gegroei nie, en was daar dus nie genoeg plantmateriaal beskikbaar vir die ondersoek nie.

Laventelplante is egter verkry van Mbabane in Swaziland, waarvan die olie-inhoud hoog en ook van 'n hoë kwaliteit was. Die olie is weggestuur vir industriële waardering.

Die volgende inheemse plante is verkry van die kwekerye van die Departement van Plantkunde en die olies daarvan is geïsoleer vir verdere analise: *Salvia triangularis*, *Thamnosma africana*, *Athrixia elata* en *Ocimum suave*.

Die Onderzoek na Alkaloïede in Suid-Afrikaanse Plante

In die begin van 1959 is begin om Suid-Afrikaanse plante te ondersoek vir die aanwesigheid van alkaloïede wat moontlik mediese waarde mag hê. Hierdie werk is moontlik gemaak deur die firma Smith, Kline en French, van Philadelphia in die V.S.A. Tot dusver is daar al 500 plante versamel en 100 is reeds getoets vir alkaloïede.

Onderzoek van Giftige Plante

„Geeldikkop”: Gedurende die afgelope jaar is veral, in samewerking met Onderstepoort, op veldwerk met die mobiele laboratorium gekonsentreer. Die belangrikste resultaat van die ondersoek is dat die verskillende saponienfraksies wat uit die plant, *Tribulus terrestris* afgeskei is, by dosering aan skape slegs 'n gedeelte van die siektebeeld veroorsaak het. Daar is ongetwyfeld ander faktore, behalwe die plant, wat 'n rol speel. Die noodsaaklikheid is besef om 'n hernieude intensiewe studie te maak van plantfisiologiese faktore wat 'n rol speel. Die moontlikheid dat 'n fungus-infeksie 'n belangrike faktor mag wees (soos die geval is met die verwante siekte gesigekseem in Nieu-Seeland) word tans ondersoek.

Essential Oils

The collaboration between the Division of Horticulture and the National Chemical Research Laboratory in the study of the cultivation and distillation of essential oil plants was continued. There were difficulties in obtaining the best types of plants for oil production, and some of the plants, although successful during the first year, were severely attacked by plant pests during the second. The best varieties of lavender were found to be very sensitive to nematodes and were all lost during the last season.

In the previous year peppermint oil was obtained in high yield, but the quality was poor because of a high menthofurane content. This season, it was hoped to find out if this was related to the intensity of sunlight in which the plants are grown. However, the plants did not grow well during the last wet season and insufficient plant material was available for investigation.

A further batch of lavender plants were obtained from Mbabane, Swaziland. The oil yields were again high and the oil of good quality. The oil has been sent for industrial evaluation.

The following indigenous plants were obtained from small plots cultivated by the Division of Botany and the oils isolated for further analysis: *Salvia triangularis*, *Thamnosma africana*, *Athrixia elata* and *Ocimum suave*.

Survey of South African Plants for Alkaloids

At the beginning of 1959 a survey of South African plants for alkaloids of possible medicinal value was started. The work is being sponsored by Messrs Smith, Kline and French, of Philadelphia, U.S.A. Some 500 plants have now been collected and about 100 of these have been examined for alkaloids.

Investigation of Poisonous Plants

„Geeldikkop”: Attention was concentrated on field work using the mobile laboratory, in collaboration with the Onderstepoort Research Laboratories of the Department of Agriculture. The most important result of the investigation was that the different saponin fractions which have been separated from the plant, *Tribulus terrestris*, only produced a part of the syndrome of the disease when dosed to sheep. There are undoubtedly factors other than the plant which play a part. It has been realised that it is essential to make a renewed, intensive study of plant physiological factors which make a contribution. The possibility that a fungus infection may be an important factor (as in the case of the related disease, facial eczema, in New Zealand) is now being studied.

In samewerking met die Wolkwekersvereniging is 'n begin gemaak met die insameling van statistiese gegewens oor die voorkoms en die verspreiding van geeldikop. Hierdie gegewens is noodsaaklik vir enige toksikologiese en plantfisiologiese studie.

Vir 'n chemiese ondersoek is die ontwikkeling van toetstegnieke op 'n klein diertjie, van die grootste belang.

Vermeersiekte: Die struktuurwerk op geigerinien, een van die geïsoleerde komponente uit *Geigeria aspera* is nou voltooi. Dit het geblyk dat dit 'n seskwiterpeenlaktoon op 'n guaanskelet is wat twee vicinale hidrok-sielgroepe en 'n dubbelbinding bevat. Werk op die struktuur van 'n seskwiterpeenketo-alkohol van dieselfde oorsprong word voortgesit.

Redelike sukses is behaal met die skeiding en suiwering van die komponente uit *Geigeria africana* ekstrakt, en 'n geasetileerde seskwiterpeenlaktoon, met 'n struktuur wat met geigerinien ooreenstem, is geïsoleer.

Gousiekte: Dit is 'n nuwe probleem wat in samewerking met die Onderstepoort-laboratoria ondersoek word.

Gedurende die somermaande veroorsaak sekere plante, naamlik, *Pachystigma pygmaeum*, *Pygmaeothamnus zeyheri* var. *rogersii* (harige goorappel) en *Pavetta harbori* groot verliese onder vee in Wes- en Noordwes-Transvaal. Die doodsoorsaak is 'n kroniese inflammasie van die hartspier wat lei tot 'n neerlegging van bindweefsel.

'n Mono-hidroksi-triterpeensuur, harboriensuur genoem, is uit die blare van al drie bogenoemde plante, asook uit *Pygmaeothamnus zeyheri* (gladde goorappel) afgeskei. Toksikologiese toetse op Onderstepoort dui aan dat harboriensuur moontlik die aktiewe gifstof kan wees.

Bitterstowwe van die Cucurbitaceae

Die belangstelling in die chemiese struktuur van dié stowwe het gedurende die afgelope jaar baie toegeneem en verskeie groot navorsingskole oorsee het tot die veld toegetree. Die afgelope jaar is dan ook hoofsaaklik gekonsentreer op struktuurwerk wat geleidelik tot die finale opheldering van die struktuur van die syketting van die meeste bitterstowwe. Die werk het nou gevorder tot op 'n stadium waarop voorlopige struktuurformules opgestel kan word. Die bitterstowwe behoort tot die klas trimetielsteroïde.

Elaterase

Werk in verband met die suiwering van hierdie ensiem is voortgesit. Deur gebruik te maak van ammonium-sulfaatfraksionering en chromatografiese skeidings op sowel DEAE-sellulose- as kalsiumfosfaatadsorberende middels, is 'n 70-voudige suiwering verkry. Die gesuiwerde ensiem bevat alleen spore koolhidraat, wat een van die vernaamste onsuiverhede van die ru-ensiem is.

In collaboration with the Wool Growers' Association, a beginning has been made with the collection of statistical data on the occurrence and distribution of "geeldikop". These data are essential for any technological and plant physiological study.

For chemical work, the development of methods of testing with small animals is of the greatest importance.

"Vermeersiekte": The structural work on geigerinin, one of the compounds isolated from *Geigeria aspera*, has been completed. It has been shown to be a sesquiterpene lactone on a guaiane skeleton containing two vicinal hydroxyl groups and a double bond. Work is progressing on the structure of a sesquiterpene keto alcohol from the same source.

Some success has been achieved in the purification of the components of the *Geigeria africana* extract and an acetylated sesquiterpene lactone structurally similar to geigerinin has been isolated.

"Gousiekte": This is a new problem which is being studied in collaboration with the Onderstepoort laboratories.

During the summer months certain plants, namely, *Pachystigma pygmaeum*, *Pygmaeothamnus zeyheri* var. *rogersii* (hairy goorappel) and *Pavetta harbori*, cause great stock losses in the western and north-western Transvaal. The cause of death is a chronic inflammation of the heart muscle which leads to a deposition of connective tissue.

A monohydroxytriterpene acid, named harboric acid, was separated from the leaves of all three of the foregoing plants as well as from *Pygmaeothamnus zeyheri* (smooth goorappel). Toxicological tests at Onderstepoort indicated that harboric acid is possibly the active poison.

Bitter Principles of the Cucurbitaceae

The interest in the chemical structure of these materials has greatly increased during the past year and various large research schools overseas have entered the field. Activities were mainly concentrated on structural work and have led to the final clearing up of the structure of the side chain of most of the bitter principles. The work has now progressed to the stage where provisional structural formulae can be proposed. The bitter principles belong to the class of trimethyl steroids.

Elaterase

Work on the purification of this enzyme was continued. Utilizing ammonium sulphate fractionation and chromatographic separations on both DEAE-cellulose and calcium phosphate adsorbents, a 70-fold purification was obtained. The purified enzyme contained only traces of carbohydrate, one of the major impurities of the crude enzyme. One component was

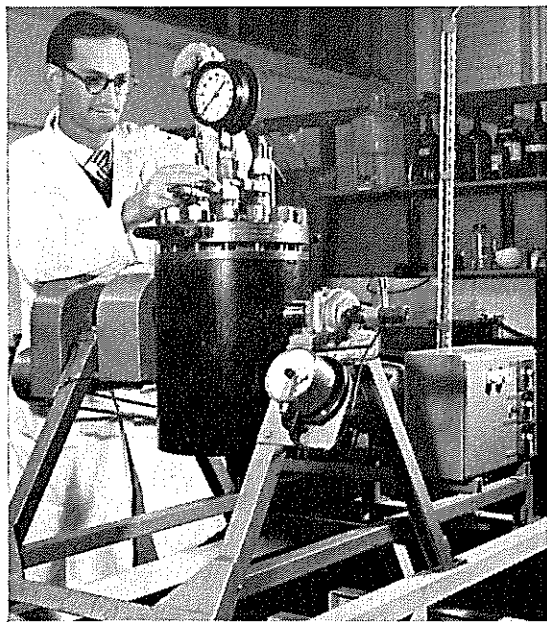
Een komponent is vir die gesuiwerde ensiem waargeneem, sowel deur elektroforese as in die sentrifuge. Werk in verband met die fisies-chemiese karakterisering van die gesuiwerde ensiem is aan die gang.

Beta-glukosidase van Amandelemulsien

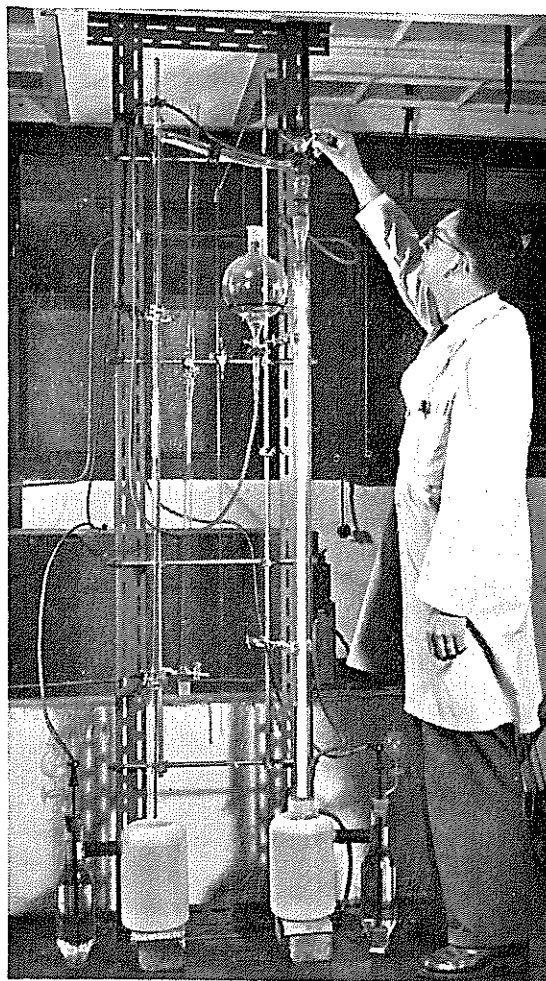
Amandelemulsien bevat 'n aantal glukosidases sowel as ander ensieme. Die doel van die huidige ondersoek is die suiwing van β -glukosidase wat in amandelemulsien voorkom. Deur gebruik te maak van sowel alkohol- as ammoniumsulfaatfraksionering is 'n 120-voudige suiwing verkry. Voorlopige chromatografiese skeidings op kalsiumfosfaatadsorbeeringsmiddels het aangetoon dat die gesuiwerde materiaal twee β -glukosidases bevat. Dit is ook gevind met kolomelektroforese op sellulosepoëier. Die skeiding en verdere suiwing van die twee β -glukosidases is verkry deur chromatografiese fraksionering op sowel kalsiumfosfaat- as DEAE-sellulose-adsorbeeringsmiddels. Werk in verband met die karakterisering van hierdie twee β -glukosidases is aan die gang.

Basboomhout

Studies van die hemisellulose van basboomhout (*Acacia mollissima*) is voortgesit. Werk is veral op die wateroplosbare fraksies gekonsentreer. Die inwerking van hemisellulose-ensieme op hierdie fraksies



*Experimental pulp digester
Eksperimentele houtpap digereertoestel*



*Column electrophoresis
Kolom-elektroforese*

observed for the purified enzyme both by electrophoresis and in the ultracentrifuge. Work on the physicochemical characterization of the purified enzyme is in progress.

Beta-glucosidase from Almond Emulsin

Almond emulsin contains a number of glycosidases as well as other enzymes. The aim of the present work was the purification of β -glucosidase occurring in almond emulsin. Utilizing both alcohol and ammonium sulphate fractionation a 120-fold purification was achieved. Preliminary chromatographic separation on calcium phosphate adsorbent indicated that the purified material contained two β -glucosidases. This was also found by column electrophoresis on cellulose

is ondersoek, sodat identifiseerbare oligosakkariede gekry kon word.

Houtpapierstudies

Al die nodige laboratoriumapparaat vir die maak van papierpap en papier is gedurende die jaar ontvang en geïnstalleer.

'n Groot aantal houtmonsters is onder standaard-toestande verpapp en tot papier verwerk. Hierdie velle papier is getoets vir verskeie fisiese eienskappe deur die Papiertoetsafdeling van die S.A. Buro vir Standaard. Sodra genoeg van hierdie gegewens van hout van verskeie gebiede beskikbaar is, sal dit help om die verpappingseienskappe van hierdie houtsoorte vas te stel en die lang-termyn benodighede te beplan.

Kafferkoring en Kafferbier

Gedurende die afgelope vier jaar is hierdie werk deur 'n beurs van die Instituut van Administrateurs van Nie-Blanke Aangeleenthede gesteun. Die Instituut het besluit om hulle ondersteuning op 'n langtermynbasis voort te sit en het aanbeveel dat Munisipaliteite 0.1 persent van die waarde van hulle broueryproduksie tot die beurs bydra. Dit is miskien toepaslik om hier te meld dat die produksie van kafferbier deur munisipaliteite nou byna veertig miljoen gallon per jaar bedra.

Die studie van die moutingskwaliteit van verskillende variëteite kafferkoring is in samewerking met die Potchefstroomse Landboukollege voortgesit. 'n Begin is gemaak met 'n ondersoek van die verwantskap tussen die moutingsgedrag en die stikstofinhoud van die graan met die doel om 'n eenvoudige toets vir die keuse van kafferkoring vir mouting te probeer ontwerp.

Tot hede is die kwaliteit van kafferkoringmout slegs op sy versuikeringswaarde beoordeel. Daar is egter besef dat dit nie die enigste faktor is wat die doeltreffendheid van die mout in die brouproses bepaal nie. Aandag word dus nou gewy aan die bestudering van die rol wat deur „versagting” gespeel word. 'n Aantal verskillende metodes is ontwikkel om die mate van versagting van garsmoute te meet. 'n Begin is hier gemaak met 'n ondersoek van die toepaslikheid van etlike daarvan vir die vasstelling van die broukwaliteit van kafferkoringmoute. Hierdie werk is van onmiddellike belang vir brouers aangesien moute wat 'n

powder. Separation and further purification of the two β -glucosidases were achieved by chromatographic fractionation on both calcium phosphate and DEAE-cellulose adsorbents. Work on the characterization of these two β -glucosidases is in progress.

Wattle Wood

Studies on the hemicelluloses of wattle wood (*Acacia mollissima*) were continued. Work was concentrated on the water soluble fractions. The effect of hemicellulase enzymes on these fractions was investigated, in order to obtain identifiable oligosaccharides.

Wood Pulping Studies

During the year all the necessary laboratory pulping and sheet forming equipment arrived and was installed.

A large number of wood samples were pulped under standard conditions and formed into sheets. The sheets were tested for various physical properties by the S.A. Bureau of Standards Paper Testing Section. When sufficient of these data are available on timbers from various localities, it will aid in the assessment of the pulping qualities of these timbers, and in the planning of long-term requirements.

Kaffircorn and Kaffir Beer

This work has been supported over the past four years by a fellowship from the Institute of Administrators of Non-European Affairs. The Institute has decided to continue its support on a long term basis and has recommended that municipalities should contribute 0.1% of the value of the production of their breweries to the fellowship fund. It is perhaps pertinent to recall here that the production of kaffir beer by municipalities is now almost forty million gallons per annum.

The study of the malting of different varieties of kaffircorn was continued in collaboration with the Potchefstroom Agricultural College. A study of the relationship between malting behaviour and nitrogen content of the grain was initiated with the object of developing a simple test for the selection of kaffircorn for malting.

Up to now the quality of kaffircorn malt has been judged solely on its diastatic power. It was realized that this was not the only factor determining the performance of the malt in brewing. Attention is now being given to the part played by “modification”. A multiplicity of tests have been developed to measure the degree of modification of barley malts. A start was made with the investigation of the suitability of these for assessing the brewing quality of kaffircorn malts. This work is of immediate interest to the brewers because some malts, which have adequate diastatic

genoegsame versuikeringsvermoë besit, maar nogtans swak resultate in die brouery lewer weens slegte versagting, onlangs in die handel verskyn het.

Die styselinhoud van die rumateriale wat gebruik word vir die brou van kafferbier, asook dié van die bierafval van verskeie brouerye is ondersoek. Party van die bierafvalmonsters het tot 50 persent stysel bevat; dit wys op ondoeltreffende gebruik van stysel gedurende die brouproses.

'n Metode vir die bepaling van die mate van vervorming van stysel in kafferkoringgraan en -mout is ontwikkel. Dit is gebruik om die uitwerking van tyd, temperatuur, pH en soutkonsentrasie op die vervorming van stysel en sy vatbaarheid vir afbraak deur die mout-ensieme gedurende beslagmaking te bestudeer. Die voltooiing van hierdie werk bring die eerste stadium van die laboratoriumsondersoek in verband met die afbraak van stysel gedurende die brou van kafferbier tot sy einde. Terwyl sekere probleme, veral dié in verband met biersubstansie nog nie opgelos is nie, is genoegsame vordering gemaak om 'n wetenskaplike basis vir die verbetering van die brouproses te voorsien. Die werk het getoon dat baie van die brouerye 'n veel hoër verhouding van mout tot graan gebruik as wat nodig is om die ensieme te voorsien vir die afbraak van die stysel en die graan. Die stysel in die mout is nie doeltreffend gebruik nie en 'n groot gedeelte daarvan gaan dus in die bierafval verlore. 'n Reeks groot-skaalse broutoetse is in samewerking met die Pretoriase munisipale brouery uitgevoer om die optimumverhouding van mout tot graan vir moute van verskillende versuikeringswaardes te bepaal. As gevolg hiervan is aanbevelings vir 'n verbeterde brouresep gemaak.

Grootskaalse broutoetse is ook uitgevoer om uit te vind of dit moontlik is om filtrasie van die bier uit te skakel. Belowende resultate is verkry deur gebruik te maak van baie fyn gemaalde mout en graan. Hierdie ondersoek word nog voortgesit.

'n Laboratoriumstudie van die lot van die stikstofhoudende bestanddele van die graan gedurende die moutings- en brouprosesse is begin. Spesiale aandag word gewy aan die verhouding tussen die afbraak van die eiwitte gedurende die moutingsproses en die versagting van die mout.

'n Masjien vir die was van bierbekers is in samewerking met die Sentrale Werkswinkels ontwerp. Drie

power but are unsatisfactory for brewing because they are poorly modified, have recently appeared on the market.

A survey was made of the starch content of the raw materials used for kaffir beer brewing and of the spent grains from a number of breweries. The spent grains were found to contain up to 50% starch in some cases. This indicates inefficient utilization of starch during brewing.

A method was developed for determining the degree of gelatinization of the starch in kaffircorn grain and malt. This was used to study the effect of time, temperature, pH and salt concentration on the gelatinization of the starch and its susceptibility to breakdown by the malt enzymes during mashing. The completion of this work brings to a conclusion the first stage of the laboratory investigations on the breakdown of starch during the brewing of kaffir beer. While certain problems, particularly in relation to beer "body", remain to be solved, sufficient has been done to provide a scientific basis for the improvement of the brewing process. The work has shown that many breweries use a much higher proportion of malt than is required to supply the enzymes needed to convert the starch in the grain into sugar. The starch in this malt is poorly utilized and much is discarded in the spent grains. A series of large scale brewing tests were carried out in collaboration with the Pretoria Municipal Brewery to determine the optimum proportions of malt and grain to be used with malts of different diastatic powers. As a result of these tests, recommendations for an improved brewing recipe were made.

Large scale brewing tests were also carried out to see whether it was possible to eliminate the need for straining the beer. Promising results were obtained with the use of finely ground malt and grain. Work on this project is continuing.

A laboratory study of the fate of the nitrogenous constituents of the grain during malting and brewing was started. Attention is being paid in particular to the breakdown of the proteins during malting in relation to "modification".

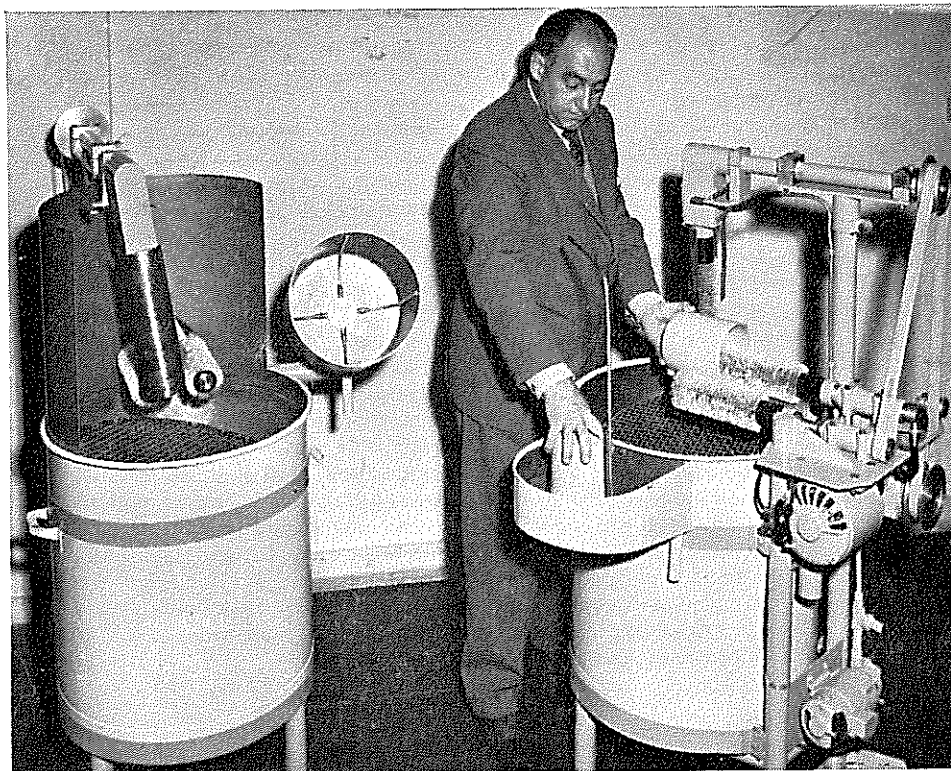
In collaboration with the Central Workshops, a machine was designed to wash beer mugs. Three

masjiene is gebou en onder praktiese toestande getoets. Die masjiene was die bekers baie doeltreffender en vinniger as handarbeid. Die ingebruikneming daarvan sal 'n belangrike bydrae tot higiëne in Bantoeetsale wees.

Verskeie munisipaliteite en moutprodusente wat tot die navorsingsbeurs bygedra het is van advies in verband met proses- en toerustingprobleme gedien.

machines were built and tested under practical conditions. The machine washes mugs much more rapidly and efficiently than is possible by hand. Its use should make an important contribution to the improvement of hygiene in the Bantu eating houses.

Advice on individual problems of processing and equipment was given to a number of municipalities and maltsters who are contributors to the fellowship.



Bierbeker-wasmasjiene

Beer mug washing machine

MEDIËSE BIOCHEMIE

Die Chemiese Meganisme van Kankerverwekking

Hierdie werk geniet nog die ondersteuning van die Nasionale Kankervereniging en word onderneem in samewerking met die W.N.N.R. se Voedingnavorsings eenheid aan die Universiteit van die Witwatersrand. Studies oor die effek van metale in verband met velkankerverwekking by rotte is uitgevoer. Dit is egter nog te vroeg om gevolgtrekkings te maak.

MEDICAL BIOCHEMISTRY

The Chemical Mechanism of Carcinogenesis

This work is still being supported by the National Cancer Association and is carried out in collaboration with the C.S.I.R. Nutrition Research Unit at the University of the Witwatersrand. Studies on the effect of metals in relation to rat skin carcinogenesis were carried out. It is as yet too early to draw any conclusions.

Aansienlike sukses is behaal met die fraksionasie van rotlewereiwitte deur middel van chromatografie op DEAE-sellulose en karboksietiel-sellulose. Stysel-elektroforese was baie effektief vir verdere fraksionering van fraksies uit bostaande afskeidings. Fraksionasie van die lewers van rotte wat op 3'-metiel-4-dimietiel-amino-asobenseen gevoer is, het duidelik aangetoon dat die kleurstof hoofsaaklik geassosieer is met 'n spesifieke eiwitfraksie.

Min aandag is tot nog toe bestee aan die binding van aminoasokleurstowwe deur bloedeiwitte. Dit is dus, sowel *in vivo* as *in vitro*, ondersoek. 'n Aansienlike hoeveelheid eiwitgebonde polêre kleurstof is in die serum gevind na 'n enkele dosis van 3'-metiel-4-dimietielaminoasobenseen *in vivo*. Kolomelektroforese van die serumeiwitte het aangetoon dat die polêre kleurstof aan die albumien gebind was. Die nie-polêre gebonde kleurstof was ook met die albumien geassosieer.

Die interaksie van p-dimietielaminoasobenseen (DMAB) en p-diëtielaminoasobenseen (DEAB) met beesserumalbumien *in vitro* is ondersoek met hulp van die dialiesetegniek. Dit het gebluk dat die nie-kankerverwekkende DEAB sterker deur die eiwit gebind is by pH 9.2 as die kankerverwekkende DMAB. Die binding het toegeneem met die pH van pH 4.3 tot pH 9.2.

Verdere werk is gedoen op die meganisme van die aksie van tripaanblou. Die snelheid waarmee die kleurstof uit die bloed verdwyn, is bepaal na 'n enkele injeksie. Die chromatografiese skeiding van tripaanblou in sy blou en rooi komponente is verbeter. Die werk word herhaal op groter skaal om voldoende van die verskillende fraksies te produseer vir die toets van hul kankerverwekkende aktiwiteit.

Die betrekking tussen die kankerverwekkende aktiwiteit van 'n aantal aminoasoverbindings en die stabiliteit van die *cis*-isomeer is ondersoek. Die isomerisasiesnelheid van die *cis*-na die *trans*-vorm is gemeet in waterige alkoholoplossings wat bytsoda bevat het. Die halfleeftyd van die *cis*-isomere van die meeste kankerverwekkende p-aminoasobenseenderivate was van dieselfde orde en was aansienlik groter as dié van verwante nie-kankerverwekkende derivate. Sekere uitsonderings op hierdie reël is egter gevind. By fisiologiese pH's en in die afwesigheid van alkohol was die *cis*-isomere van alle verbindings te onstabiel om aangetoon te word. Binding van die kleurstowwe deur serumeiwitte het die stabiliteit van die *cis*-isomere nie merkbaar verhoog nie. Dit is dus twyfelagtig of meetbare hoeveelhede *cis*-isomere *in vivo* gevorm word sodat hulle slegs 'n kortstondige rol in kankerverwekking kan hê.

Considerable success was achieved with the fractionation of rat liver proteins by means of chromatography on DEAE-cellulose and carboxy methyl cellulose. Starch gel electrophoresis was very effective in further fractionating fractions from the above separations. In fractionating livers from rats fed with 3'-methyl-4-dimethylaminoazobenzene it was clearly demonstrated that most of the dye is associated with a specific protein fraction.

Little attention has been paid to the binding of aminoazo dyes to blood proteins. This was therefore investigated, both *in vivo* and *in vitro*. A considerable amount of polar protein-bound dye was found in the serum after a single dose of 3'-methyl-4-dimethylaminoazobenzene *in vivo*. Column electrophoresis of the serum proteins showed that it was bound to the albumin. The non-polar bound dye was also associated with the albumin.

The interaction of p-dimethylaminoazobenzene (DMAB) and p-diethylaminoazobenzene (DEAB) with bovine serum albumin *in vitro* was studied by the dialysis technique. The extent of binding of the non-carcinogenic DEAB to the protein at pH 9.2 was found to be greater than that of the carcinogenic DMAB. The extent of binding increased with pH from pH 4.3 to pH 9.2.

Further work was done on the mechanism of action of trypan blue. The rate of disappearance of the dye from the blood after a single injection was determined. The chromatographic separation of trypan blue into its blue and red components was improved. The work is being repeated on a larger scale to produce sufficient of the different fractions for testing their carcinogenic activity.

The relationship between the carcinogenicity of a number of aminoazo compounds and the stability of the *cis* isomer was investigated. The rate of isomerization of the *cis* to the *trans* form was measured in aqueous alcoholic solutions containing sodium hydroxide. The half lives of the *cis* isomers of most carcinogenic p-aminoazobenzene derivatives were of the same order and were significantly greater than those of related non-carcinogenic derivatives. Certain exceptions to this rule were, however, encountered. At physiological pH's and in the absence of alcohol the *cis* isomers of all compounds were too unstable to be detected. Binding of the dyes on serum proteins did not increase the stability of the *cis* isomers measurably. It is doubtful therefore whether measurable quantities of *cis* isomers are formed *in vivo* so that their role in carcinogenesis, if any, must be a transient one.

Lipoproteïne in Aterosklerose

Die projek wat uitgevoer word in samewerking met die Mediese Navorsingsinstituut is voortgesit en uitgebrei tot leeftydsgroepe van minder as 20 jaar en meer as 60 jaar vir sowel Bantoe- as blanke persone. Die vorige gevolgtrekking dat die lipoproteïne-inhoud van blankes veel hoër is as dié van vergelykbare Bantoes, is bevestig in alle leeftydsgroepe. Die werk is voltooi en 'n verslag sal daarvoor gepubliseer word.

MIKROBIOLOGIESE CHEMIE

Wynnavorsing

Hierdie werk word deur die Wynindustriënavorsings-eenheid wat in die Westelike Provinsie Vrugtenavorsingsstasie te Stellenbosch gehuisves is, verrig. 'n Ooreenkoms tussen die W.N.N.R. en The Cape Distilling Merchant's Association is onderteken waarvolgens die werk in die toekoms gesamentlik ondersteun sal word.

Die studie oor die oorsake en voorkoming van biotiese troebelheid in Suid-Afrikaanse wyne maak goeie vordering. Die identifikasie van die giste wat vir die troebelheid verantwoordelik is, is afgehandel. Vir die klassifikasie van *Brettanomyces*-stamme wat tydens die werk geïsoleer is, was dit noodsaaklik om die taksonomie van hierdie genus opnuut te ondersoek. As gevolg hiervan is aanbevelings vir 'n hersiening van die klassifikasie van sekere soorte gemaak. Van die 79 *Brettanomyces*-stamme uit Suid-Afrikaanse wyne was 76 *Brett. intermedius* en die res *Brett. schanderlii*.

Die infeksiebronne en ander faktore wat die sekondêre ontwikkeling van giste in die wyn beïnvloed, is ondersoek. Kontak tussen lug en wyn het die groei van giste gestimuleer. Die verwydering van aanwezige aminosure deur die wyn oor 'n ionuitwisselaar te stuur, het die ontwikkeling van giste voorkom. Die aminosure het as stikstofbron vir die giste gedien. Onder anaërobiese toestande, wat by gebottelde wyn heers, kon die aminosure nie as enigste koolstofbron dien nie. Die ondersoek oor watter koolstofbron, veral by droë wyn, gebruik word, duur nog voort.

Die metabolisme van *Brettanomyces intermedius* en *Brett. schanderlii* is ondersoek om vas te stel wat die oorsaak vir hul veelvuldige voorkoms in Suid-Afrikaanse wyne is. Oorsee is gevind dat *Brettanomyces* soorte 'n abnormale gisting van glukose in stikstofryk media toon en daar is vermoed dat hulle miskien aminosure tot etanol fermenteer. Sorgvuldige herhaling van hierdie werk kon egter nie hierdie bewering staaf nie. Daar is ook berig dat *Brettanomyces* van ander giste verskil deurdat hulle onder aërobiese

Lipoproteins in Atherosclerosis

The collaborative project with the Medical Research Institute was continued and extended to include age groups from under 20 years to over 60 years of age of both Bantu and European subjects. The previous conclusion that the lipoprotein level in European subjects is much higher than in comparable Bantu subjects, was confirmed in all age groups. The work was completed and a report will be published.

MICROBIOLOGICAL CHEMISTRY

Wine Research

This work is carried out by the Wine Industry Research Unit which is accommodated at the Western Province Fruit Research Station at Stellenbosch. An agreement between the C.S.I.R. and the Cape Distilling Merchants' Association has been signed under which they will support the work jointly in future.

The study of the cause and prevention of biotic turbidity in South African wines made good progress. The identification of the yeasts responsible for turbidity was completed. In order to classify the strains of *Brettanomyces* isolated in the course of this work it was necessary to re-examine the taxonomy of this genus. As a result, recommendations were made for the revision of the classification of certain species. Of the 79 strains of *Brettanomyces* from South African wines, 76 were shown to be *Brett. intermedius* while the rest were *Brett. schanderlii*.

The sources of infection and other factors influencing the secondary development of yeasts in wine were investigated. Contact of the wine with air stimulated yeast growth. Removal of the amino acids present by passing the wine over an ion exchange resin prevented the development of yeasts. The role of the amino acids was to provide a nitrogen source for the yeasts; they could not be used as sole carbon sources under anaerobic conditions such as exist in bottled wines. The investigation of the nature of the carbon source used, particularly in dry wines, is continuing.

The metabolism of *Brettanomyces intermedius* and *Brett. schanderlii* were studied to try to throw a light on the reason for their high incidence in South African wines. It had been reported overseas that *Brettanomyces* species show an abnormal fermentative dissimilation of glucose in nitrogen-rich media and it was suggested that they may ferment amino acids to ethanol. Careful repetition of this work, however, failed to confirm this claim. Another respect in which *Brettanomyces* have been reported to differ from other yeasts is in their

toestande asynsuur vorm. 'n Studie van die oksidatiewe metabolisme van plaaslik geïsoleerde stamme is aan die gang.

Die ontwikkeling van „galsterigheid” is 'n ernstige probleem by rabatwyne. Voorlopige ondersoek het getoon dat hierdie gebrek deur 'n bakteriële infeksie veroorsaak word.

Spysvertering en Stofwisseling by die Herkouer

Hierdie ondersoek word in samewerking met die Veeartsenykundige Navorsingslaboratorium te Onderstepoort uitgevoer.

Die bakterieë van die grootpens kan volgens hulle vermoë om verskillende koolhidrate en afbraakprodukte van koolhidrate te fermenteer in stofwisselingsgroepe verdeel word. Die belangrikste groepe is dié wat onderskeidelik sellulose, stysel, glukose, xilose en laktaat verbruik. Veranderings in die aantal organismes in hierdie groepe het 'n uitwerking op die kondisie van die skape omdat hulle nie alleen die mate waarin verskillende bestanddele van die dieet in die grootpens afgebreek kan word, bepaal nie, maar ook die geaardheid van die gistingseindprodukte wat vir die dier beskikbaar kom, vasstel. Metodes vir die bepaling van die aantal bakterieë wat glukose, stysel en xilose verbruik, is ontwikkel, maar werk in verband met die telling van sellulose- en laktaatverbruikers is nog aan die gang. Bevredigende tellings van sellulosebakterieë kan verkry word by skape wat slegs op tefhooi, of tefhooi plus ureum en stysel/glukose gevoer word, maar nie in geval van skape wat lusern of tef en kragvoer kry nie. Isolering van die organismes het getoon dat daar verskille in morfologie en kolonievorm is tussen die sellulosebakterieë van diere op eersgenoemde en laasgenoemde diëte. Daar is aanduidings dat laasgenoemde organismes sterker reduesende toestande nodig het as eersgenoemde en dat die moeilikhede, wat met die tellings ondervind is, te wyte is aan 'n onvoldoende lae redokspotensiaal in die voedingsbodem. Pogings word aangewend om die voedingsbodem te verbeter.

Daar is 'n begin gemaak met 'n opname van die aantal bakterieë in die vyf vernaamste stofwisselingsgroepe in die grootpens van skape. 'n Skaap is 'n jaar lank op tefhooi en ureum gevoer, met afwisselend stysel en glukose as byvoer. Die gewig en die eetus van die dier is nie beïnvloed deur die omskakeling van stysel na glukose en omgekeerd nie. Die aantal rumenbakterieë het ook gedurende die hele eksperiment konstant gebly.

'n Tweede skaap is op tefhooi gevoer wat met 'n mengsel van ureum en melasse bespuit is. Hierdie dier het ook sy gewig en sy eetus behou. Die aantal bakterieë in die stofwisselingsgroepe was dieselfde as by die eerste skaap. Toe hierdie skaap op onbehandelde tef gevoer is en die ureum en melasse direk in die

production of acetic acid under aerobic conditions. A study of the oxidative metabolism of the local strains is in progress.

The development of “rancidity” is a serious problem in rebate wines. An exploratory study showed that this defect is due to bacterial infection of the wine.

Digestion and Metabolism in the Ruminant

This work is being carried out in collaboration with the Veterinary Research Laboratories at Onderstepoort.

The bacteria in the rumen can be divided into metabolic groups according to their ability to ferment different carbohydrates and carbohydrate breakdown products. The most important groups are those which utilize cellulose, starch, glucose, xylose and lactate respectively. Variations in the numbers of organisms in these groups affect the well being of the sheep since they determine not only the extent to which different constituents of the diet can be broken down in the rumen, but also what end products of fermentation are made available to the animal. Methods were developed for counting the numbers of glucose, starch and xylose utilizers. Work on methods for counting cellulose and lactate utilizers is continuing. Satisfactory counts for cellulose fermenters can be obtained in sheep fed teff hay alone or teff, urea and starch or glucose but not in those fed lucerne or teff and concentrates. Isolations of the organisms revealed that there are differences in morphology and colony form of the cellulolytic bacteria from animals on the former and on the latter diets. There are indications that the latter organisms require more reducing conditions than the former and that the difficulties in counting them are due to failure to maintain a sufficiently low redox potential in the growth medium. Efforts are being made to improve the medium.

A survey of the numbers of bacteria in the five main metabolic groups in the rumen of sheep on different diets was started. A sheep was maintained for a year on teff hay and urea supplemented alternately with starch and with glucose. The weight and appetite of the animal were unaffected by the change from starch to glucose and vice versa. The numbers of the rumen bacteria also remained constant throughout the experiment.

A second sheep was fed teff hay sprayed with a mixture of molasses and urea. This animal also maintained its weight and appetite. The numbers in the metabolic groups of bacteria were the same as in the first sheep. When this sheep was fed plain teff and the urea and molasses were dosed directly into the rumen the

grootpens gedoseer is, het die hooiverbruik van die dier na 11-13 weke op hierdie dieet gedaal, en het hy vinnig gewig verloor. Terselfdertyd het daar 'n honderdvoudige toename in die aantal stysel- en glukoseverbruikende bakterieë in die grootpens voorgekom en 'n tienvoudige afname van sellulosebakterieë. 'n Moontlike verklaring vir hierdie oorgroeiing van die sellulosebakterieë deur die stysel- en glukoseverbruikers is dat laasgenoemde vinniger kan groei as eersgenoemde en dus in staat is om met meer sukses vir die beperkte hoeveelheid beskikbare eiwit in die teffdieet mee te ding. Om dié veronderstelling te toets, is daar 'n begin gemaak met *in vivo* en *in vitro* bepaling van die groei-snelhede van die verskillende groepe bakterieë. Hierdie werk word voortgesit.

Stikstofbalansstudies het getoon dat die byvoeging van kobalt aan 'n dieet van tefhooi, ureum en stysel of glukose 'n verbeterde stikstofretensie teweegbring. Intramuskulêre inspuiting van vitamien B₁₂, daarenteen, het geen uitwerking op die stikstofbalans gehad nie. Dit dui aan dat kobalt die omsetting van ureum tot bakteriële eiwit, wat op sy beurt deur die skaap benuttig kan word, stimuleer. Die effek van kobalt voeding op die aantalle en tipes rumenbakterieë word ondersoek.

PROSESONTWIKKELING EN PROEFAANLEGWERKSAAMHEDE

Waterontsouting deur Elektrodialise

Die belangrikste aktiwiteit van die Afdeling was die instandhouding van nuwe tegniese samewerking met die betrokke mynmaatskappye by die oprigting van die ontsoutingsinstallasie wat twee-en-'n-half miljoen gellings per dag kan ontsout by die Free State Geduld myn te Welkom, O.V.S., wat in Januarie 1959 op 'n eksperimentele basis in werking gebring is.

Gedurende hierdie tydperk is verbeterde onderdele vir die elektrodialitiese pers ontwikkel en in genoemde installasie ingebou en 'n uitgebreide program van ioonselektiewe membraantoetse is in die laboratorium uitgevoer.

Elektrodialitiese ontsoutingstoetse op laboratorium- al het groter aandag geniet, veral met die doel om die gedrag van nuwe tipes membrane wat beskikbaar word of in die handel of van navorsingsinrigtings, te toets, en om die uitwerking van verskillende faktore by die ontwerp van elektrodialise-eenhede te ondersoek. Die fundamentele ondersoekings van polarisasie by membraan-elektrolietgrensvlakke, die meganisme van sekere tipes skaalvorming en skaalverwydering deur die metode van omgekeerde polariteit, het 'n belangrike deel van die werksaamhede uitgemaak.

animal's hay consumption dropped after 11-13 weeks on this regimen and it lost weight rapidly. At the same time there was a hundred-fold increase in the numbers of starch and glucose utilizing bacteria in the rumen and a ten-fold decrease in the cellulose digesters. An explanation for this overgrowing of the cellulolytic bacteria by the starch and glucose utilizers may be that the latter can grow faster than the former and are therefore able to compete more successfully for the limited amount of protein available in a teff diet. To test this, *in vivo* and *in vitro* studies of the growth rates of the different groups of bacteria were started. This work is continuing.

Nitrogen balance studies showed that addition of cobalt to a diet of teff hay, urea and starch or glucose gave improved nitrogen retention. Intramuscular injections of vitamin B₁₂, on the other hand, had no effect on the nitrogen balance. This suggests that cobalt stimulates the conversion of urea to bacterial protein which can then be utilized by the sheep. The effect of cobalt feeding on the numbers and types of rumen bacteria is being studied.

PROCESS DEVELOPMENT AND PILOT PLANT ACTIVITIES

Water Demineralization by Electrodialysis

The major effort was concerned with the maintenance of close technical liaison with the mining companies concerned on the erection and commissioning of the two-and-a-half million gallon per day plant at the Free State Geduld plant at Welkom, Orange Free State, which was started up on an experimental basis early in January, 1959.

In this period improved electrodialysis press components were designed and incorporated in the above plant, and an extensive programme of permselective membrane testing was carried out in the laboratory.

Laboratory scale electrodialytic desalting tests were the subject of increased effort, particularly with a view to testing the behaviour of new types of membranes that became available either commercially, or from research organisations, and to investigating the effect of various design parameters of electrodialysis units. Important studies were also those devoted to fundamental investigations on polarization at membrane-electrolyte interfaces, and the mechanism of certain types of scale formation, and of scale removal by reversal of the polarity of the system.

'n Groot probleem in die ontwikkeling van groot-skaalse eenhede vir elektrodialitiese ontsouting was die tekort aan membrane, in die gewenste aantal en grootte wat in die handel bekombaar is. Afgesien van die perkamentpapiermembrane wat deur die W.N.N.R. ontwikkel is en wat tans op grootskaal deur die Permutit Company Ltd. in Engeland vir die Free State Geduld ontsoutingsinstallasie vervaardig word, is die membrane wat tans verkrygbaar is, slegs geskik vir betreklik klein ontsoutingseenhede, en dit gee dus geen informasie aangaande die gelykmatigheid en kwaliteit wat met grootskaalse produksie verkry sal kan word nie. Daar word dus volgehou met die pogings om verbeterde membrane teen laer koste te ontwikkel.

Planne vir die oprigting van 'n elektrodialiseproef-eenheid te Luderitz, Suid-Wes-Afrika, vir die ontsouting van seewater, is vertraag aangesien die toerusting nie betyds verkry kon word nie. Daar is egter finaal besluit om die toetse teen die middel van 1959 te begin.

Met die ontwikkeling en toetsing van eenvoudige eenhede vir elektrodialitiese waterontsouting vir die produksie van drinkwater vir beeste en skape van gekonsentreerde ondergrondse brakwater, is voortgegaan. Een sodanige eenheid is in November 1958 naby Worcester, Kaapprovinsie, as proefneming opgerig. Hierdie eenheid was veral opgerig met die doel om verskillende metodes vir of die voorkoming of die verwydering van skaal op membrane, wat as gevolg van die hardheid van hierdie brakwater gevorm word, te toets.

Die doel van hierdie ontsoutingswerk was nie soseer daarop toegespits om die bestaande kommersiële eenhede te toets nie, maar eerder om eenhede te ontwerp wat eenvoudiger is en waarvan die kapitale koste en die bedryfskoste laer sal wees. Die moontlikheid om water vir besproeiingsdoeleindes te produseer is nie ondersoek nie.

Moontlike verbruikers is na handelsfirmas verwys wat eenhede vir elektrodialitiese ontsouting adverteer, maar dit skyn asof die kapitale koste sowel as die bedryfskoste nog te hoog is om vir boere in Suid-Afrika aantreklik te wees.

'n Personeellid het 'n referaat oor elektrodialise aan die Internasionale konferensie oor die probleme van Droë Streke wat in September 1958 gehou is, gelewer. Nuwe samewerking met oorsese organisasies wat op die gebied van waterontsouting werk, is gehandhaaf.

'n Monografie wat oor elektrodialise handel, met spesiale verwysing na die werk in Suid-Afrika gedurende die afgelope ses jaar, word tans voltooi en sal binnekort gepubliseer word.

Verbeterde Elektrodes

'n Nuwe projek het ontstaan uit die waterontsoutingswerk. Dit staan in verband met die ontwikkeling van

One major handicap to the development of large scale electro-dialytic desalting plants was the lack of commercial supplies of membranes of the size and quantity required. Apart from the parchment-based membranes developed by the C.S.I.R. and manufactured by the Permutit Company Ltd, England, on the large scale for the Free State Geduld water desalting plant, membranes available represented relatively small production units and therefore gave no indication of the uniformity and degree of quality that might be realised on large scale production. Efforts were, therefore, continued to develop improved low-cost membranes.

Plans for operating a test electro-dialysis unit at Luderitz, South West Africa, to desalt sea water were held up owing to delays in the supply of certain equipment. Tests were finally scheduled for mid 1959.

Increased effort was placed on the development and testing of simple electro-dialytic water desalting units for the production from highly brack underground waters of drinking water for cattle and sheep. One such unit was put into the field in November, 1958, near Worcester, Cape Province, for testing. This unit was operated particularly with the intention of testing different methods of either preventing, or for removing scale on membranes, arising from operation on brack waters with a very high hardness content.

The aim of this desalting work was not so much to tests units of existing commercial design as to develop units along new lines that could lead to simpler operation and to lower first cost and lower running costs. The production of water for irrigation was not attempted.

Potential users were put in touch with commercial firms offering electro-dialytic desalting units, but the reaction seemed to be that both capital and operating costs were so far too high for the process to attract farmers in South Africa.

A staff member presented a paper on electro-dialysis at an International Conference on Arid Areas Problems held in September, 1958, and close liaison was maintained with overseas organizations working in the water desalting field.

A monograph on electro-dialysis, with particular reference to the South African work of the past six years, is being completed and will be published shortly.

Improved Electrodes

A new project arose from the water desalting work. This concerned the development of improved graphite

verbeterde grafiëlelektrodes vir die elektrodialise van brakwater wat 'n hoë konsentrasie sulfate bevat. 'n Handelsfirma het belangstelling in hierdie werk getoon en dit is as gevolg daarvan uitgebrei om 'n meer algemene veld te dek.

Ondersoeke in verband met Reuke Afkomstig van die Nywerhede

Die kontrak wat aangegaan is met 'n industriële firma vir die verwydering van onaangename reuke, is voortgesit. Uitstekende resultate is verkry en daardeur is die probleem vir die omliggende gebiede geheel en al uit die weg geruim.

Ad hoc Probleme en Diverse Dienste

Hierdie probleme en dienste is tot die minimum verminder en slegs beperk tot sodanige navrae wat met behulp van bestaande ondervinding beantwoord kan word. In die meeste gevalle is hierdie soort werke uitgevoer vir, of in samewerking met, ander afdelings van die W.N.N.R.

Studie van Ioonselektiewe Membrane

Fisies-chemiese eienskappe: Die opstelling van 'n uitgebreide oorsig van die fisiese chemie van ioonselektiewe membrane, wat die werk wat in hierdie laboratorium gedoen is insluit, het 'n groot deel van die tyd van die afgelope jaar in beslag geneem. Die bestudering van die gedrag van W.N.N.R. se negatiewe membrane in oplossings wat barium- en natriumione bevat, is voltooi. 'n Kort studie van die uitwerking van ferriene op hierdie membrane is ook gemaak.

Die opstelling van die apparaat vir die ondersoek van die elektrokinetiese verskynsels in ioonselektiewe membrane is begin. Spesiale wandlose pompe wat gebruik gaan word vir die studie van anomale osmose, is ontwerp en opgerig. Twee elektrokinetiese verskynsels, naamlik, elektro-osmose en anomale osmose, het 'n belangrike uitwerking op die behandeling van gekonsentreerde brakwater deur elektrodialise.

'n Elektrometriese metode vir die bepaling van konsentrasie polarisasie aan die oppervlakte van ioonselektiewe membrane is bestudeer. Die metode, wat die meting van die afname in die konsentrasiepotensiaal wat te weeg gebring word deur polarisasie insluit, skyn in sekere opsigte meer veelsydig te wees as bestaande metodes om hierdie verskynsel te bestudeer. Tot dusver

electrodes for electrodialysis of brack waters in the presence of high sulphate concentrations. A commercial firm expressed interest in this work which was then extended to cover a much wider field of application.

Industrial Odour Investigations

A contract with an industrial firm for the elimination of process odours was continued. Excellent results were obtained and the nuisance to the surrounding communities was entirely eliminated.

Ad hoc Problems and Miscellaneous Services

These were reduced to the minimum and were confined to matters on which answers could be given on the basis of existing experience. Most work of this type was carried out for, or in conjunction with, other sections of the C.S.I.R. organization.

Studies on Permselective Membranes

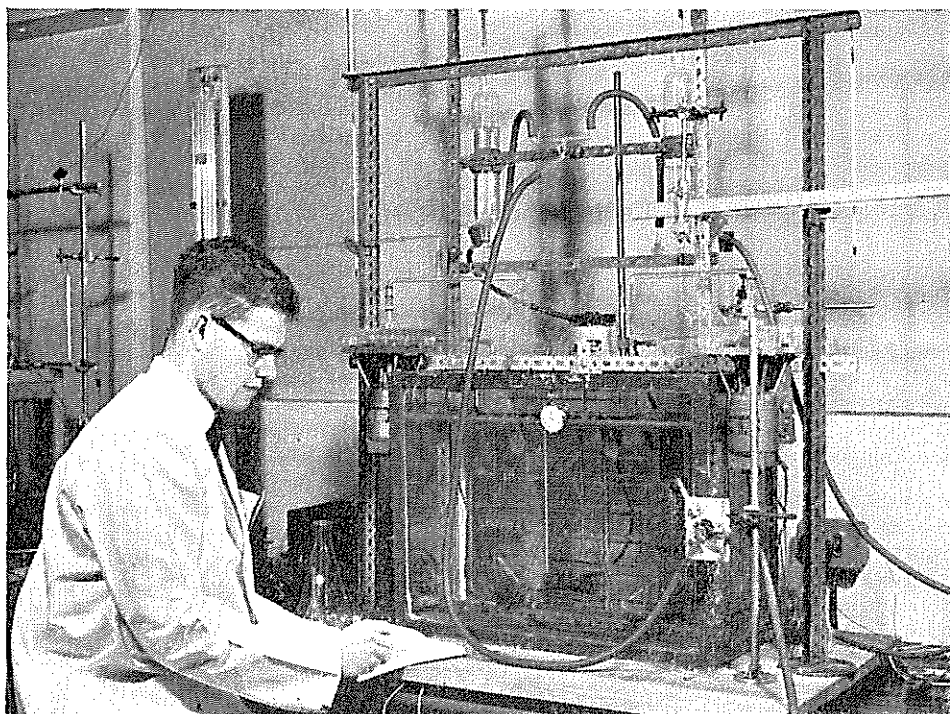
Physico-chemical properties: The preparation of an extensive review on the physical chemistry of permselective membranes, which includes an account of work carried out in this Laboratory, has occupied a great deal of time during the past year. The study of the behaviour of C.S.I.R. negative membranes in solutions containing barium and sodium ions has been completed. A brief study was also made of the effect of ferric ion on these membranes.

The assembly of apparatus for the study of electrokinetic phenomena in permselective membranes has been commenced. For an apparatus to be used in the study of anomalous osmosis, special glandless pumps were designed and constructed. Two electrokinetic phenomena, electro-osmosis and anomalous osmosis, have an important bearing on the treatment of highly saline water by electrodialysis.

An electrometric method of determining concentration polarization at the surfaces of permselective membranes has been studied. The method, which involves measuring the decay of the concentration potential created by polarization, appears in some respects to be more versatile than existing methods of studying the

is sisteme sonder beroering bestudeer, en die elektriese probleme wat met die meting gepaard gaan, opgeklaar. Alhoewel groter probleme verwag word, is dit die bedoeling om hierdie metode toe te pas op elektrodialitiese apparate wat onder normale toestande werk. 'n Begin is ook gemaak met die bestudering van die verwantskap tussen grensvlakkonsentrasies en die voorkoms van waterstof- en hidroksiëlioonvervoer deur gepolariseerde membraansisteme.

phenomenon. Thus far, systems without agitation have been studied, and the electrical difficulties associated with the measurement cleared up. Although greater difficulties are expected, it is intended to apply the method to electrodialysis apparatus operating under normal conditions. A start was made with a study of the relation between interfacial concentrations and the occurrence of hydrogen and hydroxyl ion transport through polarized membrane systems.



Apparaat vir die bepaling van osmotiese verskynsels in ioon-selektiewe membraane

Apparatus for the determination of osmotic phenomena in ion-selective membranes

Ontwikkeling van nuwe membraane: Gedurende die jaar is 'n begin gemaak met die bestudering van die sintese van stabiele anioonuitruilingsmembraane.

Aangesien guanidienformaldehydharze te onstabiel is, is die gebruik van polistireen en polivinielpiridien oorweeg. Polymerisasie van die monomere op papier is onprakties, en pogings is aangewend in verband met die kruisbinding van lineêre polimere op papier. Kruisbinding is verkry deur middel van verskeie chemiese metodes, hoewel 'n hoë graad van kruisbinding nie saam met 'n sterk-basiskapasiteit gekombineer kon word nie. Atoombestraling het kruisbinding veroorsaak, maar hierdie tegniek is slegs op klein skaal prakties.

Development of new membranes: Studies on the synthesis of stable anion-exchange membranes started during the year.

Because guanidine-formaldehyde resins were too unstable, polystyrene and polyvinylpyridine were considered. Polymerization of the monomers on paper sheets was impractical, and efforts were made to cross-link linear polymers on paper. Cross-linking was achieved by various chemical means but a high degree of cross-linking could not be combined with high strong base capacity. Atomic radiation induced cross-linking but this technique is practicable only on a small scale.

Membrane is berei van mengsels van oplosbare kwaternêre sout (monomeries sowel as polimeries) en onoplosbare harse (amienaldehyd, fenolaldehyd, epoksied en viniel), maar die elektrochemiese eienskappe was onbevredigend.

Pogings is aangewend om nuwe tipes harse met 'n sterk basis te vind, maar sonder sukses. Vir hierdie doel was doek nie geskik nie, maar die toetse op poliëteleen het 'n mate van belofte getoon.

FISIËSE EN ANALITIESE CHEMIE

Diffusiestudies

In die vorige jaarverslag is die werk op die selfdiffusie in twee binêre vloeistofsisteme gerapporteer. In die afgelope jaar is 'n derde sisteem bestudeer. Dit omvat koolstoftetrachloried as een komponent en 'n aansienlike tyd is gespandeer om 'n geskikte tegniek vir hierdie stof te ontwerp. Eerstens is dit gemerk met chloor-36 met die voorneme om dit in die dampfase te tel deur gebruik te maak van 'n Geigerteller met 'n dun wand. Dit het uiters onbevredigend geblyk te wees wanneer koolstoftetrachloried as die mindere komponent in die mengsel aanwesig is. Gelukkig is gedurende die afgelope jaar 'n sintillasiesteller aangekoop waarmee dit 'n betreklik maklike saak was om mengsels wat gemerkte koolstoftetrachloried bevat, te tel.

Voorlopige werk is gedoen vir die ontwerp en konstruksie van 'n apparaat vir die meting van selfdiffusiekoëffisiënte in gasmengsels. Tot dusver is nog nie bevredigende reproduseerbare en akkurate resultate verkry nie, sodat die apparaat dus verder verander moet word.

Radiochemie

Alhoewel hierdie afdeling voortgegaan het om sy dienste aan ander laboratoriums beskikbaar te stel, het die navorsingsprogram 'n groot verandering gedurende die periode in oorsig ondergaan toe 'n begin gemaak is met die studie van die uitwerking van bestraling op gasse en vloeistowwe. Verder is voortgegaan met ondersoeke om die meting van radioaktiewe speurders in die soliede, vloeibare en gasfases te verbeter.

Aangesien die aanvanklike uitwerking van bestraling op chemiese sisteme die vorming van sterk bekragtigde toestande is, is 'n ondersoek begin om hierdie uitwerking vir die stikstofbinding te benut. Voorlopige eksperimente met X-strale het aangetoon dat binding plaasgevind het maar die opbrengs was te klein om 'n noukeurige analise te maak. Aangesien dit duidelik geword het dat groter bronne van bestraling nodig is, word pogings aangewend om groot hoeveelhede geskikte splitsingsprodukte vir hierdie doel te gebruik.

'n Tweede navorsingsprojek i.v.m. bestralingschemie word gesamentlik met die Afdeling Radioaktiwiteit, Nasionale Fisiese Navorsingslaboratorium bestudeer in

Membranes were prepared from mixtures of soluble quarternary salts (both monomeric and polymeric) and insoluble resins (amine-aldehyde, phenol-aldehyde, epoxide and vinyl), but the electrochemical properties were unsatisfactory.

Attempts to prepare new types of strong base resins were unsuccessful. Cloth was unsuitable as a membrane base, but polyethylene sheets showed some promise.

PHYSICAL AND ANALYTICAL CHEMISTRY

Diffusion Studies

In the last annual report, work on self-diffusion in two binary liquid mixtures was reported. In the past year, a third system has been studied. This involved carbon tetrachloride as one component, and a considerable amount of time was spent in devising a suitable technique for this. At first, it was labelled with chlorine-36, with the intention of counting it in the vapour phase, using a thin-walled Geiger counter. This proved extremely unsatisfactory when carbon tetrachloride was the minor component in the mixture. Fortunately, in the course of the last year, a liquid scintillation counter was acquired and with this it proved a relatively easy matter to count mixtures containing labelled carbon tetrachloride.

Preliminary work has been carried out in the design and construction of apparatus for measurement of self-diffusion coefficients in gas mixtures. Thus far, satisfactory reproducibility and accuracy have not been achieved, so that the apparatus must be further modified.

Radiochemistry

Although this section continued to offer its services to other laboratories, the research programme underwent a major change during the period under review, when a start was made with the study of radiation effects on gases and on liquids. In addition investigations were continued on improving the measurement of radioactive tracers in solid, liquid and gaseous phases.

Since the primary effects of radiation on chemical systems led to the formation of highly energized states, an investigation was started to utilize this effect for the fixation of nitrogen. Initial experiments with X-rays showed that fixation did occur, but the yield was too small for adequate analysis. As it became clear that larger sources of radiation were necessary, attempts are being made to use large amounts of suitable fission products for this purpose.

A second research project on radiation chemistry is being studied jointly with the Radioactivity Division, National Physical Research Laboratory, in connection with the measurement of radiation dosage. The Fricke dosimeter, which is widely used for such measurement,

verband met die bestralingstempo. Die Fricke-stralingsmeter, wat algemeen gebruik word vir sulke metings, is gebaseer op die bepaling van die omvang van die oksidasie van ferro-oplossings gedurende radiolise. Die doel van hierdie ondersoek is om die opbrengs van ferri-ione per eenheid geabsorbeerde energie vas te stel en die gevolge van veranderlike kondisies op hierdie opbrengs te bepaal. Die resultate wys daarop dat die waarde wat 'n paar jaar gelede aangeneem is, te hoog is, maar dat die huidige waarde van omtrent 15 ione per 100 eV in goeie ooreenstemming is met die onlangse waardes wat oorsee verkry is.

Die ontwikkeling van akkurate en geskikte tegnieke is voortgesit. In verband met die lae-energie betastralers is die werk voltooi i.v.m. die meting van koolstof-14 as bariumkanbonaat op dun plaatjies in 'n proporsionele telbuis en hierdie projek is uitgebrei om kalsium-45 as die karbonaat, sulfaat, aksolaat en fosfaat en swawel-35 as bariumsulfaat, te meet. Op die oomblik word die meting van die 0.063 MeV beta-partikel van nikkell-63 deur dieselfde tegniek ondersoek en die moontlikheid om dit vir radium-alfa-telling te gebruik word ondersoek.

In verband met die analise van vloeistoffases is toetsing voltooi op die interne vloeistof-sintillasiestelling van organiese verbindings gemerk met koolstof-14; uitstekende resultate is verkry met dié verbindings wat in toluen oplosbaar is. Die moontlikheid om waterige oplossings met dieselfde metode te tel moet nog getoets word. Organiese verbindings gemerk met chloor-36 gee ook goeie resultate.

Die direkte telling van radioaktiewe gasse is ondersoek vir koolstofdiksied gemerk met koolstof-14. Alhoewel die metode suksesvol was, is gevind dat die metaalkatodes vergiftig word nadat hulle lank gebruik is. Hierdie probleem word ondersoek met die doel om geskikte metale vir die gebruik in telbuise te vind. Die laboratorium het voortgegaan om dienste te lewer aan ander laboratoria wat radioaktiewe isotope gebruik. Roetinekoolstof-14-analises is gedoen in verband met mediese navorsing en diffusiestudies. Terselfdertyd is personeel van ander afdelings opgelei om hulle in staat te stel om hulle eie ondersoeke te doen.

Hulp is weereens aan die Kernfisika-afdeling van die Nasionale Fisiese Navorsingslaboratorium verleen by die skeiding van isotope deur die siklotron geproduseer. Verskeie skeidings van kobalt is teweeggebring van bestraalde yster en die draer-vry gallium geproduseer in sinkskrywe is geskei. Die werk in verband met die skeiding van uraanverweringsprodukte is voltooi en 'n verslag is aan die Tweede Internasionale Konferensie oor die vreedsame aanwending van atoomenergie te Genève uitgebring. Die skeiding van UX_1 en UZ is uitgevoer van groot hoeveelhede uraan en hoeveelhede van hierdie materiaal is met gereelde tussenposes berei vir die Fisika-eenheid van die Raad op Atoomkrag in

is based on the determination of the extent of oxidation of ferrous solutions during radiolysis. The purpose of this investigation is to establish the yield of ferric ions per unit absorbed energy and to evaluate the effects of varying conditions on this yield. Results obtained showed that the value accepted a few years ago was too high, but that the present value of about 15 ions per 100 eV is in good agreement with recent values obtained overseas.

The development of more accurate and more suitable counting techniques continued. In connection with low-energy beta-emitters, work was completed on the measurement of carbon-14 as barium carbonate on thin plates in a proportional counter and this project was extended to include calcium-45 which was measured as carbonate, sulphate, oxalate and phosphate, and sulphur-35 measured as barium sulphate. At present the measurement of the 0.063 MeV beta-particle of nickel-63 is being investigated by the same technique and the possibility of using it for radium alpha counting is being tested.

In connection with liquid phase analysis, tests were completed on the internal liquid scintillation counting of organic compounds labelled with carbon-14. Excellent results were obtained for those compounds soluble in toluene. The possibility of counting aqueous solutions by the same method remains to be tested. Organic compounds labelled with chlorine-36 also gave good results.

The direct counting of radioactive gases was investigated with carbon dioxide labelled with carbon-14. Although the method proved successful, it was found that the metal cathodes became poisoned after prolonged use. This problem is being investigated with a view to finding suitable metals for use in the counters.

The laboratory continued to provide services for other laboratories using radio-isotopes. Routine carbon-14 analyses were carried out in connection with medical research and with diffusion studies. At the same time personnel from other sections were trained to enable them to carry out their own investigations.

Assistance was again rendered to the Nuclear Physics Division of the National Physical Research Laboratory in the separation of cyclotron-produced isotopes. Several separations of cobalt were effected from bombarded iron and the carrier-free gallium produced in zinc targets was separated. The work on the separation of uranium decay products was completed and reported at the Second International Conference on the Peaceful Uses of Atomic Energy at Geneva. The separation of UX_1 and UZ was carried out from multi-kilo quantities of uranium and sources of these materials were prepared at regular intervals for the Physics Unit of the

verband met die verklaring van die vervalskemas van hierdie nuklides.

Beter metodes om radioaktiewe neerslag te analiseer, word getoets. Gebruik word gemaak van die ioonuitruilingseienskappe van ammoniummolybdofosfaat om 'n vinnige skeiding van stronsium-90 en yttrium-90 teweeg te bring en die gebruik van hierdie verbinding vir die analise van die sesium-137-inhoud van seewater word ondersoek.

Vir landbounavorsing is verskeie verbindings gemerk met kalsium-45 berei en voorsien aan die afdeling Akkerbou en Weiding van die Departement van Landbou vir die bestudering van die seisoensopname van kalsium deur meerjarige grasse.

Korrosie

Werk gedurende die afgelope jaar het hoofsaaklik in verband gestaan met ondersoeke van korrosieprobleme wat ontstaan het in die nywerheid en in die verlening van hulp aan staatsdepartemente.

Die nuwe reeks blootstellingstoetse op gegalvaniseerde yster, waarvan melding gemaak is in die vorige verslag, is voltooi. Hierdie toetse toon aan dat passivering deur chroomsuurbehandeling langdurige beskerming selfs in see-atmosfere verleen.

Ioonuitruiling in Analise

Distribusiekurwes is vir 22 elemente in soutsuurmedia geteken en 'n metode is ontwikkel om torium te skei van ander katione deur gebruik te maak van AG 50 katioonuitruilingskolomme en soutsuur as elusiemiddel. Die metode is toegepas op die bepaling van torium in radioaktiewe minerale. Dit skyn besonder bruikbaar te wees om baie klein hoeveelhede torium van groot hoeveelhede ander katione te versamel en te skei. 'n Deel van die werk is opgeskryf vir publikasie.

Op versoek van die Spektrochemiese Afdeling van die Nasionale Fisiese Navorsingslaboratorium is 'n ondersoek begin na die moontlikheid van die gebruik van ioonuitruilingsmetodes vir die konsentrasie en skeiding van spoorelemente voor spektrochemiese analise. Dit skyn moontlik te wees om die spoorelemente van die massa steurende yster deur 'n enkele ioonuitruilingstap te skei deur 'n 120 cm lange kolom van AG 50 katioonuitruilinghars te gebruik.

Ondersoek i.v.m. die Sisteem Mangaan-kwik

Studie van die vaste fases: Soos aangetoon in die vorige jaarverslag is gegewens verkry wat 'n hersiening van die struktuur van Mn_2Hg_5 toegelaat het. Die enigste belangrike afwyking van die ideale struktuur, opgebou uit sferiese atome, was die verkorting van een kwikparameter met 0.2 Å. Dit het aanleiding gegee tot 'n beter gelykstelling van die verskillende Mn-Hg bindingslengtes in die struktuur.

Atomic Energy Board in connection with the elucidation of the decay schemes of these nuclides.

Better methods of analysing radioactive fall-out are being tested. Use is being made of the ion-exchange properties of ammonium molybdophosphate to effect rapid separation of strontium-90 and yttrium-90 and the use of this compound for the analysis of the caesium-137 content of sea water is being investigated.

For agricultural research various compounds labelled with calcium-45 were prepared and supplied to the Division of Crops and Pastures of the Department of Agriculture for the study of the seasonal uptake of calcium by perennial grasses.

Corrosion

Work during the past year has been mainly connected with carrying out investigations on corrosion problems arising in industry and in provision of assistance to Government Departments.

The new series of exposure tests on galvanised iron mentioned in the last report has been completed. These indicate that passivation by a chromic acid treatment bestows long term protection even in marine atmospheres.

Ion Exchange in Analysis

Distribution curves in hydrochloric acid media were prepared for 22 elements and a method was developed to separate thorium from the other cations using AG 50 cation exchange columns and hydrochloric acid as eluent. The method was applied to the determination of thorium in radioactive minerals. It seems to be especially useful for the purpose of gathering and separating very small amounts of thorium from large amounts of other cations. A part of the work was written up for publication.

At the request of the Spectrochemistry Section of the National Physical Research Laboratory an investigation of the possibility of applying ion exchange methods to the concentration and separation of trace elements prior to spectrochemical analysis was started. It seems that it will be possible to separate the trace elements from the bulk of the interfering iron by a single ion exchange step using a 120 cm. long column of AG 50 cation exchange resin.

Investigations on the System Manganese Mercury

Study of the solid phases: As indicated in the previous report data were obtained which permitted the structure of Mn_2Hg_5 to be refined. The only significant deviation from the ideal structure, built up of spherical atoms, was the contraction of one mercury parameter by 0.2 Å. This resulted in better equalizing of the various Mn-Hg bond lengths in the structure.

Die vorige magnetiese opmetings onder kamertemperatuur het aangetoon dat die twee fases $MnHg$ en Mn_2Hg_5 antiferromagneties mag wees. Termomagnetiese metings bo kamertemperatuur wat by die Brandstofnavorsingsinstituut gedoen is, het egter antiferromagnetiese curiepunte aangetoon. Die aanwezigheid van magnetiese rangskikking van die Mn-atome, wat lig sou werp op die stabiliteit van hierdie strukture, word op die oomblik by Harwell nagegaan d.m.v. neutrondiffraksie-eksperimente.

Fasediagram: 'n Drukvat vir termiese analise van die sisteem by hoë temperatuur is gebou maar geen verdere faseverandering kon waargeneem word tot 960° . Ernstige eksperimentele moeilikhede het die ondersoek by hoër temperature onmoontlik gemaak. Die fase-diagram bly dus onvolledig bokant hierdie temperatuur. Die werk i.v.m. hierdie sisteem is nou afgesluit.

Kinetika van die Termiese Ontbinding in Gasse

'n Studie van die termiese ontbinding van 'n aantal klasse organiese verbindings is begin met 'n ondersoek van metielnitraat. Hierdie stof is berei en gesuiwer en getoets vir suiwerheid d.m.v. gaschromatografie en massaspektrometrie. 'n Reaksieapparaat waarin drukke gedurende die reaksie kon gemeet word by konstante temperatuur, is gebou. Voorlopige eksperimente het aangetoon dat die reaksie van die eerste orde is, wat in ooreenstemming met die literatuur is. Dit is die plan om die produkte gedurende die reaksie gevorm met behulp van die massaspektrometer te bestudeer.

Ammoniummolibdofosfaat

Hierdie stof, welbekend aan analitiese skeikundiges vir die bepaling van fosfaat, het gebylk merkwaardige ioonuitruilingseienskappe te besit wat by geskikte keuse van kondisies, vir belangrike katioonskeidings gebruik kan word. Toepassings vind plaas in analise, maar een van die mees uitstaande eienskappe is die vermoë om monovalente katione uit te ruil en tussen hulle uit te kies. Dit ruil ammonium uit vir sesium en behou laasgenoemde so stewig dat dit geskik is as materiaal vir selektiewe herwinning van sesium-137 van splitsingsprodukte in kernreaktors. Dit is van belang aangesien sesium-137 'n lang halveringstyd het en die moontlikheid inhou om 'n geskikte bestralingsbron vir gebruik in die industrie te word. Die ioonuitruilingstoepassings van ammoniummolibdofosfaat is gedek deur patente.

Previous magnetic measurements below room temperature indicated that the two phases $MnHg$ and Mn_2Hg_5 might be antiferromagnetic. Thermomagnetic measurements above room temperature carried out at the Fuel Research Institute failed, however, to show up antiferromagnetic curie points. The presence of magnetic ordering of the Mn-atoms, which would throw light on the stability of these structures, is at present being followed up by neutron diffraction experiments at Harwell.

Phase diagram: A pressure vessel for high temperature thermal analysis of the system was constructed, but no further phase changes could be observed up to 960° . Severe experimental difficulties prevented the examination at higher temperatures. The phase diagram therefore remains incomplete above this temperature. The work on this system has now been concluded.

Kinetics of Thermal Decomposition in Gases

A study of thermal decomposition of a number of classes of organic compounds has been commenced with an investigation of methyl nitrate. This was prepared and purified and tested for purity by gas chromatography and mass spectrometry. A reaction apparatus was constructed in which pressures during the reaction could be measured at constant temperature. Preliminary experiments have shown that the reaction is of the first order, in accord with the literature. It is intended to follow products formed during the reaction by mass-spectrometer.

Ammonium Molybdophosphate

This substance, well known to analytical chemists for determination of phosphate, has been shown to possess remarkable ion-exchange properties which, under a suitable choice of conditions, enables it to be used for important cation separations. Applications occur in analysis, but one of the most outstanding characteristics is the ability to exchange monovalent cations and to select between them. It exchanges ammonium for caesium and retains the latter so firmly that it offers itself as a material for selective recovery of caesium-137 from fission products in nuclear reactors. This is important because caesium-137 has a long half life and promises to become a useful radiation source for use in industry. The ion exchange applications of ammonium molybdophosphate have been covered by patents.

Analitise Afdeling

Werk in hierdie laboratorium, afgesien van roetine-dienste, het die analise van verskeie vergelykings-monsters vir die nywerheid ingesluit.

Geochronologiese studies gerapporteer deur die Nasionale Fisiese Navorsingslaboratorium word uitgevoer in samewerking met hierdie afdeling. Skeidings van lood, uraan en torium vir massaspektrometeranalise is gemaak van 'n groot aantal monaziete, samarskiete en davidiete. 'n Verbeterde metode vir die skeiding van lood in aanwesigheid van fosfate is uitgewerk en vir publikasie voorberei.

Analytical Section

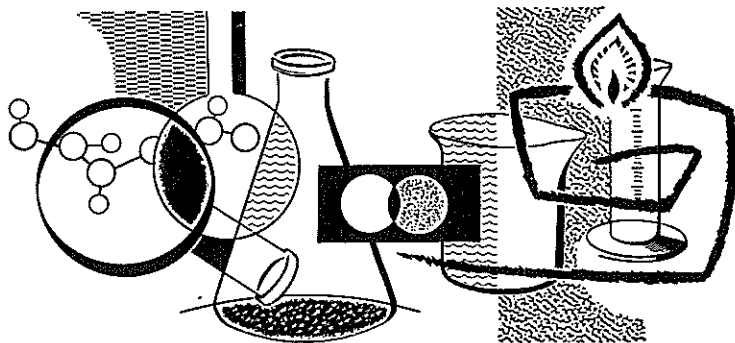
Work in this laboratory, apart from routine services, included analysis of several reference samples for industry.

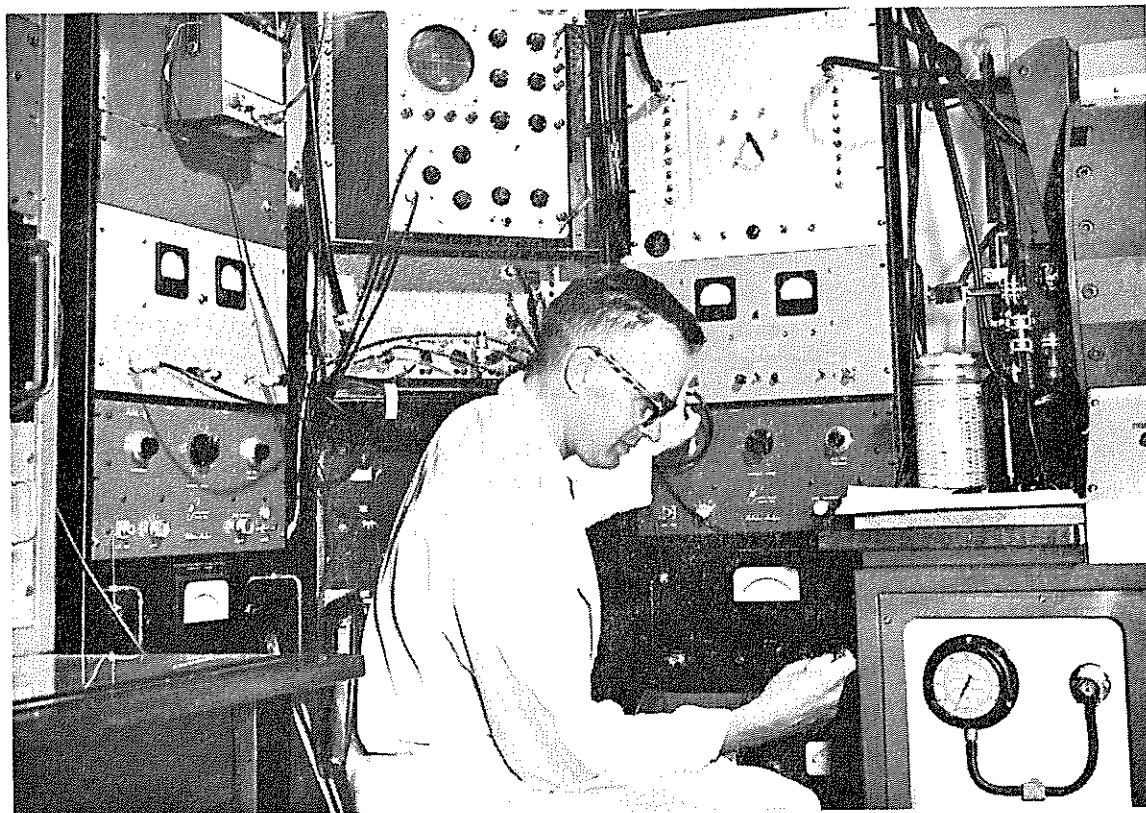
Geochronological studies reported by the National Physical Research Laboratory are being carried out in collaboration with this Section. Separations of lead, uranium and thorium for mass spectrometric analysis were made from a large number of monazites, samarskites and davidites. An improved method for separation of lead in the presence of phosphates was worked out and prepared for publication.

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Elektroniese toerusting by die Afdeling Kernfisika se tussenbeeldspektrometer. Hierdie toerusting is onder andere gebruik vir die ontrafeling van die ingewikkelde desintegrasië-skemas van Uraan- X_2 en Uraan Z

Electronic equipment at the intermediate image spectrometer of the Division of Nuclear Physics. This equipment was used, inter alia, for the unravelling of the complicated decay schemes of UX_2 and UZ

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL IV

NASIONALE FISIESE
NAVORSINGS-
LABORATORIUM

PART IV

NATIONAL PHYSICAL
RESEARCH LABORATORY

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
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NATIONALE FISIESE NAVORSINGS- LABORATORIUM

Direkteur: DR. E. J. MARAIS

KERNFISIKA

Die W.N.N.R.-Siklotron

Tot laat in 1958 is die siklotron gebruik vir bestralings met die oog op die eksperimentele navorsingsprogram in kernfisiika, en slegs wanneer die bestralingsprogram dit toegelaat het, is eksperimente uitgevoer in verband met die ekstraksie van die bundel. Hierdie eksperimente het getoon dat aansienlike wysigings aan die dee-stelsel, vakuumkamer en poolplate nodig sou wees om gunstiger ekstraksietoestande te skep en beter beheer oor die bundelbane moontlik te maak. Die geleentheid vir hierdie herkonstruksie is gebied deur die staking van eksperimentele werk. Dit is genoodsaak deur gebouveranderings wat onderneem is om 'n voor-geenome eksperimentele program met die siklotron moontlik te maak.

Die noodgedwonge onderbreking in die bestralings-roetine is verder benut om alle swak komponente op die masjien te vervang en 'n deeglike herbedrading van die beheersisteen deur te voer. 'n Optiese stelsel wat tans in aanbou is sal dit moontlik maak om uit die nuwe eksperimentekamer, dit wil sê uit 'n goedafgeskermdede posisie, in die vakuumkamer van die siklotron te kyk, en met behulp van verstelbare koolstofblokkies die pad van die bundel te volg. 'n Asimutale modulatie is met behulp van Thomas-folies op die magneetveld geplaas en beheer oor die radiale veldgradiënt word tans verkry deur middel van waterverkoelde spoel in die vakuumkamer.

'n Volledige beskrywing van die ontwerp, konstruksie en operasie van die siklotron is in die vorm van 'n W.N.N.R.-verslag uitgegee, en het ook in verkorte vorm in „Nuclear Instruments” verskyn. (Burgerjon, du Toit en Kritzinger, 1958.)

Verstrooiingseksperimente

Verstrooiingseksperimente bly nog steeds een van die belangrikste metodes vir die ondersoek van kernkragte. Die verstrooiing van siklotronversnelde alfastrale en deuterone met energieë van 38 MeV en 8 MeV respektiewelik, is met behulp van die emulsietegniek ondersoek. Die resultate wat behaal is, toon goeie ooreenstemming met Porter se teorie in die geval van alfa-verstrooiing, maar in die geval van deutronverstrooiing, was geen eenduidige interpretasie moontlik nie. Dit was duidelik dat die eksperiment by hoër bundelenergieë uitgevoer moet word om duideliker resultate te verkry.

NATIONAL PHYSICAL RESEARCH LABORATORY

Director: DR. E. J. MARAIS

NUCLEAR PHYSICS

The C.S.I.R. Cyclotron

The cyclotron was used till late in 1958 to radiate targets for the experimental research programme in Nuclear Physics. Experiments on the extraction of the beam could be performed only in between the radiations. The experiments showed that the dee system, vacuum chamber and pole plates would have to be modified considerably in order to obtain better extraction conditions and better control of the beam form. The experimental work had to stop when modifications to the building commenced and this opportunity was used to effect reconstruction. The changes in the building were necessitated by the experimental programme which is planned for the cyclotron.

During the unavoidable interruption in the routine radiation programme the opportunity was taken to replace all defective components on the cyclotron and to rewire the control system thoroughly. A new optical system is being built to enable an operator to look into the vacuum chamber of the cyclotron from the well shielded position of the new experimental room. The course of the beam inside the vacuum chamber will be followed with adjustable carbon blocks. Azimuthal modulation of the magnetic field is obtained with Thomas foils and the radial field gradient can now be changed with water-cooled coils inside the vacuum chamber.

A detailed description of the design, construction and operation was published in the form of a C.S.I.R. report and in condensed form in „Nuclear Instruments”. (Burgerjon, du Toit and Kritzinger, 1958.)

Scattering Experiments

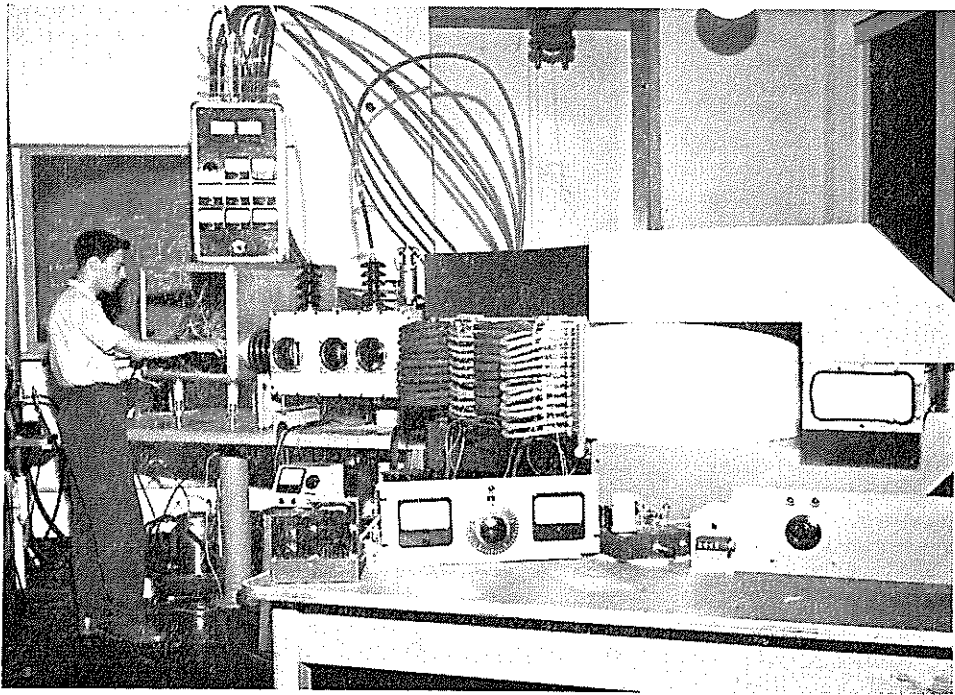
Scattering experiments are still one of the most important methods used to gain knowledge about nuclear forces. The scattering of cyclotron-accelerated alpha and deuteron beams of 38 Mev and 8 Mev respectively were determined using nuclear emulsion techniques. The results for the alpha beam correspond well with Porter's theory, but in the case of deuteron-scattering, no unique interpretation is possible. It is clear that experiments would have to be carried out at high beam energies to obtain clearer results.

Isotoopafskeier

Nadat die isotoopafskeier wat in hierdie laboratorium gebou is, aan voorlopige bedryfstoetse onderwerp is, is dit in finale bedryfsekere vorm opgestel. 'n Stabilisasie-apparaat, volgens 'n oorspronklike ontwerp, is opgebou en terselfdertyd is 'n apparaat geïnstalleer wat die massalyne op 'n ossilloskoop sigbaar maak. Dubbelfokusering is verkry deur middel van 'n nuwe lensstelsel en die oorspronklike ionebron vervang deur 'n gas-ionebron wat besonder geskik is vir toetsdoel-eindes. Toetsafskiedings van die stabiele isotope van sink, silwer en koper is deurgevoer en die moeilike skeiding van die radioaktiewe isotope fosfor-32 en fosfor-33 is baie suksesvol gedoen.

The Isotope Separator

The isotope separator, built in this laboratory, was completed and subjected to preliminary test runs and is now in good running order. A new stabilization system built to an original design, as well as a system to make the mass lines visible on an oscillograph screen, were installed. Double focussing was achieved with a new lens system and the ion source was replaced by a new gas ion source which is more suitable for testing purposes. Test separations were made on the stable isotopes of zinc, silver and copper. The difficult separation of the radio-active phosphorus-32 and phosphorus-33 isotopes was undertaken with very good results.



Die Isotoopafskeier van die N.Fis.N.L. se Afdeling Kernfisika

The isotope separator at the Nuclear Physics Division of the N.R.P.L.

Om werklik universeel bruikbaar te wees, moet die isotoopafskeier voorsien wees van ionebronne wat intense bundels uit vaste stowwe kan produseer. Hiervoor is heelwat oorspronklike ontwikkelingswerk nodig, en 'n spesiale toetsinstallasie, bestaande uit 'n vakuumsisteem, spanningsbronne en 'n afsuig- en opvangsisteem, is vir die doel opgebou. 'n Ionebron wat by hoë temperatuur werk, gebaseer op dié beskryf deur Nielsen van Kopenhagen, maar met die gloeidraad dig

An isotope separator is universally applicable only when it can be combined with ion sources which can produce intense ion beams out of solid substances. Developmental work must be undertaken in this direction and a special testing installation was built, consisting of a vacuum system, power sources, acceleration and collection systems. An ion source for high temperature work was built. It is based on the one built by Nielsen in Copenhagen, but has the filament

by die afsuigopening, is opgebou. Verder is voorbereiding gemaak vir die aanbring van 'n verstuiwings-elektrode met die oog op die uiteindelijke invoer van die siklotronbundel in die ionebrom.

Neutronefisika

Om aan beurshouers van die Raad op Atoomkrag die geleentheid te gee om vertrouwd te raak met die meting van neutrone, is 'n klein versneller opgebou wat kontinu bundels deutrone van 100 tot 200 mikroampère tot 140 KeV kan versnel. Die deutrone val op 'n skryf van swaar ys en lewer 'n intensiteit van 10^7 neutrone/sekonde soos gemeet met die aktivering van P^{31} . Dit is 'n 20 maal hoër intensiteit as dié van die Ra-Be-bron wat tot dusver beskikbaar was, en die versneller het die voordeel dat die neutrone nie vergesel word van deurdringende gamma-strale nie.

Dubbele Verstrooiing van Elektrone

Hoewel baie eksperimente reeds in verband met die dubbilverstrooiing van elektrone gedoen is, het hulle baie min betroubare resultate opgelewer en was daar nog steeds die moontlikheid om met goed-beplande eksperimente beter resultate te verkry. In die vorige jaarverslag is oor hierdie eksperimente verslag gedoen. Hierdie proewe is voortgesit en afgerond. Die eksperimentele resultate, wat die enigste beskikbare resultate in die gebied 80 KeV is, toon 'n asimmetrie wat slegs die helfte van die asimmetrie is wat deur die teorieë voorgespel word. (Schneider en Barnard, 1958.)

Interne Omvorming

Die bepaling van interne omvormingskoëffisiënte is een van die belangrikste eksperimentele benaderings tot die probleem van die wisselwerking tussen 'n kern en sy elektrone-omhulsel. Met behulp van die uiters noukeurige betaspektrometer met permanente magneet, was dit moontlik om omsettingslyne wat dig bymekaar lê en wat nog nie vantevore opgelos kon word nie, op te los en die relatiewe omsettingskoëffisiënte te bepaal.

Dit was onder andere moontlik om die L_{I-} , L_{II-} , L_{III-} en M-lyne van die 411.8 KeV oorgang in Hg^{198} op te los. Die resultate het getoon dat in hierdie geval die effek van eindige kerngrootte, indien aanwesig, klein is. In die geval van die 93.9 KeV-oorgang in Ag^{107} was die L_{I-} : L_{II-} : L_{III-} en K:L-verhoudings in uitstekende ooreenstemming met die teoretiese waardes, maar 'n afwyking is in die K:M-verhouding gevind. Dit is teruggevoer tot die feit dat die afskermingseffek nie in aanmerking geneem is in die teoretiese berekenings nie. Soortgelyke ondersoeke is deurgevoer op oorgange in Hg^{197m} . Die radioisotope wat vir hierdie ondersoeke gebruik is, is almal deur bestraling in die W.N.N.R.-siklotron vervaardig. Verskeie publikasies het oor hierdie werk verskyn. (Van Heerden, Reitmann en Schneider, 1958 en 1959—in pers.)

near to the extraction opening. Provision is made for introducing a sputtering electrode into the ion source with a view to the ultimate introduction of the cyclotron beam into the ion source.

Neutron Physics

To enable the members of the Atomic Energy Board to become acquainted with measurements on neutrons, a small accelerator was built to produce continuous deuteron beams of 100–200 micro amperes up to 140 keV. The deuteron beam strikes a target of heavy ice and produces 10^7 neutrons per second as measured by the activation of P^{31} . This intensity is 20 times higher than that supplied by the Ra-Be source available up to now, and has the advantage that the neutrons are not accompanied by penetrating gamma radiation.

Double Scattering of Electrons

Although many experiments have been undertaken on the double scattering of electrons, they have yielded few trustworthy results. There remained, however the possibility of achieving better results with better planned experiments. In the thirteenth annual report, such experiments were reported to be in hand, and these were continued and concluded during the year. The results obtained are the only ones available for energies in the region of 80 keV and show an asymmetry half as great as theoretically predicted (Schneider and Barnard, 1958).

Internal Conversion

The determination of the conversion coefficients is one of the most important experimental approaches to the problem of the interaction between the nucleus and its surrounding electrons. By using a high precision beta spectrometer with a permanent magnet a number of conversion lines previously unresolvable were resolved and the relative conversion coefficients determined.

It was possible to resolve the L_{I-} , L_{II-} , L_{III-} and M-lines of the 411.8 keV transition on Hg^{198} . The results showed that in this case the effect, if any, of a finite sized nucleus was small. In the case of the 93.9 keV transition in Ag^{107} the L_{I-} : L_{II-} : L_{III-} and K:L ratios showed excellent agreement with the theoretical values whereas the K:M ratio differed from theory. This can be explained because the shielding effect was not taken into consideration in the theoretical calculations. Similar work was done on the transitions in Hg^{197m} . All the radio-isotopes used in this work were produced in the C.S.I.R. cyclotron. Several publications appeared in connection with this work. (Van Heerden, Reitmann and Schneider, 1958 and 1959—in press).

Verval van die UX-kompleks

Die verval van die UX-kompleks in die uraanvervalreëks, is een van die oudste en moeilikste probleme in die kernspektroskopie weens die groot aantal beta- en gammaoorgange wat in die verval voorkom. Hierdie verval is deeglik ondersoek deur gebruik te maak van 'n moderne tussenbeeldspektrometer wat die afgelope jare sodanig omgebou is dat ook gevorderde koïnsidensiewerk daarmee gedoen kan word.

Die werk het gelei tot die opstelling van 'n uiters volledige en samehangende vervalskema vir UX_2 en UZ. Dit het geblyk dat UZ die grondtoestand van Pa^{234} is met die UX_2 -vlak 22 ± 12 KeV bokant UZ. UX_2 se mees energieke beta-oorgang is 2405 ± 3 KeV, die noukeurigste bepaling tot dusver uitgevoer. In totaal is 27 nuwe gamma-oorgange ontdek.

Vir meer as 20 jaar bestaan daar reeds die probleem dat die grade van verbodenheid van die bera-oorgange na die UX_2 -toestand en na die grondtoestand van U^{234} gladnie in ooreenstemming met die eksperimentele gegewens was nie. Ook hierdie probleem kon opgelos word. 'n Artikel is voorberei en vir publikasie aanvaar. (Schneider, de Lange en de Villiers.)

FISIKA VAN DIE VASTE TOESTAND

Plastiese Vervorming van Metale

Gedurende die afgelope jaar is die Philips E.M. 100 elektronmikroskoop hoofsaaklik aangewend om die voorkoms van oppervlakstrukture by plastiesvervormde alfageelkoper te ondersoek. Vir hierdie doel is enkelkristalstafies voorberei en deur die stafies agtereenvolgens deur 'n meetbare hoeveelheid uit te rek, is die ontstaan van afglylyne, die wyse waarby afglylyne en -bande vorm en groei, hulle oppervlaktedigheid met betrekking tot rekspannings en die ontstaan van kruisafskuiwing, bestudeer.

Om hierdie studies moontlik te maak, is 'n besondere afdrucktegniek ontwikkel waarby dit moontlik is om, na elke uitrekking, presies dieselfde oppervlakte van die vervormde monster weer in die gesigsveld van die elektronmikroskoop te plaas en te ondersoek. Die voordele verbonde aan so 'n tegniek, waardeur daar telkens na dieselfde afglylyne en oppervlakte tussen sulke afglylyne teruggekeer kan word by vergrotings van $35,000 \times$ of meer, is natuurlik voor die hand liggend by studies van hierdie aard. Soveel as 33 agtereenvolgende afdrucke van dieselfde oppervlakte,

Decay of the UX-complex

The decay of the UX-complex in the uranium decay series is one of the oldest and most difficult problems in nuclear spectroscopy because of the large number of beta and gamma transitions. This decay was thoroughly investigated with a modern intermediate image spectrometer modified during the past years to do advanced coincidence work.

The research led to the compilation of a very complete and coherent decay scheme for UX_2 and UZ. It was shown that the UZ is the ground state of Pa^{234} with the UX_2 -level 22 ± 12 keV above UZ. The highest energy beta transition of UX_2 is $2,405 \pm 3$ keV, the most accurate value obtained so far. In all, 27 new gamma transitions were discovered.

For more than twenty years there has existed the problem that the orders of forbiddenness for beta transitions to the UX_2 -state and the ground state of U^{234} were in complete disagreement with the experimental results. This problem also has been solved. (Schneider, de Lange and de Villiers—in press).

SOLID STATE PHYSICS

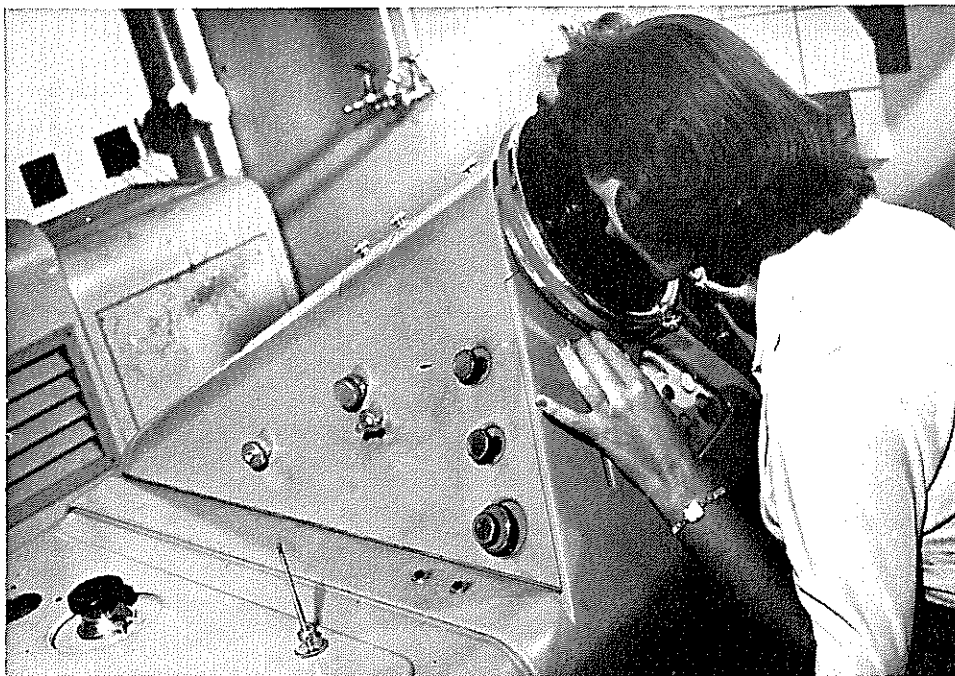
Plastic Deformation of Metals

The main use of the Philips E.M. 100 electron microscope during the past year has been in the study of the surface structure of plastically deformed alpha-brass. Single crystal rods were prepared for this purpose and by observation after successive measured extensions, a study was made of the origin of slip lines, the manner in which slip lines and slip bands are formed and grow, their surface density as a function of strain and the origin of cross slip.

A special replication technique, which allowed exactly the same surface region of the deformed sample to be viewed in the microscope after successive extensions, was developed to facilitate these investigations. The advantages of this technique, with which repeated observation of the same slip lines and regions can be made at magnifications of $35,000 \times$ or more, are obvious in this type of study. As many as 33 consecu-

elke keer by 'n toenemende uitrekking van die monster tot by sy breekpunt, is alreeds met hierdie tegniek bereik. (Fourie, 1958.)

tive replicas of the same surface, at progressively increasing extension until the samples fracture, have been obtained with this technique (Fourie, 1958).



Elektronmikroskoop wat in die N.Fis.N.L. gebruik word vir metaal-struktuur studies

Electron microscope used in the N.P.R.L. for the study of metal structure

X-straalverstrooiingstudies by Klein Hoeke

'n Kleinhoek-X-straalkamera, ontwerp volgens die beginsel van die Krattky-kamera, is voltooi en in gebruik geneem. Hierdie kamera wyk af van die Krattky-ontwerp in so verre dat daar van meetblokkies, wat op 'n plat metaalvlak rus, gebruik gemaak word om die intreebundel te definieer.

Toetse wat reeds met hierdie apparaat uitgevoer is, wys daarop dat dit oor 'n oplosvermoë van $d = 2,000 \text{ \AA}$ beskik.

Studies om die korrelgrootte van verskeie tipes koolswart te bepaal, is nou aan die gang. Samehangend met hierdie ondersoek word die invloed van monstervoorbereiding en die pakkingsdigtheid van die monsters ook bestudeer. Die verwerking van die opnames volg in hoofsaak die ekstrapolasiemetode van Guinier en die momentkurwetegniek soos voorgestel deur Hosemann. Deur vergelyking met direkte elektronmikroskopiese opnames van die monsters sal daar hopelik

Small Angle X-ray Scattering Studies

A small angle X-ray camera, designed on the Krattky principle, has been completed and is in use. This camera differs from the Krattky design in that gauge blocks resting on a flat metal surface are used to define the incident beam.

Tests already performed with this instrument indicate that it can resolve d spacings of up to $2,000 \text{ \AA}$.

The particle sizes of various types of carbon black are being measured and the effects of sample preparation and packing density studied in conjunction with these measurements. The extrapolation method of Guinier and the moment-curve technique suggested by Hosemann have been used to interpret the scattering curves. It is hoped that direct electron microscopy

tussen hierdie twee metodes om resultate te verwerk, beslis kan word.

Die voorneme is om hierdie ondersoek uit te brei na korrelgrootte studies in verband met Fischer-Tropsch-kataliste asook die bestudering van kristalfoute soos ontwingings, vakante atoomposisies ens. by plasties-ervormde metale en stralingsbeskadigde stowwe.

X-straalondersoek van Fischer-Tropsch-katalisatore

Aanvanklik was hierdie ondersoek toegespits op die aanwending van X-straaldiffraksiemetodes vir die ontleding van katalisatormonsters. Die probleem is van beide teoretiese en eksperimentele standpunte benader en 'n metode is ontwikkel waarvolgens alfa-yster, magnetiet en die drie moontlike ysterkarbid-fases wat voorkom, met 'n noukeurigheid van 5% ontleed kan word.

Aansienlike vordering is ook gemaak met studies aangaande die hoë-temperatuur-transformasies van die verskillende ystercarbides. 'n Reeds bestaande X-straalontledingstechniek is ook aangewend om die invloed van die reduksie van katalisatore op die fisiese toestand van die yster, wat ontstaan as gevolg van hierdie reduksies, te ondersoek.

'n Begin is ook gemaak met die verfyning van die bekende benaderde kristalstruktuur van sementiet, terwyl ook met voorlopige kristalstruktuurondersoek op die ander ystercarbides begin is.

Termiese Ontbinding van Vaste Stowwe

Ondersoeke in verband met die termiese ontbinding van silberpermanganaat en kaliumpermanganaat in die vaste toestand is voortgesit. Dit is bevestig dat silberpermanganaat tot 'n nie-kristallyne glas ontbind. Die struktuur van hierdie glasagtige fase word nou met behulp van X-strale ondersoek. In teenstelling met hierdie resultate is daar gevind dat kaliumpermanganaat ontbind tot kaliummanganaat en deltamangaandioksied wanneer dit tot 220°C. verhit word. Beide hierdie produkte is kristallyn. 'n Chemiese ontleding wat deur die Nasionale Chemiese Navorsingslaboratorium uitgevoer is, het aangetoon dat die mangaandioksied egter 'n aansienlike hoeveelheid kalium bevat.

Die manier waarvolgens intergevoormde gasse, by die ontbinding van die bestanddele van 'n kristal, uit die kristal ontsnap, is teoreties ondersoek. Daar is bewys dat 'n mate van vertraging tussen gasformasie en die ontsnapping daarvan sal voorkom wanneer die roosterdiffusievermoë die proses beheer. Die feit dat geen vertraging gedurende termiese ontbindings-eksperimente gevind word nie, lei tot die gevolgtrekking dat ontbinding uitsluitlik by krake en korrelgrense begin en die diffusiesnelheid van die gas deur die korrelgrensdiffusie-vermoë bepaal word.

on the samples will allow a decision to be made as to which method of treating the curves is better.

It is hoped to extend these investigations to studies of the particle sizes of Fischer Tropsch catalysts and crystalline defects such as dislocations, vacancies, etc. in plastically deformed metals and radiation damaged materials.

X-ray Studies of Fischer-Tropsch Catalysts

This investigation was initially directed towards the application of X-ray techniques to the analysis of catalyst samples. The problem has been approached from both experimental and theoretical aspects and a method has been developed which allows analysis of alpha iron, magnetite and the three phases of iron carbide with an accuracy of 5%.

Appreciable progress has also been made with studies of the high temperature transformations of the different iron carbides. An existing X-ray technique was used to study the influence of various methods of reducing the catalysts on the physical state of the iron so formed.

A start has been made with the refinement of the existing approximate crystal structure of cementite and the preliminary crystal structure determination of the other iron carbides.

Thermal Decomposition of Solids

Studies of the thermal decomposition of solid silver permanganate and potassium permanganate were continued. It was established that silver permanganate decomposes into an amorphous substance. The structure of this amorphous phase is being investigated with X-rays. In contradistinction, potassium permanganate decomposes into the crystalline products potassium manganate and delta manganese dioxide when heated to 220°C. A chemical analysis made by the National Chemical Research Laboratory has shown that the manganese dioxide contains an appreciable amount of potassium.

A theoretical investigation has been made of the way in which the gas generated internally during decomposition of the crystalline material escapes from the crystal. It was shown that a delay between gas formation and its escape would occur when a lattice diffusion process controls the gas escape. The fact that almost no delay occurs during thermal decomposition leads to the conclusion that thermal decomposition begins exclusively at cracks and grain boundaries and that the rate of diffusion of the gas is determined by the grain boundary diffusion coefficient.

Die teorie verklaar ook waarom aansienlike vertraging gevind word wanneer ontbinding in nitrate onder die invloed van straling plaasvind.

'n Artikel oor hierdie onderwerp is opgestel en vir publikasie aanvaar. (Gafner.)

Outomatiese Registrasie van X-straaldiffraksiepatrone

Dit is dikwels nodig om die intensiteit oor 'n X-straaldiffraksiepiek met 'n konstante noukeurigheid te bepaal. Om dit te kan doen, moet die tydskuur vir 'n bepaalde aantal tellings by gegewe punte op die piek gemeet kan word. Ten einde sodanige metings te kan bewerkstellig, is 'n apparaat wat hierdie taak outomaties verrig deur die Eenheid vir Elektrotegniese Instrumentasie ontwerp en gebou. Die tyd vir 'n bepaalde aantal Geigerbuistellings word gemeet en op 'n papierband geregistreer. Onmiddellik hierna word die telgedeelte van die apparaat weer op nul gestel en die Geigertelbuis van die diffraktometer word na die volgende soekposisie verskuif. Dan begin die siklus weer. Met behulp van hierdie apparaat kan nagte en naweke nou ook benut word sonder dat personeel teenwoordig hoef te wees.

Kristalstrukture

Die kristalstruktuur van die beta-vorm van 1:2-4:5-tetrabromobenseen is met behulp van die metode van kleinste kwadrate noukeurig bepaal. Die berekening is in die Verenigde State van Amerika uitgevoer aangesien elektroniese rekenfasiliteite toe nog nie in Suid-Afrika beskikbaar was nie. Uit die resultate blyk dat die molekule platvlakdig is, wat in teenstelling is met vroeëre elektron-diffraksie-bevindinge op die gasfase. Die enigste meetbare molekule vervorming is 'n vermeerdering van 0.08 Å in die afstand tussen naburige broom-atome. Dit ontstaan as gevolg van 'n klein toename van die C-C-Br-hoeke. 'n Voorlopige verslag oor hierdie resultate is gepubliseer. (Gafner en Herbstein, 1958.) Verdere ondersoek het gewys dat verdere polimorfiese vorms van hierdie verbinding voorkom. Aandag word nou gevestig op die bepaling van hul kristalstrukture en op die verwantskap tussen die molekule rangskikking van molekules in hierdie kristalvorms.

Ruimtebeperkinge in die 1:4-5:8-tetrachloornaftaleen-molekuul verskil van dié wat in 1:2-4:5-tetrabromobenseen voorkom. Intensiteitsmetings wat mettertyd tot 'n volledige kristalstruktuurbeplanning sal lei, is reeds uitgevoer.

Teenstrydige konformasies van twee siklohexa-1:4-diene afgeleides is onlangs eksperimenteel bepaal; in die een geval (9:10-dihidro-1:2:5:6-dibenzo-antraseen) is die molekuul platvlakdig terwyl in die ander (9:10-dihidro-antraseen) die molekuul om 'n as deur die 9:10-koolstofatome gebuig is. Die eksperimentele gegewens blyk heeltemal betroubaar te wees. 'n Teoretiese ondersoek het gewys dat die verskil tussen die

The theory also explains why a large delay occurs when nitrates are decomposed by ionizing radiation.

A paper on this subject has been written and accepted for publication. (Gafner.)

Automatic Recording of X-ray Diffraction Patterns

It is often necessary to measure the intensity over an X-ray diffraction peak with constant accuracy. This requires the measurement of the time taken to accumulate a given count at given angular intervals over the peak. An instrument which automatically fulfils this function has been designed and constructed by the Electrotechnical Instrumentation unit. The time taken to accumulate a certain number of Geiger counts is measured and recorded on a paper strip. Immediately after this the zero of the counter is reset and the Geiger tube on the diffractometer moved to the next position. The cycle is then repeated. This instrument allows recording to continue overnight and during weekends without the attention of an operator.

Crystal Structures

The crystal structure of the beta phase of 1:2-4:5-tetrabromobenzene has been accurately refined using the method of least squares. The calculations were carried out in the United States of America as electronic computing facilities were not available locally at the time. The results showed the molecule to be planar, in contrast with the early electron diffraction results on the gas phase. The only measurable molecular deformation is an increase of 0.08 Å in the distance between adjacent bromine atoms, which results from a small increase in the C-C-Br angles. These results have been published in a preliminary report. (Gafner and Herbstein, 1958.) Further investigation showed that other polymorphic forms of this compound exist and attention is being given to the determination of their crystal structure and the relationship between the molecular arrangements in these polymorphs.

The overcrowding in the 1:4-5:8-tetrachloronaphthalene molecule differs from that found in 1:2-4:5-tetrabromobenzene. The intensity measurements which will lead to the complete crystal structure determination of the former have already been made.

Conflicting conformations of two cyclohexa-1:4-diene derivatives have recently been established experimentally; in the one instance (9:1P-dihydro-1:2:5:6-dibenzo-anthracene) the molecule is planar, while in the other (9:1P-dihydro-anthracene) the molecule is folded about an axis through the 9:10 carbon atoms. The experimental results appear to be completely reliable and a theoretical investigation showed that the

twee konformasies verklaar kan word deur die steriese effekte van die waterstofatome in ag te neem. Soortgelyke berekeninge het aangetoon dat die siklohexa-1:4-dieen-molekuul self gebuig sou wees. Hierdie werk is in 'n artikel opgeskryf en vir publikasie aanvaar. (Herbstein.)

SPEKTROSKOPIE

Die verbode elektroniese oorgang $d-X$ in die absorpsie-spektrum van koolmonoksied, is geïdentifiseer as 'n $d^3 \Delta - X \frac{1}{2}$ oorgang. Hierdie interpretasie van die bande-struktuur is bewys deur die sogenaamde triplet-bande van koolmonoksied opnuut onder hoë oplosvermoë te fotografeer en die bande te analiseer. Hier is bewys dat die triplet-bande te wyte is aan 'n $3 \Delta - 3\pi$ oorgang en nie soos voorheen gemeen 'n $3\pi - 3\pi$ oorgang nie. Dit verklaar die onverklaarde struktuur, wat in die vorige jaarverslag gemeld is. 'n Publikasie word voorberei.

TOEGEPASTE RADIOAKTIWITEIT

Die beplanning van 'n nasporingeksperiment om die *beweging van sand* in die omgewing van 'n Suid-Afrikaanse hawe te bestudeer, is voltooi. Die probleem is om vas te stel of die beweging van sand vanaf die strande noord van die hawe sodanig is dat dit in die hawe beland. Die metode is so gevoelig dat ongeveer 200 millicuries van barium-140 genoegsaam behoort te wees om die verspreiding oor 'n afstand van vyf myl vas te stel.

'n Teoretiese en 'n eksperimentele ondersoek (laasgenoemde met radioaktiewe fosfor) van die faktore wat die *verblyftyd van stowwe* bepaal wat deur 'n tenksisteem vloei, is voltooi. Daar is gevind dat die gemiddelde verblyftyd alleen deur die volume en vloeispoed bepaal word maar die verspreiding om die gemiddelde is deur die aantal kompartemente bepaal. Daar is gevind dat hierdie verspreiding deur die Poisson-distribusie gegee word. 'n Publikasie word voorberei. 'n Groot skaalse ondersoek wat hierop gebaseer was, is vir 'n mynsisteem met 'n aantal tenke in serie met 'n totale volume van 'n half miljoen gelling uitgevoer deur van radioaktiewe jodium-131 gebruik te maak. Dit was baie maklik om te bewys dat die doeltreffendheid van die mengapparaat goed genoeg was.

'n Groot tekortkoming by die gebruik van radio-isotope in die industrie is die gebrek aan isotope waarvan die uitstraling die klassieke X-straalgebied dek. Dit is eger moontlik om die *bremstrahlung* te gebruik wat verkry word wanneer beta-partikels in 'n metaal geabsorbeer word. Dit is hier bewys dat bremstrahlung-bronne van radioaktiewe strontium baie bevredigend is al is die relatiewe hoë koste nog 'n struikelblok.

difference between the two conformations could be explained by considering the steric effects of the hydrogen atoms. Similar calculations showed that the cyclo-hexa-1:4-diene molecule should also be folded. An article on this work has been accepted for publication (Herbstein).

SPECTROSCOPY

The forbidden electronic $d-X$ transition in the absorption spectrum of carbon monoxide was identified as a $d^3 \Delta - X \frac{1}{2}$ transition. This interpretation of the band structure was proved by rephotographing the so-called "triplet" bands of carbon monoxide, using high resolving power and then analysing the bands. It was shown that the triplet bands are due to a $3 \Delta - 3\pi$ transition and not a $3\pi - 3\pi$ transition. This explains the unidentified structure that was mentioned in the previous annual report. A publication is being prepared.

APPLIED RADIO-ACTIVITY

The planning of a tracer experiment to study the movement of sand in the vicinity of a South African harbour has been completed. The problem is to determine whether the movement of sand from a beach north of the harbour is such that some of this sand finds its way to the harbour mouth. The method is sufficiently sensitive to determine the spread over a distance of 5 miles using 200 millicuries of Barium-140 as tracer isotope.

A theoretical and experimental investigation (the latter with radioactive phosphorous-32) has been made into the factors which determine the *residence time of fluids* flowing through a system of tanks. It was shown that the mean residence time is a function only of volume and flow rate but the spread about the mean is fixed by the number of compartments in the system. This spread is found to be given by the Poisson-distribution. A publication is in preparation. A large-scale study based on these findings was made of an installation on a mine consisting of several tanks in series with a total volume of half a million gallons and using Iodine-131 as tracer isotope. It was a simple matter to verify that the mixing efficiency of the equipment in use was satisfactory.

A considerable handicap in the use of radio-isotopes in Industry has been the lack of isotopes emitting radiations in the normal X-ray range. It is now possible to take advantage of the *bremstrahlung* emitted when Beta particles are stopped in dense materials. It has been shown here and elsewhere that bremstrahlung sources using radio-strontium are very suitable but their high cost is still an obstacle to their general application.

Een toepassing wat hier ontwikkel word, is die akkurate beheer van die digtheid van ligte materiale in dun seksies.

'n Metode om die doeltreffendheid van *afskieding van erts* in water in 'n sikloon as 'n funksie van partikelgrootte te bepaal, is gebaseer op die feit dat daar gevind is dat genoegsame fosfor-32-aktiwiteit in die erts deur stadige neutronbestraling voortgebring kan word. Vinnige neutrone afkomstig van die siklotron en verstrooi deur was, is vir hierdie doel gebruik maar in die finale toets sal die erts in 'n reaktor bestraal word om genoeg radioaktiwiteit te skep. Hierdie werk mag van algemene belang wees in die metallurgiese industrie waar die lotgevalle van 'n bepaalde hoeveelheid erts nagegaan moet word.

In die studie van 'n eksperimentele pyplyn vir die hidroeliese vervoer van steenkool, was dit nodig om die *vloeiempoed van die steenkool* en die draerwater te bepaal. 'n Stuk steenkool is met 'n gammastraler gemerk en die vloeiempoed eenvoudig met gammatellers op twee plekke langs die pyp gemeet.

'n Metode vir die *bestraling van saad* met relatief klein bronne om genetiese mutasies te veroorsaak, is verder in hierdie laboratorium ontwikkel. (Basson, 1958.) Bronne wat kleiner as een curie is, is gebruik om saad van verskillende korrelgrootte en totaalgewigte (half- tot twintig pond per keer) te bestraal. Dosismeting is gedoen beide met die Fricke-ystersulfatsisteem en met behulp van gekalibreerde filmstrookies. Die resultate van die dosismeting het goed ooreengestem met berekenings gebaseer op die sterktes van die gekalibreerde radioaktiewe bronne. Metings van die uniformiteit van die bestralings is nog aan die gang.

RADIOAKTIWITEIT EN STRALING

Bepaling van Radioaktiewe Ertsmoesters

Die ondersoek na die radiometriese bepaling van gemengde uraan-thorium-ertse wat natuurlike loging ondergaan het, is suksesvol afgesluit met die ontwikkeling van die beta-gamma-gamma-metode. Hierdie werk verteenwoordig die eerste suksesvolle radiometriese analise op natuurlikgeloogde gemengde ertse. Die werk is vir publikasie aanvaar. (De Lange.)

'n Vergelykende studie tussen die beta-gamma-, gamma-gamma- en beta-gamma-gamma-metodes vir die ondersoek van hierdie ertse is op dieselfde reeks moesters met behulp van sewe verskillende standaardmoesters uitgevoer. Vyf van hierdie moesters bestaan uit gemengde uraan-thorium-erts, een van hulle bestaan slegs uit uraan met al sy vervalprodukte en een van hulle is uraanerts wat geen radium bevat nie. Daar is aangetoon dat die minimum konsentrasies met hierdie metodes bepaalbaar 0.005% uraanoksiede en of 0.01% thorium-oksiede is. Vanweë die aansienlike

One application, developed in this laboratory, is the accurate control of the density of light-weight materials of thin section.

A method for determining the efficiency, as a function of ore particle size, of the cyclone separation of ore from a water slurry is based on the observation that slow neutron irradiation of ore produces useful quantities of phosphorous-32. Cyclotron-produced neutrons, slowed down in wax, were used in initial tests but the final measurement will require ore irradiation in a nuclear reactor to produce sufficient radio-activity. This work could be of general interest to the mining industry in quantitative tracing of ore through a given process.

In the study of an experimental arrangement for the hydraulic transport of coal, it was necessary to measure the *velocity of coal* and carrier (water) through the pipeline. A piece of artificial coal labelled with gamma emitting radio-isotope was timed as it passed gamma counters at two places along the pipeline.

A method for the *irradiation of seed* with relatively small gamma emitting sources in order to induce genetic mutations (Basson 1958) has been further developed in this laboratory. Sources of strength less than one curie are used to irradiate seed of different size and total weight from half to twenty pounds per irradiation. Dose measurement is accomplished with the Fricke ferrous-sulphate system and also with calibrated photographic films. The results of the dose measurements are in good agreement with calculations based on the measured strengths of the radio-active sources. Measurements to test the uniformity of the seed irradiation are continuing.

RADIO-ACTIVITY AND RADIATION

Measurement of Radio-active Mineral Samples

The investigation of the radiometric analysis of naturally leached mixed Uranium-Thorium ores has been successfully concluded with the development of the beta-gamma-gamma method. This work, the first successful approach to the radiometric analysis of naturally leached mixed ores, has been accepted for publication (de Lange).

A comparative study of the beta-gamma, gamma-gamma, and beta-gamma-gamma methods for the analysis of mineral samples has been conducted using the same series of seven different standard samples. Five of these samples consisted of mixed Uranium-Thorium ores, one consisted of uranium with all its daughter products and one consisted of uranium ore containing no radium. It was shown that ores containing as little as .005 per cent of uranium oxide and/or 0.01 per cent of thorium oxide were still measurable.

tydbesparing bied hierdie radiometriese metodes 'n definitiewe voordeel bo radioskeikundige bepalinge wanneer 'n aantal ertsmonsters gemeet moet word. 'n Artikel is voorberei en vir publikasie aanvaar. (De Lange.)

Radon in die Lug

Die gesondheidsgevaar in uraanmyne is hoofsaaklik te wyte aan die radioaktiewe dogters van radongas. 'n Ondersoek van die fisiese eienskappe van 'n mengsel van radondogters wat nie in ewewig met die moeder-radon verkeer nie, is voltooi. Hierdie werk het dit moontlik gemaak om die presiese toestand van verstoorte ewewig tussen radium A, B en C op 'n roetine basis te bepaal met 'n minimum van berekening en die metode is nou ingesluit in die werk wat in die myne gedoen word. Die voordeel van hierdie metode is dat die maksimum informasie verkry word van 'n eenvoudige vervalmeting van die dogters wat op „millipore” filterpapier opgevang is. 'n Verslag word voorberei.

Radioaktiewe Neerslag

Daar is voortgegaan met die meting van radioaktiewe neerslag by sewe stasies oor die hele Suid-Afrika. Verslae is aan die Internasionale Geofisiese Jaar (nou die Internasionale Geofisiese Samewerking) se Wêreld-sentrums vir Gegewens gestuur. Met dié reëling sal voortgegaan word.

Skattings van die totale opgehoopde radioaktiwiteit by elke insamelingstasie, en die gevolglike genetiese-effektiewe gammastralingsdosis, is van die metings verkry. Daar is gevind dat die neerslagdosistempo baie klein is in vergelyking met dié van die straling wat in die natuur voorkom. Daar is gevind dat die hoeveelheid neerslag 'n funksie van reënval en breedtegraad is en daar is ook aanduidings dat hoogte bo seespieël 'n faktor is. Die Pretoria-stasie (die noordelike een) het die meeste neerslag ontvang en die Kaapstad-stasie die minste.

'n Metode is ontwikkel om die effektiewe ouderdom van splitsingsprodukte in neerslag te bepaal sonder om gebruik te maak van die probeer-en-fouteer metode by die aanpassing van die vervalkurwe vir gemengde splitsingsprodukte. Indien daar, na die ontploffing van 'n atoomwapen, genoeg neerslag versamel word, is dit moontlik om te bepaal hoe lank die radioaktiewe puin geneem het om Suid-Afrika te bereik. In elk geval kan daar vasgestel word dat daar kort tevore 'n wapen ontplof het.

'n Meting van die hoeveelheid radioaktiewe strontium in Suid-Afrikaanse rys is uitgevoer en vergelyk met rys afkomstig van Egipte en Sjina.

'n Verslag oor die meting van neerslag oor Suid-Afrika is voorberei.

When a large scale survey of mineral samples must be undertaken, the considerable time saving and comparative simplicity of radiometric analysis are great advantages over the radio-chemical methods. A paper has been prepared for publication (de Lange).

Radon in the Air

The health hazard in uranium mines is due primarily to the radio-active decay products of the gas radon. An investigation of the physical properties of a mixture of radon daughters not in equilibrium with the parent radon has been completed. It is now possible to determine the exact degree of disturbed equilibrium between radium A, B, and C on a routine basis and the method has been incorporated into work in progress in the mines. The advantage of the method lies in the fact that a maximum of information is obtained from a simple decay curve measurement of the daughter activity collected by drawing an air sample through “millipore” filter paper. A report has been prepared.

Radio-active Fall-out

The measurement of fall-out at seven sampling stations over South Africa has been continued. Reports have been sent to world data centres of the International Geophysical Year (now the “International Geophysical Co-operation”). This arrangement will be continued.

Estimates of the total accumulated radio-activity and the corresponding genetically effective gamma dose have been obtained for each sampling station. It has been shown that the radiation dose rate from radio-active fall-out is very small in comparison with that from natural sources. It has been verified that the amount of fall-out is a function of rainfall and latitude and there is a suggestion that altitude is also a factor. The sampling station at Pretoria (the most northerly) has received the most fall-out and the Cape Town sampling station has received the least.

A method has been developed to estimate the effective age of the fission products in radio-active fall-out without having to apply a trial and error fit of the mixed fission product decay curve. If the detonation of a nuclear weapon gives rise to measurable deposits of fall-out on South Africa, then it is possible to estimate the time taken for the debris to reach South Africa, or conversely to show that such a detonation has occurred.

A measurement of the radio-strontium content in South African rice was compared with parallel measurements in rice from Egypt and China.

A report on the measurement of fall-out over South Africa is being prepared.

Dosismeting

Die chemiese dosimeter van Fricke waarin die oksidasie van Fe^{++} -ione na Fe^{+++} -ione gebruik word om die geabsorbeerde energie (met ander woorde dosis) van 'n stralingsveld te meet, is 'n waardevolle instrument vir die absolute meting van dosisse in die gebied van 10,000 rad. Dit is reeds in hierdie laboratorium gebruik vir die meting van dosisse waarmee saad bestraal is. Daar is oorsee reeds fundamentele studies gemaak van die chemiese dosimetersisteme met behulp van eksterne stralingsbronne, maar die geval waar die bron in die sisteem self geleë is, het minder aandag ontvang. 'n Studie van die chemiese opbrengs per eenheid geabsorbeerde energie—die sogenaamde G-waardes—is in hierdie laboratorium begin met interne bronne bestaande uit gestandaardiseerde oplossings van verskillende radioisotope. Hierdie werk word in samewerking met die Nasionale Chemiese Navorsingslaboratorium gedoen. Die werk is begin met P-32 hoofsaaklik omdat dit 'n suiwer beta-vervalskema het. Pogings word aangewend om te korreger vir 'n bydrae van fosfor-33 wat aanwesig is in die radioaktiewe materiaal wat van Engeland verkry is.

Die dosismeting van vinnige neutrone is 'n probleem wat deur die laboratorium bestudeer word met die oog op beide die gebruik van die neutronbundel afkomstig van die siklotron, en die beskerming van die siklotronpersoneel. Dit is reeds aangetoon dat die telling van protonterugslagspore in kernemulsies voldoende is vir personeel-dosismeting. Vir die bepaling van die neutron-dosis, geskik vir bestralingsdoeleindes, word aandag gegee aan die eenvoudigste metodes soos differensiële kondensatorkamerlesings om te onderskei tussen gamma- en neutron-dosis, en drumpelreaksiemetings wat die bepaling van 'n fluks-energie-distribusie moontlik maak.

Gestandaardiseerde oplossings van jodium-131 en fosfor-32 is in die loop van die jaar aan gebruikers van isotope in Suid-Afrika verskaf.

CHEMIESE FISIKA

Spektra op 'n Tydbasis Geskei

In die spektrochemiese ontledingmetodes is die ligbron die belangrikste beperkende faktor wat die noukeurigheid van hierdie metode bepaal. So het Dieke en sy medewerkers te Johns Hopkins-universiteit bewys dat daar sekere analitiese voordele is om sekere gedeeltes van die spektrum op 'n tydbasis geskei, uit te skakel. So is daar, gedurende die afgelope jaar in samewerking met die Eenheid vir Elektrotegniese Instrumentasie, 'n sisteem ontwikkel om spektra op 'n tydbasis te skei. In dié sisteem word die fotobuise van 'n direklesende spektrometer van die integreertipe vir sekere bepaalde tye ongevoelig gemaak. Die sisteem

Dose Measurement

The Fricke chemical dosimeter, in which the oxidation of the Fe^{++} ion to the Fe^{+++} ion is used to measure the energy (or dose) absorbed from a radiation field, is a useful instrument for measurement in the 10,000 rad. range. It has already found application in this laboratory in the measurement of the doses used in the irradiation of seed. Fundamental studies of this chemical system have been conducted by overseas laboratories but most of their attention has been given to the use of external radiation sources. The case of the incorporation of the source into the system has received little attention. A study of the chemical yield per unit of absorbed energy—so-called G-values—has been begun using internal radiation sources consisting of solutions of several different standardised radioisotopes. This work is being undertaken with the co-operation of the National Chemical Research Laboratory. The investigation has been begun with the use of phosphorous-32 mainly because of its pure beta decay. An attempt is being made to correct for the phosphorous-33 which is present in the radio-active material obtained from England.

The measurement of fast neutron dose is receiving attention with a view both to the use of the neutron beam available from the cyclotron, and to the protection of personnel. It has already been shown that the counting of proton recoils in nuclear emulsions is a satisfactory approach to personnel dose measurement. For the measurement of the dose in the neutron beam (which can be used for irradiation studies) attention has been given to the simplest methods such as the differential condenser chamber technique to differentiate between gamma and neutron dose, and the threshold reaction method which enables a determination of absolute flux-energy distributions.

Standardized solutions of iron-59, iodine-131 and phosphorous-32 have been supplied during the course of the year to isotope users in South Africa.

CHEMICAL PHYSICS

Time-resolved Spectra

The light source is the most important limiting factor determining the accuracy of spectrochemical analytical methods. Dieke and co-workers at Johns Hopkins University showed that there were distinct analytical advantages in cutting out certain portions of the spark by means of time-resolved spectra. During the past year, with the co-operation of the Electrotechnical Instrumentation Division, a system for the study of time-resolved spectra has been developed. In this system the phototubes of a direct-reading spectrometer have been rendered insensitive for certain fixed periods of the spark. The system allows the use of exposure times

maak integreertye moontlik wat normaal in die spektrochemie gebruik word. Resultate sover met die sisteem verkry, dui daarop dat dit in sekere gevalle meer besonderhede kan verstrek oor die verloop van die uitstraling as die ander metodes wat tot dusver deur ander outeurs gerapporteer is. 'n Artikel is voorberei en vir publikasie aanvaar. (Strasheim en Schroeder.)

Die Elektrodepakmasjien—„Elpac”

In laboratoriums vir roetine produksiekontrole, is die noukeurigheid en spoed waarmee ontledings deurgevoer kan word twee belangrike oorwegings waaraan altyd aandag gegee moet word. Vir die bevredigende gebruik van die gelykstroommetode is dit noodsaaklik dat die elektrodes behoorlik gepak moet word. Hierdie operasie is veral moeisam wanneer 'n groot aantal elektrodes per hand gepak word. Hierdie probleme is nou oorbrug deur die ontwikkeling van 'n elektrodepakmasjien, wat die poeiermonsters in die elektrodeholtes met behulp van 'n vibrerende stamper pak. Een van die belangrikste voordele van hierdie masjien is dat materiaal met 'n noukeurigheid van 1 persent gepak kan word. Hierdie masjien is tans kommersieel beskikbaar. 'n Artikel is voorberei en vir publikasie aanvaar. (Strasheim en Tappere.)

Semikwantitatiewe Spektrochemiese Ontleding

Die belangrikste oogmerk van 'n semikwantitatiewe metode is om 'n vinnige kwalitatiewe ontleding deur te voer en tegelykertyd 'n mate van die konsentrasie van die verskillende elemente te kan gee.

Ontledings van vyf verskillende monsters waarvan die chemiese resultate beskikbaar is, is vir vyf elemente in drie verskillende matryse deurgevoer. Die beste resultate is verkry deur 'n metode van kraalvorming met 'n mengsel van litium karbonaat en boorsuur by hoë temperatuur, soos gebruik deur Tingle en Matocha.

Spektrochemiese Ontleding van Uraanbasismateriale

In enige atoomenergieprogram moet die gevoeligheid vir die ontleding van onsuiverhede—veral neutron-aktiewe onsuiverhede soos litium, boor, berillium, kadmium en tellurium—van die orde van 10^{-5} persent wees.

Weens die menigte uraanlyne in die spektrum, is dit nodig om die uraan te skei van die ander elemente. Die chemiese skeidingsmetode wat met behulp van die Nasionale Chemiese Navorsingslaboratorium ontwikkel is, is nie bevredigend bevind nie daar die skeiding nie kwantitatief behoort het nie.

'n Begin is gemaak met eksperimente om die verdampingsmetode, tans in algemene gebruik in Rusland, met die „Carrier Distillation”-metode, soos in Amerika gebruik, te vergelyk. Voorlopige eksperimente volgens die Russiese metode uitgevoer, is veelbelowend.

normally used in Spectrochemistry. The results thus far obtained with this system, show that, in certain cases, more information can be gained about the course of radiation than has been possible by alternative methods reported by other authors. A paper has been prepared and submitted for publication (Strasheim and Schroeder).

The Electrode-packing Machine—„Elpac”

The accuracy and speed with which analyses can be carried out are two important factors to be considered in laboratories doing routine production control. For satisfactory use of the direct current method it is necessary that electrodes be properly packed. This operation is especially tedious when a large number of electrodes have to be packed by hand. This problem has now been overcome by the development of an electrode-packing machine which packs powder sample into the electrode cavities by means of a vibrating plunger. One of the more important advantages of this machine is that the material can be packed with an accuracy of 1 per cent. This machine is now commercially available. A paper has been prepared and submitted for publication (Strasheim and Tappere).

Semi-quantitative Spectrochemical Analysis

The most important aim of a semi-quantitative method is to carry out a rapid qualitative analysis and, at the same time, to give a measure of the concentration of the different elements.

Five different samples, the chemical analyses of which are available, were analysed for five elements in three different matrices. The best results were obtained by a flux method as used by Tingle and Matocha, beads being formed with a mixture of lithium carbonate and boric acid at high temperature.

Spectrochemical Analysis of Uranium-base Materials

In any atomic energy programme, the sensitivity for the analysis of impurities—especially neutron active impurities such as lithium, boron, beryllium, cadmium and tellurium—must be of the order of 10^{-5} per cent.

In view of the multiplicity of uranium lines in the spectrum, it is necessary to separate the uranium from the other elements. The chemical separation developed with the help of the National Chemical Research Laboratory was not found to be satisfactory as the separation was not quantitative.

Experiments to compare the evaporation method, at present in use in Russia, with the “Carrier Distillation” method, as used in America, have been commenced. The initial experiments, using the Russian method, are very promising.

Ontleding van Biologiese Monsters

Die ontwikkeling van 'n spektrochemiese metode vir die ontleding van bloedsêrum is op versoek van die Nasionale Voedingsnavorsingsinstituut onderneem. Die elemente waarin dié navorsers gefinteresseerd is, is aluminium, koper, yster, mangaan, molibdeen en sink. Die grootte van elke monster sou nie groter as 200 milligram gedroogte serum (of 20 milligram as) wees nie. Die konsentrasies van net die eerste vier elemente was hoog genoeg om die ontleding direk op die as te kon deurvoer. Die sinklyn 2138 kon ook met 'n spesiale plaat gevind word, maar die intensiteit was te laag vir fotografiese werk. Pogings om die spoorelemente deur chemiese ekstraksie met 8-hidroksiekinolien in chloroform te konsentreer, het nie daarin geslaag om die molibdeen en sinklyne genoegsaam te versterk nie, hoewel die lyne van die ander vier elemente veel meer intens geword het as gevolg van die skeiding van natrium en kalium wat hoofbestanddele van die as is. Die moontlikheid van 'n direklesende metode vir hierdie probleem word tans ondersoek.

Die Spektrochemiese Bepaling van Goud in Lood met behulp van Direklesende Metodes

Vuurassaiëringmetodes word tans nog hoofsaaklik gebruik om goud en ander edelmetale te bepaal. Hierdie metodes is meesal tydrowend en redelike opgeleide personeel word vir die finale stadium daarvan vereis. Die direklesende spektrochemiese ontledingmetode bied die moontlikheid aan om al die edelelemente gelyktydig te bepaal.

Deur van konvensionele metodes gebruik te maak, het navorsers tot dusver veral hulle aandag gewy aan die bepaling van besonder lae konsentrasies. In sekere gevalle is silwer of goud as versamelaar gebruik en na verdamping van die lood is die silwer of goud kraal in 'n gelykstroomboog verbrand.

Om die uitvoerbaarheid van direklesende metodes vir die assaiëring van mynmonsters vas te stel, is die moontlikheid van die bepaling van goud in die loodknopie ondersoek. Hoewel twee dele per miljoen goud direk in die loodknopie bepaal kan word, is die noukeurigheid van die ontleding nie bevredigend vir konsentrasies van minder as agt dele per miljoen nie. Gedeeltelike konsentrasie van die goud, met palladium as interne standaard (5 tot 20 maal) in die loodknopie, word tans ondersoek.

Voorlopige eksperimente dui daarop dat die metode die moontlikheid bied om goud in sowel die mynmonsters as residu-monsters te bepaal.

Studie van die Eienskappe van die Gelykstroomboog in Spoorelementnavorsing

Die suksesvolle verloop van 'n spektrochemiese ontleding van 'n poeiermonster is in 'n groot mate afhanklik van die boogtoestande wat gekies word. Om hierdie rede is 'n studie van die verskillende eienskappe van die

Analysis of Biological Samples

The development of a spectrochemical method for the analysis of blood serum has been undertaken at the request of the National Nutrition Research Institute. The elements in which these research workers are interested are aluminium, copper, iron, manganese, molybdenum and zinc. The size of each sample should not exceed 200 milligram of dried serum (or 20 milligram of ash). The concentrations of the first four elements are sufficiently high to allow the analysis to be done directly on the ash. The zinc line 2,138 was discernable using a special plate, but the intensity was too low for photographic work. Attempts to concentrate the trace elements by chemical extraction with 8-hydroxyquinoline in chloroform were not successful in increasing the intensities of the molybdenum and zinc lines sufficiently, although the lines of the remaining four elements were intensified considerably as a result of the separation from sodium and potassium, which are the main constituents of the ash.

The Spectrochemical Determination of Gold in Lead by Direct Reading Methods

Fire-assay methods are still generally used for the determination of gold and other noble metals. These methods are usually time-consuming and require suitably trained personnel to complete the final stages. The direct reading spectrochemical method of analysis offers the possibility of determining all the noble metals simultaneously.

Research workers have thus far mainly devoted their attention to the determination of exceptionally low concentrations, using conventional methods. In certain cases, silver or gold is used as a collector and, after evaporation of the lead, the silver or gold bead is burned in a direct current arc.

To test the feasibility of a direct reading method for assaying mine samples, the possibility of determining gold in the lead button was investigated. Although two parts per million of gold can be determined directly on the lead button, the accuracy of the analysis is not satisfactory for concentration of less than eight parts per million. Partial concentration of the gold (5 to 20 times), with palladium as internal standard in the lead button, is at present being investigated.

Initial experiments show that with the use of this method the possibility of determining gold in both the mine samples and the residue samples exists.

A Study of the Characteristics of the Direct Current Arc in Trace Element Research

The success of a spectrochemical analysis is, to a large extent, dependent on the choice of arcing conditions. For this reason, a study of the different characteristics of the direct current arc and the manner in

gelykstroomboog en die manier waarop die resultate hierdeur beïnvloed word, van groot belang. 'n Hele aantal parameters van die gelykstroomboog is reeds in hierdie laboratorium bestudeer.

In die afgelope jaar is weer aan die Stallwoodlug-tregter aandag gegee. Stallwood het die gebruik van 'n lugstroom voorgestel wat deur 'n spesiale tregter om die elektrode blaas. In 1956 en 1957 is die lugtregter met sukses in hierdie laboratorium getoets en verdere toetse is gedurende die afgelope jaar met verskillende tregtergroottes deurgevoer. Daar is gevind dat die 8 mm tregter die bevredigendste resultate gee.

In die ontwikkeling van 'n metode vir die bepaling van sink in plantmateriaal, het die lugtregter spesiale toepassing gevind. Moeilikheid is eers ondervind as gevolg van selfabsorpsie van die sinklyn by 2138.6 Å. Deur van die lugtregter en lugstroom gebruik te maak, was dit moontlik om ontslae te raak van die absorberende kolom metaaldampe wat om die boog vorm.

'n Wiskundige Metode om Spektrochemiese Resultate te Vergelyk

In 1956 en 1957 is 'n wiskundige metode vir die vergelyking van spektrochemiese resultate in hierdie laboratorium ontwikkel. (Strasheim en Keddy, 1958.) Verdere eksperimente wat gedurende die afgelope jaar deurgevoer is, het bewys dat die trek van die ellips om die punte van digtheid-digtheid verstrooiingsdiagramme, resultate met genoegsame noukeurigheid vir die vergelyking van ontledingstoestande gee. Alleenlik wanneer die verhouding tussen die areas van die individuele ellipse vir verskillende ontledingstoestande naby 'n statistiese betekenisvolle waarde is, is dit nodig om die volle wiskundige metode te gebruik.

Chemiese Metodes vir die Skeiding en Konsentrasie van Sporelemente vir Plantmateriaal

Om die klein konsentrasies van sekere elemente soos sink, molibdeen, kobalt en ander te bepaal wat in plantmateriaal voorkom, is dit nodig om hierdie elemente van die hoofbestanddele van die monster te skei en te konsentreer. Beide presipitasiemetodes (Strasheim en Keddy, 1958) en chemiese ekstraksie-metodes is al vir hierdie doel gebruik, terwyl die moontlikheid bestaan dat ionuitruilingsharse ook gebruik kan word.

Die presipitatie-metode van Mitchell word met sukses in verskillende laboratoria toegepas, maar die metode het die nadeel dat dit taamlik lank neem.

Die ekstraksie-metode deur Stetter en Exler voorgestel, is in hierdie laboratorium getoets en 'n bevredigende spektrochemiese ontledingmetode is ontwikkel wat van hierdie konsentrasieprosedure gebruik maak. 'n Publikasie is voorberei en sal binnekort verskyn.

Die gebruik van ionuitruilingsharse, wat reeds baie toepassings gevind het by die bepaling van een of twee elemente, is nog nie vir die skeiding van 'n hele groep

which the results are influenced by these characteristics, is of major importance. A large number of parameters of the direct current arc have already been studied in this laboratory.

During the past year attention has again been given to the Stallwood airjet. Stallwood proposed the use of a stream of air which was directed round the base of the electrode by means of an especially prepared jet. In 1956 and 1957 the airjet was used with success in this laboratory and, during the past year, further tests have been carried out with varying jet sizes. It has been found that the 8 mm jet gives the most satisfactory results.

The airjet found special application in the development of a method for the determination of zinc in plant material. Initially, the selfabsorption of the zinc line at 2,138.6 Å caused trouble. By means of the airjet, it was possible to remove the absorbing column of metal vapour that forms round the arc.

A Mathematical Method of Comparing Spectrochemical Results

During 1956 and 1957, a mathematical method of comparing spectrochemical results was developed in this laboratory (Strasheim and Keddy, 1958). Further experiments, carried out during the past year, have shown that the drawing of an ellipse round the points of a density-density scatter diagram gives sufficient accuracy for the comparison of analysis conditions. Only when the ratio between the areas of the individual ellipses for different analysis conditions approaches a statistically significant value, is it necessary to use the full statistical method.

Chemical Methods for the Separation and Concentration of Trace Elements in Plant Material

To determine the low concentrations of certain elements such as zinc, molybdenum, cobalt and others which are present in plant material, it is necessary to separate them from the main constituents of the sample and to concentrate them. Both precipitation methods (Strasheim and Keddy, 1958) and chemical extraction methods have already been used for this purpose, and the possibility exists that ion exchange resins can also be used.

Mitchell's precipitation method has been used with success in various laboratories, but it has the drawback that it is time-consuming.

The extraction method proposed by Stetter and Exler has been tested in this laboratory and a satisfactory method has been evolved for spectrochemical analysis using this concentration procedure. A paper has been prepared and will be published shortly.

The use of ion-exchange resins, which has already found many applications for the determination of one or two elements, has not yet proved successful for the

van die makro-elemente in biologiese materiaal met sukses toegepas nie. Eksperimente wat onlangs in hierdie laboratorium deurgevoer is, het bewys dat 'n metode gebaseer op ionuitruilingsprinsiepe, wel by die skeiding van spoorelemente in biologiese materiale gebruik sal kan word.

Direklesende Spektrochemiese Ontleding van Plantmateriaal

Direklesende spektrochemiese ontledingsmetodes het sekere voordele bo gewone spektrografiese metodes. So word die moeilikhede van fotografiese-plaat-kalibrering uitgeskakel en verder kan die ontleding baie vinniger deurgevoer word. Direklesende metodes is veral vir die ontleding van metale gebruik. Tot dusver is die tegniek egter minder toegepas by die ontleding van biologiese materiaal wat van 'n meer komplekse aard is. Gedurende die afgelope jaar is 'n spesiale tegniek ontwikkel vir die ontleding van chloroform-ekstrakte van metaalorganiese komplekse van plantmateriaaloplossings. In hierdie metode word die ekstrakoplossing op die kant van 'n roterende ronde skyf van grafietnatriumkarbonaat gespuit en hierdie skyf dien dan as die anode in 'n onderbrekende gelykstroombog. 'n Metode vir die bepaling van sink, koper en lood in plantmateriaal is ontwikkel. Die ligbron hierbo genoem, bied die volgende voordele vir direklesing. Dit gee 'n eenvoudige spektrum met lae agtergrond en verder kan spoed waarmee die verskillende metale van die roterende elektrode afgebrand word, in 'n mate beheer word.

X-straalfluoresensietegnieke

Die X-straalfluoresensietegniek is aangewend om 'n groot aantal mineraalmonsters kwalitatief te ontlead. Onder hierdie monsters resorteer onder andere uraan, sirkonium- en thorium-draende ertse, en monasiete wat vir hulle seldsame aarde bestanddele ontlead is.

Onder andere is kwantitatiewe X-straalfluoresensiemetodes uitgewerk om die hoeveelheid uraan in oplossings te bepaal; hier is gevind dat konsentrasies so laag as 1 deel in 105 met behulp van 'n voorafbepaalde kalibrasiekurve bepaal kan word. Verder is 'n vinnige metode ontwikkel om koper in koperdraende ertse noukeurig te bepaal. Die invloed van steurende elemente, veral yster, monstervoorbereiding, partikelgrootte, ens. op die koperkonsentrasies is sorgvuldig ondersoek. Uit die resultate van hierdie ondersoek wil dit voorkom asof hierdie metode van ontleding wel deeglik in die praktyk aangewend kan word en dat dit groot moontlikhede inhou vir aanlegmetode in die koperbedryf. Vir 'n industriële instansie is drie navorsers in hierdie verband op 'n kontraktbasis opgelei, met die doel om hierdie tegnieke in die industrie toe te pas en verder te bevorder.

Met behulp van hierdie metodes is ook 'n studie gemaak van die distribusie van uraan en thorium oor

separation of a large group of micro-elements in biological material. Experiments recently carried out in this laboratory have shown, however, that a method based on ion-exchange principles, will be of use for the separation of trace elements in biological samples.

Direct Reading Spectrochemical Analysis of Plant Material

Direct reading spectrochemical analysis methods have certain advantages over general spectrographic methods. They remove the difficulties of photographic plate calibration and are much quicker. Direct reading methods are usually applied to the analysis of metals. Thus far the technique has found less application for the analysis of biological materials, which are of a more complex nature. During the past year a special technique has been developed for the analysis of chloroform extracts of metal-organic complexes of plant material solutions. In this method, the extract-solution is sprayed on to the side of a rotating round disc of graphite/sodium carbonate, which forms the anode of an interrupted direct current arc. The method was developed for the determination of zinc, copper and lead. The light source mentioned above has the following advantage for direct reading. It gives a simple spectrum with low background and the speed with which the different metals are evaporated off the rotating electrode can, to some extent, be controlled

X-ray Fluorescence Techniques

The X-ray fluorescence technique has been applied to qualitative analysis of a large number of minerals including uranium-, thorium- and zirconium-bearing ores and also to the analysis of Monazites for their rare-earth constituents.

Quantitative X-ray fluorescence methods have been evaluated for the determination of uranium in solution and it was found that concentrations as low as one in 10^5 could be measured using a calibration curve. A rapid method was developed for the accurate determination of copper in copper ores. The effects of perturbing elements (iron in particular), sample preparation, particle size, etc. on the measured copper concentration were carefully investigated. The results indicate that this analytical method is practicable and has potentialities for plant control in the copper industry. Three research workers from an industrial concern have been trained, on a contract basis, to enable them to apply and improve these techniques in industry.

A study was also made of the distribution of uranium and thorium in the surface of a polished Monazite single

die oppervlakte van 'n gepoleerde monasiet-enkelkristal. Hierdie laaste ondersoek staan in verband met ouderdomsbepalings op monasiete deur die „lood-metode” en is daarop gemik om die moontlike verlies van thorium in monasiete na te spoor.

X-straaldiffraksietegnieke

Kwantitatiewe X-straaldiffraksietegnieke is op uitgebreide skaal toegepas om die komposisie van Fischer-Tropsch katalisatore te bestudeer. Hierdie ondersoek wat in noue samewerking met ander analitiese metodes uitgevoer is, het weereens getoon hoe kragtig en onontbeerlik die X-straalmetode is by die ontleiding van mengsels van komplekse verbindings soos hulle in Fischer-Tropsch katalisatore voorkom.

Die kwantitatiewe metodes wat vir bostaande ondersoek breedvoerig uitgewerk is, is sonder meer ook aangewend by ondersoek in verband met die bestanddele van sement, asook om verskille in samestelling te ontbloot in wolframoksied-monsters wat ná reduksie gelei het tot wolfram-metaal van verskillende en soms ongewenste korrelgrootte. Laasgenoemde drie ondersoek is almal op 'n kontrakbasis vir industriële instansies uitgevoer.

Elektronmikroskoop-tegnieke

Roetine elektron-mikroskopiese ondersoek ten behoeve van industriële en ander organisasies het bepaling van die grootte en vorm van kleinmonsters, gifdeeltjies in spuitmiddels, virusse, bakterieë, ensovoorts, ingesluit.

GEOKRONOLOGIE

Verskeie monasietvoorkomste in Suidelike Afrika is geokronologies ondersoek, ten einde die geskiktheid van hierdie mineraal vir ouderdomsbepalings vas te stel. Monasiet bestaan hoofsaaklik uit die fosfate van die seldsame aardes met thorium vanaf 0.2 tot 22 persent en uraan tussen .005 en 0.3 persent. Hoewel thorium en sy stabiele eindprouk Pb^{208} vanweë groter konsentrasies noukeuriger bepaal kan word, is die Pb^{208}/Th^{232} -ouderdomme tot 50 persent laer as die ware ouderdom van die mineraal. In gevalle waar ouderdomme verskil, word die volgende patroon gewoonlik gevind Pb^{207}/Pb^{206} -ouderdom $> Pb^{207}/U^{235}$ -ouderdom $> Pb^{206}/U^{238}$ -ouderdom $> Pb^{208}/Th^{232}$ -ouderdom. Die Pb^{207}/Pb^{206} -ouderdom is gewoonlik die naaste aan die ware ouderdom. Die keuse van monsters mag wel 'n rol speel—soos blyk uit resultate van die Bandolierkop-, Kakamas- en Mt. Darwin-monasiete—maar die werklike oorsake van hierdie afwykinge is nog onbekend.

Ouderdomsbepalings op die Houtenbeck-monasiet, naby Groblersdal, het die ouderdom van die Bosveld-stollings-kompleks onteenseglik op $2,000 \pm 50$ miljoen jaar gestel en gevolglik 'n minimum ouderdom vir die Transvaal Sisteem bepaal. (Nicolaysen, 1958.) Vir die

crystal. This investigation was connected with the work on the age determination of Monazites and is intended to provide information on the possible loss of thorium.

X-ray Diffraction Techniques

Quantitative X-ray diffraction techniques were applied on an intensive scale to the study of the composition of Fischer-Tropsch catalysts. These investigations, carried out in conjunction with other analytical methods, illustrated the power of the X-ray method in the analysis of mixtures of complex compounds as found in the Fischer-Tropsch catalysts.

The quantitative methods developed for the above-mentioned investigation were applied without alteration to investigations into the constituents of cement; and the differences in composition of tungstic oxides which gave different and sometimes undesirable grain size in the tungsten powders obtained by their reduction. These investigations were all carried out under contract with industrial concerns.

Electron Microscope Techniques

Routine electron microscope investigations on behalf of industrial and other concerns included measurement of the size and shape of clay particles and poisonous particles in insecticides and photo-microscopy of viruses and bacteria.

GEOCHRONOLOGY

Several samples of monazite occurrences in Southern Africa were investigated to determine the suitability of monazites for age determinations. Monazite is essentially a rare-earth phosphate with thorium from 0.2 to 22% and uranium between .005 and 0.3%. Although the concentrations of thorium and its stable end product Pb^{208} are relatively more accurately determined because of their greater abundance, Pb^{208}/Th^{232} ages are as much as 50% lower than the true age of the mineral. The following pattern is usually found in cases where ages differ: Pb^{207}/Pb^{206} age $> Pb^{207}/U^{235}$ age $> Pb^{206}/Pb^{208}$ age $> Pb^{208}/Th^{232}$ age. The Pb^{207}/Pb^{206} age is usually the most reliable estimate of the true age. Results from the Bandolierkop-, Kakamas- and Mt. Darwin-monazites suggest that sample selection might account for some of the age discordances. No satisfactory explanation of discrepant age patterns has yet been proposed.

Age determinations on the Houtenbek monazite near Groblersdal dated the Bushveld Igneous Complex at $2,000 \pm 50$ million years, thus setting a minimum age for the Transvaal System (Nicolaysen 1958). For the

eerste maal is ionuitruilingskolomme gebruik toe ditisoonekstraksie van die lood in teenwoordigheid van hoë fosfaatioonkonsentrasie misluk het. Onderzoek word ingestel na die moontlikheid om die huidige algemene organiese vloeistofekstraksietegnieke met ionuitruilingskolomme te vervang.

Noukeurige bepalinge op vier monsters van 'n monasietvoorkoms by Kakamas, het die ouderdom van hierdie pegmatiet op 950 ± 40 miljoen jaar gestel. Hierdie resultaat stem ooreen met ouderdomsbepalinge op ander minerale in dieselfde pegmatiet.

'n Ouderdom van $2,550 \pm 100$ miljoen jaar is vasgestel vir 'n monasiet uit 'n pegmatiet in die ou granietebandolierkop. Die buitengewoon lae uraan-konsentrasie van 40 dele per miljoen het die toepassing van isotoopverduunningstegnieke genoodsaak.

Die rol wat monsterkeuse speel, word treffend geïllustreer deur die resultate van die Mt. Darwin monasiet uit 'n pegmatiet 70 myl noord van Salisbury. In een geval is uitstekende ooreenstemming tussen die vier isotoopouderdomme verkry terwyl 'n tweede monster 'n afwyking van 20% vir die thorium-ouderdom aangee-ton het.

Om 'n beter insig te kry in die aard en moontlike oorsake van ouderdomsafwykinge, is vier monasiet-monsters aan matige suur-loging onderwerp. Enkele belangrike gevolgtrekkings kan aangedui word:

In verhouding is gewone lood makliker oplosbaar in verdunde suuroplossings as radiogene lood;

Pb^{207} en Pb^{206} is meer oplosbaar in verdunde suur as Pb^{208} ;

uraan los makliker op in verdunde suur as thorium; die ouderdomsafwykinge is die gevolg van verlies van ouer en dogter. Die berekende ouderdomme sal te hoog of te laag wees na gelang die verlies van ouer of dogter oorheersend was.

Die aanduidings dat die distribusie van uraan, thorium en lood in die monasietkristal met ouderdomsafwykinge gekorrelleer kan word, word tans met behulp van X-straalfluoresensie ondersoek.

In samewerking met dr. H. Besairie, Direkteur van die Geologiese Opname, Madagaskar, is ouderdomsbepalinge op monasietvoorkomste by Inoa, Mananjary, Mananjely, Amboangitelo, Vohimena en Kalambatitra, uitgevoer. Hierdie navorsing het 'n belangrike rol gespeel in die bevestiging van sekere stratigrafiese indelings vir die geologie van Madagaskar. Interpretasie is bemoelik deur die alluviale voorkoms van verskeie van die monasiete. Die ouderdomme is soos volg: Inoa 550 ± 30 miljoen jaar; Mananjary 850 ± 40 miljoen jaar; Mananjely 550 ± 30 miljoen jaar; Amboangitelo 550 ± 30 miljoen jaar; Vohimena 900 ± 50 miljoen jaar en Kalambatitra 550 ± 30 miljoen jaar.

Die studie van die loodisotoopverhoudings van loodglans van die Witwatersrand en Oranje-Vrystaat, en

first time ion exchange columns had to be introduced following the failure of dithizone extraction of lead in the presence of predominant phosphate-ion concentrations. The substitution of organic liquid extraction techniques by ion exchange columns is being investigated.

Accurate age determinations on four samples of a monazite occurrence near Kakamas yielded an age of 950 ± 40 million years for this pegmatite. This result is in concordance with age determinations done on other minerals from the same pegmatite.

An age of $2,550 \pm 100$ million years was established for a monazite from a pegmatite in the Old Granites near Bandolierkop. Isotope dilution techniques were applied to determine the exceptionally low uranium concentration of 40 parts per million.

The effects of sample selection on age patterns were strikingly illustrated by the results of the Mt. Darwin monazite occurring in a pegmatite 70 miles north of Salisbury. Two samples were studied; one gave excellent agreement for the four isotope ages; the other showed at 20% thorium age discrepancy.

Four powdered monazite samples were subjected to mild acid leaching and the results studied in an attempt to gain a better understanding of the nature and possible cause of age discrepancies:

Proportionately, common lead is more soluble in diluted hydrochloric acid than radiogenic lead.

Pb^{207} and Pb^{206} are more soluble in diluted hydrochloric acid than Pb^{208} .

Uranium is more easily leached by mild acid washing than thorium.

Age discrepancies result from the loss of both parent and daughter. The calculated ages will be either too high or too low according to whether the loss of parent or daughter predominated.

Investigation with X-ray fluorescence are carried out in order to determine possible correlations between age discrepancies and the distribution of uranium, thorium and lead in the monazite crystal.

Age determinations on monazite occurrences at Inoa, Mananjary, Mananjely, Amboangitelo, Vohimena and Kalambatitra were done in collaboration with Dr. H. Besairie, Director of the Geologic Survey of Madagascar. These investigations played an important part in the confirmation of certain stratigraphic classifications in the geology of the island. The following ages were adopted. Inoa 550 ± 30 million years; Mananjary 850 ± 40 million years; Mananjely 550 ± 30 million years; Amboangitelo 550 ± 30 million years; Vohimena 900 ± 50 million years and Kalambatitra 550 ± 30 million years.

hul verhouding tot die ouderdom van die Witwatersrandse uraninite, is voortgesit. 'n Verdere 13 monsters is ontleed.

Ongeveer 15 Sr-opnames is gemaak ten opsigte van Rb-Sr-ouderdomsbepalings wat aan die Bernard Price-instituut onderneem word. Dit vorm deel van 'n projek wat gesamentlik deur die Nasionale Fisiese Navorsingslaboratorium en die Bernard Price-instituut onderneem word om die ouderdomme van uraan- en rubidiumdraende minerale van dieselfde geologiese voorkoms, te vergelyk.

OSEANOGRAFIE

Die klankvoortplantingseienskappe van die boonste laag van die see verander met tyd en plek en daar is 'n begin gemaak met 'n studie van die fisiese prosesse wat hierdie veranderinge teweegbring.

In die afgelope jaar is daar by vier geleenthede metings ter see gedoen en daar is meer as driehonderd *temperatuurdiepte grafieke* gemaak. Eerstens is gemiddelde temperature met uurlange tussenposes vir elke meterdiepte vanaf die oppervlak tot op dertig meter bereken en grafieke van temperatuur in verhouding tot tyd is gemaak. Die daaglikse verhitting en verkoeling wat deur die oppervlak voortgeplant word was duidelik opmerkbaar, hoewel dit heelwat deur wind-, weer- en gety-veranderinge vervormd is. In hierdie stadium was dit nie moontlik om enige kwantitatiewe korrelasies te maak nie. Tweedens is metings wat binne tydperke van vyf minute gedoen is, ontleed om vas te stel watter temperatuurwisselinge daar op een punt binne so 'n kort tydperk kan bestaan. Daar bestaan 'n goeie verband tussen temperatuurwisselinge en temperatuurveranderinge in 'n vertikale vlak maar hierdie verhouding het met tyd aansienlik verander. Dit was 'n aanduiding dat die temperatuurveranderinge op 'n vertikale vlak nie alleen verantwoordelik was vir die temperatuurwisselinge nie, maar dat hulle wel 'n invloed uitgeoefen het op die faktore wat oorspronklik die wisselinge veroorsaak het.

Die temperatuurregisterder is in die loop van die jaar verander sodat dit van vyf tot vyf-en-twintig grade kon meet in elf stappe van tien grade elk. Stabiliteit van die instrument was plus-minus twee-honderdstes van 'n graad Celsius.

In die afgelope jaar is die *klanksnelheidregisterder* aansienlik verander. 'n Nuwe kristaluitstraler is ontwerp en gebou en die stroombaan van die instrument is verander sodat beter werkverrigting ter see verkry kon word. Toetse in die see het bewys dat die instrument, hoewel ongeyk, stabiel was tot op een deel in twintigduisend, en dit was die eerste keer dat die apparaat sonder onderbreking gewerk het ten spyte van die onvermydelike ruwe hantering in 'n klein bootjie op die oop see.

The study of the isotopic compositions of galenas from the Witwatersrand and Orange Free State and their relation to the age of the Witwatersrand uraninites was continued. Thirteen samples were analysed.

The isotopic composition of 15 Sr. samples were determined for the Bernard Price Institute. This is part of a joint National Physical Research Laboratory—Bernard Price project to compare the ages of uranium-, thorium- and rubidium-bearing minerals of cogenetic occurrence.

OCEANOGRAPHY

The sound transmission characteristics of the surface layer of the sea varies with time and position and a start was made on a study of the physical processes involved in producing these variations.

Four trips to sea were made during the year and a total of more than three hundred temperature-depth records obtained. In the first instance, hourly mean temperatures were computed at one metre intervals from zero to thirty metres and plotted as functions of time. Diurnal variations in temperature were clearly discernable, though modified by the effects of wind, weather and tides. It was impossible at this stage to make quantitative correlations. Secondly, records within five-minute periods were analysed to indicate the extent of short-term temperature fluctuations. Good correlation was found between temperature fluctuations and vertical temperature gradients, but the relationship between the two varied considerably with time, indicating that the gradient alone was not the prime cause of the fluctuations but only exerted a controlling influence on whatever factors produced the fluctuations initially.

The temperature recorder was modified during the year to cover the range 5° to 25° in eleven scales of ten degrees each. Stability in use at sea was proved to be $\pm .02^{\circ}\text{C}$.

The sound velocity recorder was considerably modified during the year by the construction of a new crystal transducer mounting and re-design of the circuit in the underwater unit to ensure stability in use at sea. A test at sea in an uncalibrated state indicated short-term stability of at least 1 part in 20,000, and for the first time the instrument operated continuously despite the rough handling inevitable at sea in a small ship.

'n Proefinstrument is in samewerking met die Universiteit van Kaapstad gebou om die soutgehaltestruktuur van die oppervlak te bepaal. 'n Kort beskrywing van hierdie instrument is reeds gepubliseer (Anderson, Guelke, Hotz & Spong, 1957). In die loop van die jaar is die ontwerp en dele van hierdie instrument getoets en 'n prototipe word tans deur die „Instrument Manufacturing Corporation” in Kaapstad gebou.

Die langgolfregistreerder vir die Internasionale Geofisiese Jaar by Witsandbaai, het suksesvol gewerk tot Desember toe die plastiese pyp gebreek het. Die pyp is egter weer teen Maart herstel. Die registreerder in Port Elizabeth is in Julie gemonteer maar het slegs vir 'n week gewerk waarna werksaamhede gestaak is.

ATMOSFERIESE FISIKA

Soos in die vorige drie jaar is daar weer gedurende die afgelope Januarie-maand daaglikse metings van die *konsentrasie vrieskerne* in die lug uitgevoer. In hierdie geval is metings by twee plekke naby Pretoria, ongeveer 7 myl van mekaar, gemaak. Op hierdie wyse sal inligting oor die verspreiding en oorsprong van hierdie deeltjies verkry word. Vrieskerne speel vermoedelik 'n groot rol in die groei van reëndruppels in wolke.

Die gesamentlike waarnemings, vanaf 1956 tot 1959, dui aan dat daar aansienlike vermeerderings in die konsentrasie ysvormende kerne omstreeks die 12de en die 29ste Januarie plaasvind; dit toon goeie ooreenstemming met soortgelyke waarnemings in ander dele van die wêreld. 'n Derde hoogtepunt, ongeveer die 22ste Januarie, ontbreek egter by ons.

Dit is moontlik dat hierdie deeltjies van meteorietiese oorsprong is, aangesien daar bekende „meteorietbuie” is wat die aarde se atmosfeer presies 'n maand vroeër tref.

Die ondersoek van die *groeiprosesse van stormwolke* oor Pretoria is gedurende die tydperk van November tot Maart voortgesit. Waarnemings van die hoogte van wolktoppe dui aan dat wolke eers tot baie groot hoogtes moet aangroei voor reën moontlik is. Verysing wat dikwels die voorganger van reën is, vind gewoonlik eers by 'n temperatuur laer as -20°C . plaas.

'n Deeglike studie van die *geskiedenis van enkele wolke* kan nou gemaak word met behulp van fotografiese waarnemings wat gelyktydig met die hoogtemetings gemaak is. 'n Radar-toestel is ook as hulpmiddel gebruik.

Naby die kus is daar 'n aansienlike aantal soutdeeltjies in die lug. Hulle belangrikheid lê in die feit dat hulle reënformasies kan aanhelp. Baie min is egter bekend oor die verspreiding van hierdie partikels na die binneland. In samewerking met die Departement Fisika van die Universiteit van Natal in Durban, is daar 'n begin gemaak met die metings van die aantal en grootte van die soutdeeltjies in die lug. Lug word deur 'n baie fyn filtreerpapier gesuig en die partikels

The experimental model of the instrument was produced in conjunction with the University of Cape Town and was briefly described elsewhere. (Anderson, Guelke, Hotz & Spong 1957.) A prototype is under construction by the Instrument Manufacturing Corporation of South Africa in Cape Town. The design and testing of some of the component parts were undertaken during the year.

The recorder at Witsandbaai was maintained until mid-December when a break in the hose to sea occurred. Operation was resumed in early March. The recorder at Port Elizabeth was eventually installed at the end of July but worked for one week only. This project was subsequently abandoned.

ATMOSPHERIC PHYSICS

As in the previous three years, daily measurements were carried out during last January of the *concentration of freezing nuclei* in the atmosphere. This year measurements were made at two places near Pretoria, about seven miles apart. In this manner information on the distribution and origin of these particles will be obtained. Freezing nuclei are thought to play an important part in the growth of raindrops in clouds.

The consolidated observations, from 1956 to 1959, indicate that considerable increases occur in the concentration of ice-forming nuclei about the 12th and the 29th January; this shows good agreement with similar observations in other parts of the world. A third peak, on about the 22nd January, has not been observed by us.

It is possible that these particles are of meteoric origin, as there are known meteor showers which enter the earth's atmosphere exactly a month earlier.

The investigation of *growth processes of storm-clouds* over Pretoria was continued during the period November to March. Observations of the height of cloud tops show that the clouds must first reach great heights before rain is possible. Glaciation, which often precedes rain, first occurs at temperatures lower than -20°C .

A thorough study of the history of single clouds can now be made using the photographic records which were made at the same time as the height measurements. Additional information was also obtained using a radar set. Near the coast there are a large number of salt particles in the air. Their importance lies in the fact that they can assist the formation of rain. Very little is known about the distribution of these particles inland. In co-operation with the Department of Physics of the University of Natal in Durban, a start has been made of the measurement of the number and size of salt particles in the atmosphere. Air is drawn through a very fine filter and the particles which are deposited

wat opgevang word, word aan 'n chemiese reaksie blootgestel sodat hulle dan waarneembaar is.

Werk op *lugbesoedeling* in die Pretoria-gebied is nou vier jaar lank aan die gang. Die Gesondheidsdepartemente van Johannesburg, Durban en Oos-Londen het vir 'n korter tyd metings gedoen en hulle resultate is gevolglik minder waardevol. Die resultate vir die vier stede is in een verslag saamgevat, wat aan die gesondheidsbeamptes en die stadsrade van die vier stede 'n oorsig van die algemene toestand sal gee. Dit blyk dat Johannesburg se sentrale gebied die ergste aan rook onderhewig is. Die resultaat is nie verbasend nie aangesien Johannesburg die grootste van die vier stede is. Die rook wat in Pretoria gemeet is, het gedurende die vier jaar 'n aansienlike styging getoon. Die metings in die ander drie stede is nog nie lank genoeg aan die gang om 'n gevolgtrekking te kan maak nie.

Die toenemende aandag wat aan *son-energie* gegee word, maak dit noodsaaklik om 'n noukeurige studie van sonlig ook in Suid-Afrika te maak. Met behulp van 'n dubbelmonokromator en die nodige geassosieerde meetinstrumente, is 'n begin gemaak met 'n studie van die energieverdeling in son- en daglig. Aandag is hoofsaaklik aan sonlig gegee maar 'n begin is ook met die studie van daglig gemaak. Die invloed van atmosferiese besoedeling op die energieverdeling in son- en daglig is ondersoek maar heelwat meer resultate, veral onder wintertoestande, is nodig vir die maak van geldige gevolgtrekkings. Op hierdie stadium kan egter reeds gesê word dat lugbesoedeling wel 'n sterk invloed op die energieverdeling uitoefen en dat dit veral die maksimum van die energie-kurwe in die rigting van die rooi stoot.

OPTIKA

Metodes vir die *kense van glase* in Taylor-triplette, met oorblywende longitudinale kromatiese aberrasie, is ontwikkel. Hierdie metodes berus op vergelykings wat óf die krag óf die deviasie van die tweede lens in terme van glas-konstantes bepaal, en op krommes van konstante krag of konstante deviasie vir die tweede lens. Met behulp van hierdie krommes word glas-kombinasies gevind wat óf 'n klein krag óf 'n klein deviasie vir die tweede lens gee, asook die vereiste lengte van die objektief en 'n geskikte posisie vir die diafragma. (Lessing, 1958 en 1959.)

Glansmeting behoort 'n belangrike plek in die studie van oppervlakke van byvoorbeeld teëls of verwe in te neem. Die psigologiese en fisiologiese faktore wat die beoordeling van glans beïnvloed is egter in die algemeen verwaarloos en gevolglik is 'n studie van glans vir gekleurde oppervlaktes begin met die doel om, indien moontlik, die kwantitatiewe ligverstrooiingseienskappe van oppervlakke met die ooreenkomstige visuele voor-komste te korreleer. (Boshoff, 1958.)

are subject to a chemical reaction so that they may then be observed

Work on air pollution has now been in progress for four years. The health departments of Johannesburg, Durban and East London have had measurement programmes going for a shorter period and their results are therefore of less value at the moment. The results for the four towns have been combined in a single report in order to give officials and their city councils a general picture of the present position. It appears that the central section of Johannesburg has the highest concentrations of smoke and this result is not surprising, seeing that Johannesburg is the largest town of the four.

The smoke measurements in Pretoria have shown a marked increase during the four years. The measurements in the other three towns have not covered a long enough time for any trend to be observed.

The increasing world attention to the energy of the sun makes necessary a detailed study of solar energy in South Africa. With a double monochromator and associated measuring instruments a study was started of the energy distribution of sun- and daylight. The emphasis here was on sunlight but daylight will also be studied. The influence of atmospheric pollution on the energy distribution in sun and daylight was investigated but more results, especially under winter conditions, are needed to reach valid conclusions. At this stage it seems that air pollution has a large influence on the energy distribution. It displaces the maximum energy distribution towards the red part of the spectrum.

OPTICS

Methods for the *selection of optical glasses* in Taylor Triplets with residual longitudinal chromatic aberration have been developed. These methods are based on equations which determine either the power or the deviation of the second lens in terms of the optical glass constants, and on curves of constant power of constant deviation for the second lens. By means of these curves glass combinations are found which give either a small power or a small deviation for the second lens, the required length of the objective, and a suitable position for the diaphragm. (Lessing, 1958 and 1959.)

The *measurement of gloss* should play an important role in the study of tile, paint and other surfaces. Psychological and physiological factors affecting the judgment of gloss are generally neglected in existing methods of gloss measurement. A study of the gloss of surface-colours is commenced in an attempt to correlate quantitative light distribution properties of surfaces with their visual appearance.

Interferensiefilters van die metaaldiëlektrikumtype, gevorm deur vakuumpodamping van magnesiumfluoried as tussenmateriaal en aluminium as reflekerende lagie, is suksesvol in die laboratorium vervaardig. Hierdie filters kan in die ultraviolet tot by ongeveer 2,000Å gebruik word maar die deurlating is klein—byvoorbeeld 8 persent deurlating vir 'n deurlatingspiek van 140Å by 2,180Å.

Om die moeilikheid van klein deurlating te oorbrug, is die gebruik van slegs diëlektra ondersoek en bariumoksied is as hoë-indeks-stof gekies. Daar is gevind dat bariumoksied in die atmosfeer redelik stabiel is en 'n absorpsie van slegs 35 persent by 2,000Å toon. Verder is gevind dat die brekingsindeks van die opgedampte barium-oksiedlagies ongeveer 1.7 is, wat laer is as wat verwag is. Dit is merkwaardig dat hierdie waarde besonder goed is vir 'n dubbellaag-antirefleksie-samestelling met magnesiumfluoried vir die bedekking van kwarts.

BIOFISIKA

Kragte in die Baarmoeder

Die wetenskaplike span van die Mediese Skool van die Witwatersrandse Universiteit en die Afdeling Algemene Fisika van hierdie laboratorium, het nou tot die gevolgtrekking gekom dat een belangrike rede waarom die eerste stadium van die geboorteproses somtyds 'n aansienlike tyd neem, veroorsaak word deurdat die moeder se maagspiere op die buitekant van die baarmoeder druk en verhoed dat die baarmoeder sy normale bolvorm aanneem. Die mediese groep van die span het nou 'n metode ontwikkel wat die duur van die geboorteproses en ook die pyn wat die moeder verduur, kan verminder.

Met dié metode word die druk van die maagwand op die baarmoeder verminder deur die onderdeel van die moeder se lyf onder 'n verminderde lugdruk te plaas. Dié metode het die duur van die geboorteproses van meer as twaalf uur (in die geval van 'n eerste geboorte) tot omtrent drie uur verminder.

Die hoof van die Afdeling Algemene Fisika het by hierdie ondersoek in 'n raadgewende hoedanigheid opgetree, terwyl die kliniese eksperimente deur die mediese groep gedoen word. (Halliday et al, 1958.) 'n Verdere aantal publikasies word deur die mediese groep voorberei.

AKOESTIEK

Psigo-Akoestiek

Vir alle berekenings aangaande die verstaanbaarheid van spraak in vertrekke, asook die optimum naklanktye van vertrekke, is dit nodig om te weet tot welke mate spraak gemasker word deur laat-weerkaatsings wat buite die integrasieperiode van die gehoorsisteam optree.

Interference filters of the metal-dielectric type, formed by vacuum evaporation of transparent magnesium fluoride as spacer material and aluminium for the reflecting layers, have been successfully manufactured in the laboratory. These filters can be employed in the ultraviolet down to about 2000 Å but have low transmission values—for example, 8 percent transmittance at 2180 Å for a peak 140 Å wide centred on this wavelength.

To overcome the difficulty of low transmission, the use of dielectrics alone has been investigated and Barium oxide was selected as the high index material. This material is reasonably stable under normal atmospheric conditions and absorbs only 35 per cent of incident monochromatic radiation at 2000 Å. The refractive index of the Barium oxide layers was observed to be about 1.7, somewhat lower than expected. It is significant, however, that this value is particularly suited to its use in a two-layer antireflection combination with magnesium fluoride, for blooming quartz surfaces.

BIOPHYSICS

Forces in the Uterus

The scientific team from the Witwatersrand University and the General Physics division of this laboratory has now come to the conclusion that one important reason why the first stage of the birth process sometimes takes a very long time is that the abdominal muscles of the mother exert a force upon the uterus and prevent it from assuming a semi-spherical shape. The medical group of the team has now developed a process which reduces the time of the first stage of labour and also reduces the pain which the mother experiences.

In this method the force of the abdomen upon the uterus is reduced by placing the lower portion of the mother's body in a space under reduced pressure. The method has reduced the time of the first stage of labour from more than twelve hours (in the case of a first birth) to something like three hours.

The head of the General Physics Division has played a consultative part in the development of this method, while the experimental work has been done by the medical group. (Halliday et al, 1958). A further series of publications is being prepared by the medical group.

ACOUSTICS

Psycho-Acoustics

For all calculations regarding the intelligibility of speech in rooms, as well as the optimum reverberation time of rooms, it is necessary to know the degree to which speech is masked by late reflections occurring outside the integration period of the hearing system.

Die akoestiese spektrum van foneties-gebalanseerde woordelyste is bepaal en 'n apparaat is gebou wat agtergrondlawaai kan verskaf wat dieselfde spektrum het. Toetse word in die weerklankvrye kamer uitgevoer om die maskerende werking van die agtergrondlawaai te bepaal.

Bestaande kurwes van naklanktye vir vertrekke is grotendeels empiries. Deur van die integrasie-eienskappe van die oor gebruik te maak, kon die optimum naklanktyd van vertrekke bereken word—die berekende waardes kom goed ooreen met gepubliseerde kurwes, maar sekere faktore (soos die maskering van spraak deur laat-weerkaatsings) moes aangeneem word. Die aanduidings is dat die berekeningsmetode betroubare resultate sal lewer wanneer hierdie faktore eksperimenteel bepaal is.

Die ontleding van die resultate van pulstoetse in sale mag die antwoord bied op die berekening van spraak-verstaanbaarheid van objektiewe toetse. 'n Apparaat wat klankdrywing in plaas van klankdruk meet en wat oor gegewe periodes kan integreer, word tans ontwikkel en is feitlik gereed vir voorlopige toetse.

Argitektoniese Akoestiek

Die verskaffing van raad aan instansies wat die akoestiek van hulle geboue wil verbeter, en aan argitekte wat hulle geboue akoesties reg wil ontwerp, bly nog steeds 'n gewilde diens.

Gedurende die jaar is raad gegee vir die behandeling van ses-en-twintig geboue oor die hele Unie en selfs gebiede buite die grense. Daaronder was skole, kerke, bioskope, stadsale en raadsale.

Akoestiese Instandhoudingswerk

Instandhoudingswerk word nog steeds gedoen aan toerusting wat vir die Transoranje Skool vir Doves en die Meganiese Opname van Hofverrigtinge ontwikkel is.

Spesiale grammofoonplate is vir die handel en die Nasionale Toneelorganisasie gemaak.

Daar is met die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese saamgewerk in verband met lawaaiprobleme wat mag ontstaan by die installasie van nuwe ventilasie-toerusting by 'n Vrystaatse myn.

Navorsing oor die Afwering van Haaie

Daar is ongeveer 'n jaar gelede met hierdie werk begin. Vanweë die geringe gegewens wat oor haaie in die literatuur te vinde was, moes 'n groot hoeveelheid eksperimentele werk gedoen word. Daar is op elektriese metodes van afwering gekonsentreer en studies is gemaak van die veldverdeling tussen elektrodes in vars- en soutwater en die kragverbruik vir verskillende soorte impulse en elektrodes.

The acoustical spectrum of phonetically balanced word lists was determined, and an apparatus was constructed to generate background noise having the same spectrum. Tests are being carried out in the anechoic chamber to determine the masking of this background noise.

Existing curves of reverberation time for rooms are mainly empirical. By using the integration characteristics of the ear, optimum reverberation times of rooms could be calculated. The calculated values are in good agreement with published curves, but some factors (such as the masking of speech by late reflections) had to be assumed. There are indications that this method of calculation will furnish reliable results once these factors have been determined experimentally.

The analysis of pulse tests in halls may be the answer to the problem of computing speech intelligibility from objective measurements. An apparatus that measures sound energy rather than sound pressure and can integrate over given periods, is being developed and is practically ready for preliminary tests.

Architectural Acoustics

Advice to persons who want to improve the acoustics of their buildings and to architects who want to design their buildings so as to be acoustically correct remains a service for which there is a popular demand.

During the year advice was given on the treatment of twenty-six buildings throughout the Union, even in territories outside our boundaries. Included were schools, churches, cinemas, city halls and council chambers.

Acoustical Maintenance

Maintenance work is still being done on equipment developed for the Transoranje School for the Deaf, and for the mechanical recording of law court procedures.

Special gramophone records were made for the Trade and for the National Theatre Organization.

Work was done jointly with the National Mechanical Engineering Research Institute in connection with noise problems that could arise from the installation of new ventilation equipment at a mine in the Free State.

Research on Shark Barriers

Work started about a year ago. Due to the meagre information available on sharks in the literature a great deal of experimental work had to be done. Electrical repulsion methods were concentrated upon, and studies were made of the field distribution between electrodes in fresh water and in salt water as well as of the power requirements of different electrode types and pulse waveforms.

Die reaksies van 'n paar soorte varswatervisse op elektriese stimuli is bepaal en apparate is opgebou om 'n groot verskeidenheid impulse op te wek. Die vermoë van die apparate het van 1 kilowatt tot 'n piek van 1,000 kilowatt gewissel. Laasgenoemde word tans aan die Natalse kus gebruik waar toetse op lewendige haaië uitgevoer word. Die uitwerking van die elektriese stimuli op mense word ook ondersoek.

ULTRASONIKA

Met behulp van ultrasoniese pulsrefleksiemetodes is die bepaling van die omvang en graad van verbrokkeling van rotswande in Suid-Afrikaanse myne suksesvol deur die navorsingstadiums gevoer. Die fundamentele eienskappe van rotse, soos byvoorbeeld klankspoedweerstand teen voortplanting, is gemeet as funksies van die frekwensie van die aangelegde ultrasoniese en soniese klankgolwe asook stasiese drukspanning op die rotse. Met hierdie inligting as grondslag is 'n metode ontwerp om die omvang asook die graad van rotsverbrokkeling in die omgewing van uitgrawings te bepaal. (Lutsch, 1958.)

'n Instrument vir gebruik by roetine-ondersoeke en met 'n draaggolffrekwensie van 250 kiloherz is ontwerp. Die konstruksie van hierdie instrument is byna voltooi.

Metodes is ontwikkel om die graad van koppeling tussen ultrasoniese omsetters en die voorwerpe onder toets te bepaal. In die toepassing van ultrasoniese golwe vir nie-vernietigende toetse is die vertolking van die toetsresultate dikwels bemoelijk deurdat die graad van koppeling tussen omsetter en voorwerp nie bekend was nie. (Lutsch, 1958.)

Vanweë die plastiese wig tussen omsetter en toetsvoorwerp is bogemelde tegniek nie van toepassing in die geval van skuinstoetskoppe nie. Om die graad van koppeling in sulke gevalle te bepaal, is 'n geskikte akoestiese metode ontwikkel en eksperimenteel is gevind dat daarmee 'n maatstaf van die graad van koppeling verkry word. (Lutsch, 1958.) 'n Teoretiese ondersoek van die metode met behulp van die syferrekenaar is tans onderweg.

Vir die aandrywing van ultrasoniese omsetters word 'n multifrekwensie-apparaat ontwikkel om die elastiese eienskappe van materie by verskillende ultrasoniese frekwensies in tydsintervalle van millisekondes te bestudeer. Die voorlopige apparaat is ontwerp om pulse van frekwensies 1, 3 en 5 megahertz onderskeidelik teen 'n herhalingsfrekwensie van 10 tot 10,000 pulse per sekonde op te wek. Twee verskillende intreebane is ondersoek, maar weens kruiskoppeling tussen die onderskeie afgestemde kringe wat vervorming van meer as 10 persent veroorsaak het, is hierdie bane as ongeskik beskou en word verdere ontwerpe bestudeer.

Die oriëntasie van die assestelsel van 'n Piezo-elektriese kwartskristal is met behulp van die Afdeling

The reactions to electrical stimuli of a few species of fresh water fish were determined and apparatus was built to generate a wide variety of pulses. The peak output of the instruments varied from 1 kilowatt to 1000 kilowatts. The latter is at present being used on the Natal coast where tests are being performed on live sharks. The effect of electrical stimuli on humans is also being investigated.

ULTRASONICS

Using ultrasonic pulse-reflection methods, the determination of the extent and degree of fracture of rock faces in South African mines has been taken successfully through the various investigational stages. The velocity of propagation and the attenuation of elastic waves in rocks have been measured as a function of frequency in both the sonic and the ultrasonic range as well as of the static pressure in the rock. On the basis of this information a method has been developed for determining both the extent and degree of fracture of the rock in the vicinity of mine workings. (Lutsch 1958.)

An instrument for use in routine investigations, with a carrier frequency of 250 kilocycles/sec, has been designed. Its construction is nearing completion.

Methods have been developed to determine the degree of coupling between ultrasonic transducers and the objects under test. In the application of ultrasonic waves in nondestructive testing, the interpretation of tests results was often hampered by the absence of precise information on the degree of coupling (Lutsch 1958).

Because of the plastic wedge between transducer and test object in the case of angle testheads the above-mentioned method could not be applied. To determine the degree of coupling in such cases, a suitable acoustic method was developed and was found experimentally to give a measure of the degree of coupling (Lutsch 1958). A theoretical analysis of the method, using a digital computer, is under way.

A multifrequency generator for the excitation of ultrasonic transducers is being developed with the object of studying the elastic properties of materials at different ultrasonic frequencies during millisecond time-intervals. Preliminary designs of apparatus are being investigated for generating pulses with carrier frequencies of 1, 3 and 5 megacycles/sec. respectively and with repetition frequencies of 10 to 10,000 pulses per second. Two different input circuits were examined but because of cross-coupling between the different tuned circuits which caused distortion of more than 10%, these circuits have been regarded as unsuitable, and other designs are being studied.

The orientation of the axes of a Piezo-electric quartz crystal has, with the assistance of the X-ray crystallography division, been determined with an accuracy

X-strale tot 'n noukeurigheid van $\pm 0.5^\circ$ bepaal. 'n X-snitplaat van 1 duim deursnee en 2.87 millimeter dikte is deur die optiese werkplaas gesny en geslyp. Hierdie kristal het die verwagte resonansiefrekwens van 1 megahertz gehad toe dit in 'n Piercetype kristalgekontroleerde ossilator getoets is. Hierdie omsetter sal in die multifrekwensie-apparaat gebruik word. Met hierdie werk is dan ook die nodige ondervinding opgedoen sodat kristalle vir ander laboratoria of groepe gemaak kon word.

Die moontlikheid om 'n bariumtitanatoomsetter vir gebruik bokant 10 megahertz te vervaardig, word tans ondersoek.

'n Ultrasoniese golfrigter en behandelingskamer is vir die Amebiasenavorsingsseenheid ontwerp vir gebruik by die selektiewe opbreking van amebe.

Bakterieë is ook deur ultrasoniese vibrasies by 20 kilohertz vernietig in 'n eksperiment wat ten behoeve van die Departement van Landbou gedoen is.

ELEKTROTEGNOLOGIE

Transistor Gelykstroomversterkers

Resultate dui daarop dat gelykstroomversterkers met transistore as aktiewe elemente gebruik kan word waar nulpuntverskuiwing (zero drift) van buise 'n beperking is. Dit geld veral in toepassings waar intree weerstande in die orde van 5–50 kilo-ohm toelaatbaar is, dus veral in stroomversterkers.

Selfvoorspanning (V_{be}) en versadigingstroom (I_{co}) is funksies alleenlik van temperatuur en nie ook van tyd soos in buise nie. Weens hul voorspelbaarheid is gevind dat met sekere kompensasiemetodes, nulpunt verskuiwing van minder as 0.1 mikro-ampère vir temperatuurveranderinge tussen 0°C . en 65°C . verkry kon word. Die nulpunt verskuiwing is selfs kleiner onder omstandighede van kleiner temperatuurskommelings soos wat gewoonlik in die praktyk voorkom. Die kompensasie is dus doeltreffend tot slegs 10°C . onder die maksimum toelaatbare temperatuur van 75°C . vir die betrokke germaniumeenhede.

Daar is gevind dat hierdie doeltreffendheid van kompensasie sonder veel moeite in gebalanseerde versterkers verkry kon word. Deur van 'n korrekte instelprosedure gebruik te maak, kon in 'n samegestelde gebalanseerde-ongebalanseerde versterker met effens langer prosedure, dieselfde resultate verkry word. Laasgenoemde tipe versterkers gee 'n besparing van aktiewe elemente. Versterkers met 'n totale stroomversterking van tot 20,000 is uitgetoets.

Instrumentasie

Onder die groot aantal instrumente wat ontwikkel is, word die volgende genoem: 'n Apparaat is ontwikkel om die geleidingsvermoë van water, meestal in riviere,

of $\pm .05^\circ$. An X-cut plate of 1 inch diameter and 2.87 mm. thickness was cut and ground in the optical workshop. This transducer had the expected resonance frequency of 1 megacycle/second when tested with a Pierce type crystal-controlled oscillator. It will be used in the multifrequency apparatus. This work has also enabled us to gain the necessary experience to approach with confidence the task of preparing similar crystals for other laboratories or research groups.

The possibility of making a barium-titanate transducer for use at frequencies above 10 megacycles/second is being investigated.

An ultrasonic waveguide and treatment chamber for use in the selective destruction of amoebae was designed for the Amoebiasis Research Unit.

Bacteria have also been destroyed using ultrasonic vibrations of 30 kilocycle/second frequency, in an experiment performed on behalf of the Department of Agriculture.

ELECTROTECHNOLOGY

Transistor D.C. Amplifiers

Results indicate that amplifiers in which transistors are the active elements can be used in applications where the allowable zero drift of valves is a limitation. This is true particularly for applications where input resistances of the order of 5 to 50 kilo-ohm are permissible, thus especially for current amplifiers.

Autobias (V_{be}) and saturation current (I_{co}) are functions of temperature only and not also of time as in the case of electronic tubes. Because of their predictability it was found that, with certain compensation methods, a zero drift of less than 0.1 micro-amperes could be obtained for a temperature change of 0°C to 65°C . The zero drift is even smaller under conditions of smaller temperature fluctuations such as usually occur in practice, compensation is thus effective for the germanium units in question up to a mere 10°C below the maximum allowable temperature of 75°C .

It was found that this degree of compensation could without much trouble be obtained in balanced amplifiers. By using a slightly longer setting procedure, it was found possible to get the same results in a combined balanced-unbalanced amplifier. The latter type of amplifier effects a saving of active elements. These methods have been used in amplifiers with a total current amplification of up to 20,000.

Instrumentation

Among the many instruments which have been developed, the following may be mentioned: An instrument for automatically registering the conductivity of

oor tydperke van 24 uur of langer outomaties te registreer. Die bereik van die prototipe instrument dek die gebied van 100 tot 10,000 mikro-mho per sentimeter. Veldtoetse het egter getoon dat die geleidingsvermoë in die riviere waar dit gebruik word, hoogstens 'n paar persent oor lang tydperke verander. 'n Ander instrument sal moontlik vir hierdie omstandighede ontwikkel moet word.

'n Oliebadtemperatuurbeheerder vir standaardweerstande is ontwerp om die temperatuur van 'n oliebadhouer oor periodes van 15 minute binne een tweehonderste van 'n graad Celsius te hou.

In samewerking met die Afdeling Spektrochemie is 'n nuwe metode ontwikkel om 'n fotovermenigvuldigerbuis van 'n ongevoelige na 'n gevoelige toestand in minder as 0.5 mikrosekondes te skakel. Die metode is om die laaste dinode van die buis uit die normale kettingskakeling te neem en met 'n aparte spanning te voer wat in die verlangde manier gepols kan word. Die sisteem kan drie kanale van die direklesende spektrograaf bedien. 'n Publikasie sal binnekort verskyn.

'n Apparaat is ontwikkel om die aantal reksiklusse te registreer wat tussen die breek van individuele drade verloop wanneer kables in 'n toetsmasjien vir vermoeiingseienskappe getoets word.

'n Baldwin-rekstrokiemeter wat kommersieel verkrygbaar is, is deur die toevoeging van 'n filter sodanig verander dat dinamiese rekstrokiemettings uitgevoer kan word sonder om noukeurigheid en gevoeligheid prys te gee.

'n Koïnsidensbaan, bestaande uit twee kristalodiodes wat twee enkelstootvibrators opvolg, is ontwerp en gebou vir gebruik in die Afdeling Radioaktiwiteit. Die oplostyd vir elkeen van die twee kanale kan apart ingestel word.

'n Vertragingsapparaat vir gebruik by kernfisiese navorsing is ontwikkel. Die tydsvertraging word verkry met behulp van 'n enkelstootvibrator met verstelbare stootlengte gevolg deur 'n differensiasiebaan. Die vertraging is verstelbaar van 0.8 tot 20 mikrosekondes.

Apparaat vir die Bepaling van Saadplantereienskappe

Verdere ondervinding is opgedoen met die instrument wat vir die Departement van Landbou ontwikkel is om die doeltreffendheid van saadplanters te bepaal en ook die statistiese verspreiding van die sade, soos deur die planter geplant, te bepaal.

Baie tegniese probleme het met die gebruik van die konvensionele opneemtoestel ontstaan en as gevolg daarvan moes dele van die apparaat herontwerp word. Daar is ook moeilikheid ondervind met die meganisme van die saadplanter wat baie van die sade in klein stukkes opgebreek het.

Die veldtoetse wat tot dusver gemaak is, gee bevredigende resultate en is met ander metodes gekontroleer,

water, usually in rivers, over periods of 24 hours or longer was developed for the N.I. Water R. The prototype instrument has a range of 100 to 10,000 micro-mho per centimetre. Field tests have, however, shown that conductivities in rivers where the instrument is used change by only a few per cent over long periods. Another instrument will possibly be developed to suit this situation.

An oil-bath temperature control for standard resistors was designed to maintain the oil bath temperature within 1/200°C over a period of fifteen minutes.

In cooperation with the Spectrochemistry Division a new method was developed to switch a photomultiplier tube from an insensitive to a sensitive state in less than 0.5 microseconds. In this method the last dinode of the tube is taken out of the normal chain connection, and fed with a separate voltage pulsed in the required manner. The system can serve three channels of a direct-reading spectograph. An article describing this work will appear shortly.

An apparatus was developed to register the number of stress cycles which occur between the breaking of individual strands of a cable undergoing fatigue tests in a testing machine.

A commercially available Baldwin strain gauge instrument was modified by the addition of a filter so that it could be used on dynamic strain gauge measurements without sacrificing accuracy or sensitivity.

A coincidence circuit consisting of two crystal diodes following two monostable vibrators was designed and built for use in the Radio-activity Division. The resolving time for each of the two channels can be adjusted separately.

A delay apparatus was developed for use in nuclear research. The delay time is obtained by using a monostable vibrator with adjustable on-time followed by a differentiating circuit. The delay is adjustable from 0.8 to 20 microseconds.

Apparatus for Determining Seed-planter Characteristics

Further experience has been gained with the instrument which was developed for the Department of Agriculture for determining the efficiency of seed planters and also to measure the statistical distribution of the seeds as planted by the planter.

Many technical problems arose in the use of the conventional recording equipment and as a result parts of the apparatus had to be redesigned. Difficulty was also experienced because the mechanism of the seed-planter broke up many of the seeds into small pieces.

Field tests carried out thus far have given satisfactory results and have been checked by other methods, but

maar die aard van die resultate is s6 dat hulle nie maklik met die gewone statistiese metodes ontleed kan word nie.

Outomatiese Gegewensbewerking en Plantenavorsing

'n Apparaat is deur die Departement van Landbou ontwikkel wat die gegewens van plantegroei op 'n papierponsband met 26 kanale in kodevorm opneem. Die ontleiding van hierdie opname vereis onder andere die aflees van die geponste gegewens vanaf die band op voorafbepaalde ry-tussenposes.

Bykomstige toerusting is vir die Departement van Landbou ontwerp om opnames van die frekwensie van voorkoms en die herhalingspatroon van plantegroei te ontleed.

Deur gebruik te maak van Dekatron-GS10D-tipe telbuise en logiese stroombane, kan uitgesoekte ry-intervalle vanaf 0 tot 9,999 verstel word. As die voorafingestelde ry bereik is, word die afleser aangeskakel en die geponste gegewens op die uitgesoekte ry-interval afgelees. Die apparaat word outomaties na begintoestand herstel om die ontleiding deurlopend te maak.

Beheer van die Digtheid van Pulp vir die Gradering van Steenkool

Hierdie projek het as doelstelling die meet van digthede van floteringsmedia soos skalie of magnetietpulp wat in die gradering van steenkool gebruik word. Die digthede wat gebruik word, lê gewoonlik in die gebied 1.2-1.7 soortlike gewig.

Vorige metodes waarin van elektromeganiese meetmetodes gebruik gemaak is, was nie gevoelig genoeg onder die turbulente toestande wat noodwendig in die medium teenwoordig moet wees om die vaste stof in suspensie te hou nie.

Radioaktiewe absorpsie-metodes, waar daar van gammastrale gebruik gemaak word, word nou ondersoek. Toetse is gemaak op 'n volskaalmodel van 'n pulptenk, soos dié wat in die Brandstofnavorsingsinstituut in gebruik is. Hoewel die meting oor groot afstande 'n hoë gevoeligheid gee (in die omgewing van 0.1 persent van digtheidvariasie), sou die vereiste bronsterkte om oor die tenk se totale deursnee van vyf voet te meet, te groot wees vir gerieflike afskerming in die praktyk. Toetse is op kleiner monsters uitgevoer om metings oor kleiner afstande, soos waar die medium deur pype vloei, te simuleer. Die resultate dui daarop dat digtheidvariasies van 0.25 persent wel gemeet kan word.

Geskikte instrumentasie vir 'n prototipe digtheid-registreerder word oorweeg wat later tot 'n geslote beheerkring uitgebrei kan word.

Verkeersontleding

'n Begin is gemaak met die ontwikkeling van 'n outomatiese dataregistrasiesisteem vir gebruik by verkeersopname wat as deel van 'n program van die Nasionale

the nature of the results is such that they cannot readily be analysed with the usual statistical methods.

Automatic Data Processing and Plant Research

An apparatus has been developed by the Department of Agriculture which records data on plant growth in code on punched paper tape using 26 channels. The analysis of this record demands *inter alia* reading the punched data from the tape for predetermined row intervals.

Additional equipment was designed for the Department of Agriculture to analyze records of the frequency of occurrence and the repetitive pattern of plant growth.

By using Dekatron-GS10D type counting tubes and logical circuits, selected row intervals can be shifted through positions numbered from 0 to 9999. When the preset row is reached the reader is switched on and the punched data on the selected row interval is read off. The apparatus is automatically reset to initial conditions to make analyses continuous.

Control of Pulp Density for the Separation of Coal

The purpose of this project is the measurement of density of floatation media, such as shale or magnetite pulp which are used for the separation of coal. The densities which are used usually lie in the range 1.2-1.7 specific gravity.

Previous methods using electromechanical means of measurement had not proved to be sufficiently sensitive under the turbulent conditions required in the medium to keep the solid component of the pulp in suspension.

Radio-active absorption methods in which γ -rays are used are being investigated. Tests have been made on a full-scale model of a pulp tank, similar to those in use at the Fuel Research Institute. Although measurement over large distances gives high sensitivity (about 0.1 per cent change in density) the strength of the radiation source needed for measuring through the five foot diameter of the tank would be too large in practice for convenient shielding. Tests have been made on smaller samples to simulate measurements over shorter distances such as occur where the medium flows through pipes. The results indicate that density variations of 0.25 per cent can readily be measured.

Appropriate instrumentation for a prototype density recorder which could later be extended to a closed loop control system is being considered.

Traffic Analysis

A start has been made on the development of an automatic data-recording system for use in a traffic survey forming part of a program being undertaken by

Instituut vir Padnavorsing gedoen word. Die verlangde gegewens moet die aantal en tipe voertuie volgens gewig klassifiseer. Hierdie gegewens wat op ponsband opgeneem word, sal dan direk in die syferrekenmasjien verwerk word.

Syferrekenmasjien „Zebra”

'n Elektriese syferrekenmasjien is gedurende Oktober en November in samewerking met die vervaardigers, Standard Telephones and Cables (Ltd.), vir die Afdeling Wiskundige Analise geïnstalleer. Die installering en inwerkingstelling het ongeveer 'n maand in beslag geneem. Die nuttigheidsgraad van Zebra vir die eerste drie maande was gemiddeld 98 persent, wat 'n uitstekende betroubaarheid weerspieël.

Analoogrekenmasjien „Heiden”

Die lineêre rekeneenhede van die masjien is op volle kapasiteit gebring, naamlik 24 summators en 12 integrators. Die volle aantal funksie-ontwikkelaars, naamlik 3, is ook voltooi. Van die beplande 3 vermenigvuldigers is een reeds beskikbaar.

Met die masjien op volle kapasiteit is gevind dat dit nodig is om die warm lug uit die kamer te verwyder. 'n Waaiersisteem is hiervoor geïnstalleer.

'n Begin is gemaak met die kalibrasie van die rekenelemente. Sodra hierdie taak afgehandel is, sal die masjien ook vir kwantitatiewe werk beskikbaar wees.

Veldprobleemrekenaar

'n Outomatiese veldlynregistreerder is in die finale stadiums van konstruksie. Hierdie analoogrekenaar kan vir alle probleme waar die Laplace-vergelyking die sisteem in een vlak beskryf, gebruik word.

Dit sal veral gebruik word vir die uitteken van elektriese en magnetiese vloedlyne en is spesiaal ontwerp om elektron-vlugbane outomaties te registreer.

FISIËSE STANDAARDE

Lengte-standaarde

Die ontwikkeling van die interferometer wat deur telling van die aantal liggolwe kort afstande kan meet, het die stadium bereik waar elektriese polse getel kan word terwyl die spieël van die interferometer oor 'n afstand van tien sentimeters beweeg. Die optiese sisteem word nou verbeter om die betroubaarheid van die elektroniese telstelsel te verhoog.

Die optiese bank van die vyftig meter interferometer is oor sy volle lengte getoets en bevredigende interferensiestrepië is verkry. Die beweging van die strepië (wat deur trilling van die optiese bank en verandering van die lugtemperatuur veroorsaak word) is nie meer as die afstand tussen twee strepië nie. Dit beteken dat die werking van die sisteem by vyftig

the National Institute of Road Research. The desired data should classify the number and type of vehicles according to weight. These data which are recorded on punched tape will then be processed directly in an available digital computer.

“Zebra” Digital Computer

An electronic digital computer was installed in cooperation with the manufacturers, Messrs. Standard Telephones and Cables Ltd., for the Division of Mathematical Analysis. Installation and bringing into operation took about one month. The availability of Zebra during the first three months of operation averaged 98% which reflects outstanding reliability.

Analogue Computer “Heiden”

The linear computing units of the computer have been brought up to the full quota namely 24 adders and 12 integrators. The full number of function generators, namely 3, has also been completed. Of the 3 multipliers which were planned one is already available.

With the machine working at full capacity it was found necessary to exhaust the hot air from the room and a fan system for this purpose has been installed.

A start has been made on the calibration of the computing elements. As soon as this task has been completed the machine will also be available for quantitative work.

Computer for Field Problems

An automatic field line recorder is in the final stages of construction. This analogue computer can be used on all problems in which the Laplace equation in two dimensions describes the conditions.

It will in particular be used for tracing electric and magnetic flux lines and has been designed specially for automatically drawing electron trajectories.

PHYSICAL STANDARDS

Length Standards

The development of the interferometer for the measurement of short lengths by means of the direct counting of interference fringes has reached the stage where electrical pulses can be counted while the mirror of the interferometer is moved a distance of ten centimetres. The optical system is now being improved in order to improve the reliability of the system.

The optical bench of the fifty metre interferometer has been tested over its full length and satisfactory interference fringes were observed. The oscillation of the fringes (caused by vibration of the optical bench and changes in the air temperature in the measuring tunnel) is less than the distance between two fringes. The workshop is now making the full set of mirror stands which is necessary for the length multiplication process involved in the measurement of fifty metres.

meter net so goed as by vyf-en-twintig meter is. Die Werkplaas is nou besig met die vervaardiging van die spieëlhouers wat nodig is om die hele stelsel in werking te bring.

Elektriese Standaarde

'n Begin is gemaak met die opbou van apparaat vir die toets van spanningstransformators. Aandag is in die eerste plek aan betreklik lae spannings gegee (tot by 11 Kv) waar weerstandspanningsdelers nog prakties is, en 'n deler van dié bouvorm met baie lae fasefoute is nou in aanbou. Die spanningsdeler sal egter nie as standaard gebruik word nie. Die yking van 'n transformator sal in twee stappe gedoen word; die eerste sal in wese die oorblywende foute van die deler vasstel, en die tweede sal die bykomende foute van die transformator meet. In beginsel sal dieselfde meetstroombane met enige vorm van spanningsdeler gebruik kan word.

Reëlmatige vergelyking van die standaardselle en weerstande wat die nasionale volt en ohm weergee, toon aan dat die verwagte akkuraatheid (beter as 5 dele per miljoen) behou word. Die standaard was basis vir yking van standaardinstrumente in standaardisasie-laboratoriums van die land, asook in aangrensende gebiede.

Optiese Standaardisering

Die substandaarde van ligfluks en horisontale kerskrag is in stand gehou en onderling met mekaar vergelyk. Elf lampe van ander organisasies is gestandaardiseer.

Standaardisering van Radioaktiwiteit

'n Studie is gemaak van die 4π -beta-gamma koïnsidensie-metode van standaardisering wat 'n groot vordering op die gebied van standaardisasie verteenwoordig. Hierdie variasie van die konvensionele beta-gamma-koïnsidensie-metode maak gebruik van hoë doeltreffendheid detektors: 4π -tellers in die beta-kanaal en gamma-sintillasie-spektrometers in die



50 Meter optiese bank op vere gemonteer; steunpunte word ingestel

50 Meter optical bench mounted on springs; adjustment of supports

Electrical Standards

The construction of apparatus for testing potential transformers was put in hand. Attention was given in the first place to relatively low voltages (up to 11Kv) where resistance voltage dividers are still practical, and a divider of this type having very low phase-angle errors is being built. This divider will, however, not be used as a standard. Calibration of a transformer will take place in two stages; the first will in effect be a determination of residual errors in the divider while the second will measure the additional errors of the transformer. In principle it will be possible to use the same measuring circuits with any type of divider.

Regular comparison of the standard cells and resistances which constitute the national volt and ohm show that the expected accuracy (better than 5 parts per million) is being maintained. These standards formed the basis for the calibration of standard instruments of standardising laboratories in this country, as well as in neighbouring territories.

Optical Standardization

Substandards of luminous flux and horizontal candle power were maintained and intercompared. Eleven lamps were calibrated for other organizations.

gamma-kanaal. Onder andere is die gebruik van die 4π -vloeistof-sintillasiesteller as beta-detektor in hierdie metode deeglik ondersoek en die werk is gepubliseer. (Steyn en Haasbroek, 1958.)

Die laboratorium het deelgeneem aan internasionale vergelykings van standaardmonsters van radioaktiewe fosfor-32 en goud-198. Die 4π -beta-gamma-koïnsidensiemetode is gebruik tydens die standaardisering van goud-198. In die geval van fosfor-32 was die resultaat 7 persent laer as dié van die laboratorium wat die standaardisering gereël het. Die resultaat was egter in ooreenstemming met dié van ander laboratoria wat deelgeneem het en waarvan die resultaat ook 7 persent laer was. Hierdie gebrek aan ooreenstemming met die uitreikingslaboratorium is betekenisvol aangesien dit heeltemal onverwags was deurdat die standaardiseringsmetodes vir fosfor-32 lank reeds gevestig is.

Gedurende die jaar is gestandaardiseerde oplossings van yster-59, jodium-131 en fosfor-32 aan isotoopgebruikers in Suid-Afrika verskaf.

Standaardisering van Straling

Die konstruksie van die vryluginisasiekamer vir X-straaldosismeting is reeds voltooi. Onverwagte struikelblokke is egter met die presiese opstelling van die X-straalapparaat ondervind. Bevredigende resultate is verkry met pogings om die opbrengs van die X-straalbuis te stabiliseer. Die ionisasiestroom van 'n monitorkamer in die vorm van 'n ring om die X-straalbundel, word gebruik om 'n magnetiese versterker te beheer en die opbrengs hiervan word na die gloei-draadstroombaan van die X-straalbuis teruggevoer.

X- en gammastraal-dosismetingsinstrumente word in hierdie laboratorium geïk teen dosis-substandaarde wat hier in stand gehou word. Die gebruik van die fasiliteite is verpligtend vir die geoutoriseerde mediese verbruikers van radioisotope in Suid-Afrika.

YKING VAN TOERUSTING EN TOETSE OP MATERIALE

Yking van Gewigte

'n Aantal stelle gewigte is geïk. Een van die stelle sal as substandaard in die laboratorium van 'n industriële firma gebruik word. 'n Personeelid van die firma het die afdeling besoek om die metode vir die yking van gewigte aan te leer.

Standardization of Radio-activity

A study has been made of the 4π Beta-gamma coincidence method which represents a great advance in the field of radio-activity standardization. This variation of the conventional β - γ -coincidence method makes use of high efficiency detectors: 4π counters in the beta-channel and gamma scintillation spectrometers in the gamma channel. One type of beta channel detector used in this method is the 4π liquid scintillation counter which has been carefully studied in this laboratory. The results of this work have been published. (Steyn and Haasbroek 1958).

The laboratory has engaged in international comparisons of standard samples of radio-active phosphorus-32 and gold-198. The 4π -beta-gamma coincidence method was used by this laboratory in the standardization of gold-198. In the case of phosphorous 32 the result was 7 per cent lower than that of the distributing laboratory. The other laboratories taking part in the intercomparison of standards were also 7 per cent low, in agreement with this laboratory. This unexpected discrepancy with the organizing laboratory is significant in that the standardization of phosphorous-32 involves well established methods.

Standardized solutions of iron-59, iodine-131 and phosphorous-32 have been supplied during the course of the year to isotope users in South Africa.

Standardization of Radiation Dose

The construction of the free-air ionisation chamber for X-ray dose measurement is now completed. Unexpected obstacles have, however, been met in the precise adjustment of the X-ray equipment. Satisfactory results have been achieved in attempts to stabilize the X-ray output. A doughnut-shaped ionization chamber is positioned around the X-ray beam and is used to supply the control current of a magnetic amplifier. This corrects any X-ray output changes by modifying the potential applied to the filament of the X-ray tube,

X- and gamma-radiation dose measuring instruments are calibrated in this laboratory against sub-standards maintained by the laboratory. The use of such facilities is obligatory to authorized medical users of radioisotopes in South Africa

TESTING OF EQUIPMENT AND TESTING OF MATERIALS

Testing of Weights

A few sets of analytical weights have been tested. One of these is to be used as a substandard in the laboratory of an industrial firm. A member of the staff of this firm visited the division in order to learn the methods used in the calibration of weights.

Ses landmetermaatlyne is geyk. Twee word deur 'n ingenieursfirma by die Karibadam gebruik en 'n ander behoort aan die Landmetersdepartement van die Noord-Rhodesiese Regering.

Kalibrasie van Temperatuurmeetinstrumente

Daar was 'n groot navraag vir toetse van die noukeurigheid van termometers, termokoppels, weerstands-termometers en optiese pirometers.

Metings van Hittegeleidingsvermoë

Die aantal toetse op isolasiemateriale het weer toegeneem tot 62. Waardes van geleidingsvermoë is bepaal by temperature tussen -10 en 450°C ., meestal op plaaslike produkte.

Akoestiese Metings op Materiale

Elf stelde toetse is uitgevoer op die produkte van twee vervaardigers om die klankabsorpsie te bepaal. Klanktransmissiemetings is op die produkte van twee vervaardigers gedoen.

Bepaling van die Elastiese en Plastiese Konstantes van Teer met behulp van Vibrasiemetodes

'n Instrument is ontwerp wat spesiaal vir die toets van bitumineuse materiaal gebruik word. Die toetsmateriaal rus in die ruimte tussen 'n koniese houder en 'n vertikale staaf met koniese punt. 'n Koppel word deur die staaf op die toetsmateriaal uitgeoefen en die meganiese impedansie van die sisteem word elektries gemeet. Uit die impedansie kan die viskositeit en styfheid van die materiaal bereken word. Die werkplaas is besig om die instrument te vervaardig.

ALGEMENE DIENSTE

Beskerming teen Bestraling

Die laboratorium bly op hoogte van sake in verband met die biologiese effekte van straling met betrekking tot beroepsblootstelling aan straling. Deur middel van advies, lesings en publikasies (W. R. McMurray, 1958, 1959) word gepoog om 'n gesonde maar nie buitensporige respek vir straling by nyweeraars en alle personeel wat met straling werk, af te dwing.

Die filmwapendiens, georganiseer as 'n veiligheidsdiens vir werkers wat straling of radioisotope gebruik, groei steeds en ongeveer vyftien duisend wapens is die afgelope jaar hanteer.

Hantering van Radioisotope

Fasiliteite vir die hantering van groot radioaktiewe bronne is verbeter. Die tweeweeklikse onderverdeling van jodium-131-besendings vir mediese doeleindes is

Six surveyor's tapes have been calibrated. Two have been used by an engineering firm at the Kariba dam and another belongs to the Surveyor General's office in Northern Rhodesia.

Calibration of Temperature-measuring Instruments

There was a large demand for tests of the accuracy of thermometers, thermocouples, resistance thermometers and optical pyrometers.

Measurements of Thermal Conductivity

The number of tests on insulation materials has again increased, 62 having been performed during the past year. Values of conductivity were determined at temperatures between -10 and 450°C ., mostly of local products.

Acoustical Measurements on Materials

Eleven sets of tests were carried out to determine the sound absorption of materials made by two manufacturers. Sound transmission measurements were carried out on the products of two manufacturers.

Measurement of Elastic and Plastic Constants of Tar by means of Vibration Methods

An instrument has been designed for special use in tests of bituminous materials. The sample is placed in the gap between a conical cup and a vertical shaft with a conical point. A couple is applied by the shaft on the sample and the mechanical impedance of the system is measured electrically. From the impedance the viscosity and elasticity of the material can be calculated. The workshop is making the instrument.

GENERAL SERVICES

Radiation Protection

The laboratory keeps abreast of information concerning the biological effects of radiation relevant to occupational exposure to radiation. An effort is made, through lectures, publications (McMurray 1958, 1959) and advice, to induce a healthy but not excessive respect for radiation in industrial workers and others who are occupationally affected.

The film badge service, organised as a protection service, continues to expand and processed about 15,000 film badges during the past year.

Handling of Radio-isotopes

Facilities for the handling of large radio-active sources have been improved. The laboratory has continued the bi-weekly sub-division of iodine-131 doses for use in

nog steeds vir die Raad op Atoomkrag onderneem. Verbeterde en veiliger apparaat is vir hierdie doel plaaslik ontwerp en gebou om bronne van meer as een half-curie te hanteer. Die radioaktiwiteit van die onderverdeelde jodiumdosisse is in 'n spesiale substandaard-ionsisasiekamer gemeet wat hier gekalibreer is.

Radioisotopekursus

'n Lid van die laboratorium het gehelp met 'n radioisotopekursus wat aan sestion lede van die Departement van Landbou op Stellenbosch in Desember 1958 gegee is. Die kursus is deur die Merensky-Instituut vir Fisika in samewerking met hierdie laboratorium en die Westelike Provinsie se Vrughtnavorsingstasie gereël.

Optiese Dienste

Algemene dienste van optiese aard is aan navorsings- en nywerheidslaboratoriums asook aan nywerhede gelewer. Voorbeelde hiervan is: Die toets en yking van nooddakkels vir reddingswerk ter see; 'n ondersoek na die deursigtigheid van gebreekte en ongebreekte vensterglas vir motorvoertuie; die opstel van polaar-krommes vir straatlampe; yking van ligmeters en termosuile; die vervaardiging van 82 spesiale spieëls deur vakuümverdamming van silwer en aluminium; die vervaardiging van 8 straalverdelers; die behandeling van 13 optiese komponente vir die uitskakeling van refleksieverliese; die vervaardiging van optiese komponente wat nie in die handel verkrygbaar is nie en wat gewissel het van eenvoudige glas- en kwartsplate tot hoë-kwaliteit spieëls en lense, diffusie-buise en kristallyne kwartsplate vir die opwekking van ultrasoniese golwe.

WISKUNDIGE ANALISE

In 'n ondersoek ten behoeve van die Weerburo na die stabiliteitseienskappe van die stelsel differensiaalvergelings wat atmosferiese bewegings beskryf, is gevind dat sowel die insluiting of weglating van sekere terme, as die presiese vorm van die randvoorwaarde aan die bopgrens van die troposfeer, beslissende invloed op die dinamiese stabiliteit het. Die eerste helfte van 'n handleiding vir opleidingsdoeleindes op die gebied van dinamiese weervoorspelling is voltooi.

Ondersoek het 'n kwasi-stasionêre karakter van die vortisiteitsvergeliking ten opsigte van atmosferiese bewegings van die grootste afmetings aan die lig gebring. Dit impliseer dat die barotropiese model, naamlik die eenvoudigste nie-lineêre differensiaalvergelings wat gebruiklik op die bewegings van groot afmetings toegepas word, heeltemal ongeskik is op die grootste skaal, terwyl selfs die meer omvattende barokliniese modelle nie besonderhede op hierdie skaal kan verskaf nie. Hierdie werk is in *Tellus* (Stockholm) gepubliseer. (Burger, 1958.)

medical diagnosis and treatment. This work is undertaken for the Atomic Energy Board. Improved and safer apparatus has been designed and installed and is able to handle more than half curie amounts of radioiodine. The radio-activity in the sub-divided iodine doses is measured in a special ionisation chamber which has been calibrated by this laboratory.

Radio-isotope Course

A member of the laboratory assisted in a radio-isotope course given to sixteen members of the Department of Agriculture at Stellenbosch in December 1958. The course was organised by the Merensky Institute for Physics with the co-operation of this laboratory and the Western Province Fruit Research Station.

Optical Services

General optical services were rendered to research and industrial laboratories as well as to industries. Examples are: The test and calibration of flares for rescue work at sea; an investigation of the transparency of shattered and clear automobile windowscreens; the determination of polar curves for street lanterns; calibration of lightmeters and thermopiles; the deposition of 82 special mirrors by vacuum evaporation of silver and aluminium; the making of 8 beam splitters; the surface treatment of 13 optical components in order to eliminate reflection losses; the manufacture of optical components which were not commercially obtainable, varying from simple glass and quartz plates to high quality mirrors and lenses, diffusion tubes and crystal-line quartz plates for obtaining ultrasonic waves.

MATHEMATICAL ANALYSIS

In an investigation undertaken on behalf of the Weather Bureau on the stability properties of the system of differential equations describing atmospheric motion, it was found that the inclusion or exclusion of certain terms, as well as the exact form of the boundary conditions at the upper boundary of the troposphere, influences the nature of the dynamic stability. The first half of a manual on dynamical weather forecasting has been completed.

Investigation showed a quasi-stationary character of the vorticity equation in connection with atmospheric motion of the largest dimensions. This implies that the barotropic model, namely the simplest set of non-linear differential equations normally applied to large scale motion, is unsuitable on the largest scale, while even the baroclinic models, though more comprehensive, do not supply details on this scale. This work was published in *Tellus* (Stockholm) (Burger, 1958).

Metodes uit die abstrakte algebra is op die statistiese analise van gebalanseerde blokontwerpe toegepas. 'n Manuskrip is vir publikasie voorberei.

'n Besonder kort metode is aangegee om 'n randwaardeprobleem met die golfvergelyking op te los, met toepassing op diffraksieprobleme op 'n harde of geleidende skerm in die vorm van 'n halfvlak. 'n Manuskrip is vir publikasie voorberei.

Die oplossing van die elastodinamiese probleem van 'n harmoniese uitstraler op 'n half ruimte van twee verskillende homogene en isotropiese media is in integraalvorm verkry.

Die analitiese behandeling van 'n sferiese monster waterversadigde klei onder simmetriese belasting het grondliggende gebreke in die bestaande wiskundige teorie aangetoon. 'n Manuskrip is vir publikasie voorberei.

In samewerking met die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese is 'n uitdrukking vir die dempingsfaktor van weerstande in 'n betreklik langsame lugstroom by verskillende grade van gekoncentreerdheid van die weerstand gevind, met toepassings op gaas en op plaatstabiliseerders in windtonnels. 'n Manuskrip is vir publikasie voorberei.

Die moontlikheid is ondersoek om in 'n transsoniese potensiaalstroming randsteurings in die supersoniese gebied op te lê wat, hoewel dit gelokaliseerd is, tog die potensiaaleienskap behou. In die Chaplyginstroming wat behandel is, het geblyk dat dit onmoontlik is. 'n Manuskrip is vir publikasie voorberei.

Dienste

Onder die groot hoeveelheid dienste wat aan ander Departemente van die W.N.N.R. en aan buiteliggame gelewer is, word slegs enkele voorbeelde genoem naamlik die oplos van 'n integraalvergelyking van die Stieltjes-tipe; die omkering van 'n ingewikkelde Laplace-transform; skattings van die somme van reekse en van die oplossing van 'n randwaardeprobleem in kristal-groei by verskillende argumentwaardes; die oplos van 'n nie-linéêre integrodifferensiaalvergelyking wat redu-seer tot 'n spesiale Painlevé-transendente; oplos van 'n Helmholtz-differensiesisteam met twee simmetrie-asse en van 'n hoëordesisteam; bepaling van die stabiliteitseienskappe van 'n nie-homogene Hillse differensiaalvergelyking vir groot parameter-waardes; afleiding van die bevriesingseienskappe van waterdruppels; verskaffing van die uitdrukking vir 'n bronoplossing van die warmte diffusievergelyking onder gegewe voor-waardes; bepaling van elastiese en resonansie-eien-skappe in reologiese studies; die aangee van rigtings-faktore vir die intensiteit van hemelstraling.

Methods of abstract algebra were applied to the statistical analysis of balanced block designs. A manu-script was prepared for publication.

A very short method was described for the solution of boundary value problems by wave equation with reference to diffraction problems on a hard or con-ductive screen in the form of a half-plane. A manu-script was prepared for publication.

The solution of the elasto-dynamic problem of an harmonic radiator on a half space of two different homogeneous and isotropic media was achieved in integral form.

The analytic treatment of a spherical sample of water-saturated clay under symmetric load showed basic defects in the existing mathematical theory. A manu-script was prepared for publication.

In co-operation with the National Mechanical En-gineering Research Institute an expression was found for the damping factor of concentrated or widely distri-buted resistances in a relatively slow air flow, with applications to gauzes and to plate-stabilizers in wind-tunnels. A manuscript was prepared for publication.

In considering transonic potential flow, the pos-sibility was considered of introducing, into the super-sonic domain, boundary disturbances which, although localized, preserve the potential flow property. In the Chaplyginflow treated, this proved to be impossible. A manuscript was prepared for publication.

Services

Of the many services rendered to other Departments of the C.S.I.R. and to other organizations the following may be mentioned: the solution of an integral equation of Stieltjes type; the inversion of an involved Laplace-transform; estimation of the sums of series and the solution of a boundary value problem in crystalgrowth for different argument values; the solution of a non-linear integro-differential equation that reduces to a special Painlevé-transcendental; solution of a Helm-holtz difference system; determination of the stability properties of a non-homogeneous Hill's differential equation for large parameter values; derivation of the freezing properties of water drops; derivation of a source-solution of the diffusion equation under given conditions; determination of elastic and resonance properties in rheological studies; the determination of direction factors for the intensity of sky radiation.

BEREKENINGSWISKUNDE

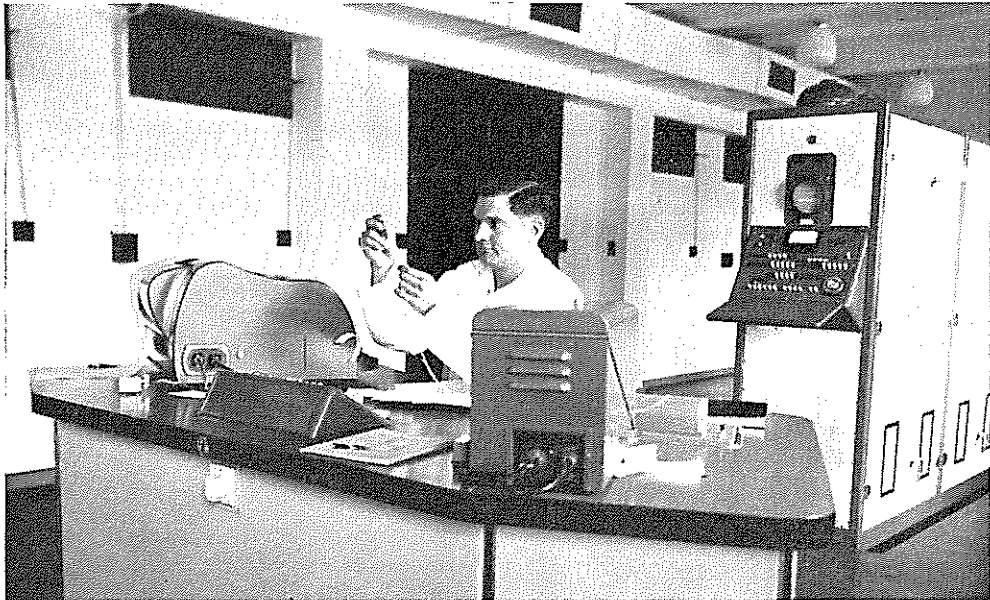
Die rekenoutomaat „Zebra” is geïnstalleer en in gebruik geneem, en tientalle persone van verskillende liggame binne en buite die W.N.N.R. is in programmering opgelei, dit wil sê in die opstel van bereken-skemas en die omsetting daarvan in die opdragkode van die masjien.

'n Aantal programme is opgestel om deel uit te maak van die biblioteek van standaardprogramme by die

COMPUTATIONAL MATHEMATICS

The automatic computer “Zebra” was installed and various members of organizations within and outside the C.S.I.R. were trained in programming, that is, in setting up computing schemes and translating these into the instruction code of the computer.

A number of programmes were written to form part of the library of standard programmes, including a programme for matrix-inversion and the solution of



Die N.Fis.N.L. Rekenoutomaat „Zebra”

The N.P.R.L.'s automatic computer “Zebra”

masjien, onder andere 'n program vir matriksomkering en die oplos van samegaande lineêre algebraïese vergelykings. 'n Program vir die berekening van matriks-eiewaardes en -vektore is ook geskryf.

Verskillende berekeningsdienste is gelewer. As voorbeeld kan genoem word: die numerieke oplossing van 'n nie-lineêre dubbelintegraalvergelyking in die prosesering van wolvels; die berekening van hitteverlies in pypisolasie; hulp met die numerieke oplossing van 'n integraalvergelyking vir 'n spanningsfunksie.

simultaneous linear algebraic equations. A programme was also written for the calculation of matrix-eigenvalues and vectors.

Various computing services were rendered. For example: the numerical solution of a nonlinear double-integral equation arising from a study of the processing of woolfibres; the calculation of heat loss in pipe insulation; assistance in the numerical solution of an integral equation for a stress function.

Tydreëse wat ontstaan uit outoregressievergelykinge met 'n nie-normale versteuringskomponent, e_t , is sistematies ondersoek. Die benaderingsvergelyking vir die binomiale geval is opgestel en daar is aangetoon dat daar geen minimumvariansie-skattinge vir die parameters in hierdie geval bestaan nie.

By die bepaling van die eienskappe van verdelings wat gebruik kan word by ekonomiese waarnemings, is 'n nuwe model voorgestel vir die verdeling van inkomstes vir die Unie van Suid-Afrika en is soos volg: Daar bestaan twee komponente—die basiese en die klein komponent. Eersgenoemde is 'n logaritmiëse normaal wat optree oor die inkomsteverdeling as geheel. Laasgenoemde is 'n afgeknotte logaritmiëse normaal wat slegs oor 'n deel van die inkomstegebied optree. Dit is nog 'n beskouing van en 'n toevoeging tot die reeds bestaande inkomsteverdelings wat ontwerp is in 'n poging om inkomsteverdelings volledig te kan beskryf deur middel van wiskundige modelle. Hierdie werk is vir publikasie aanvaar.

In die navorsing wat gedoen is oor die normalisasie en stabilisasie van verdelings is 'n algemene voorwaarde gevind waaronder die variansie van 'n Poissonveranderlike gestabiliseer word. Vir die stabilisasie van die variansie van 'n nie-sentrale t-verdeling is 'n arcsinh-transformasie gevind en vir 'n nie-sentrale F-verdeling is die transformasie van die tipe arccosh. Twee artikels is vir publikasie voorberei.

'n Ondersoek na die onderskeidingsvermoë van die toetsingsgrootheid T van Wilcoxon (of U van Mann en Whitney) onder soveel moontlik verskillende alternatiewe hipoteses vir redelike klein steekproefwaardes is begin. Die onderskeidingsvermoë is wel bekend vir baie klein en groot steekproewe maar nie vir waardes tussenin nie. Dié toetsingsgrootheid word baie gebruik in die Verdelingsvrye Statistiek.

Die eienskappe van die negatiewe binomiale en negatiewe faktoriaalbinomiale verdelings van Lexis asook Poisson is ondersoek. Die verband tussen die variansies is bepaal en daar is gevind dat dit verskil van dié van die positiewe verdelings. Na analogie van die dubbelhipergeometriëse verdeling van Isserlis, is 'n negatiewe faktoriaalbinomiale verdeling afgelei. Verdere ondersoek word ingestel na die eienskappe van die verdeling.

Time series which arise from autoregressive equations with a non-normal random component, e_t , were studied systematically. The approximating equation in the case of a binominal distribution was obtained and it has been shown that in this particular case there exist no minimum variance estimates for the parameters.

In determining the properties of distributions which can be used for economic observations, a new model was proposed for the distribution of income in the Union of South Africa, viz. there are two components—the fundamental and the minor component. The former has a logarithmic normal distribution which covers the entire income distribution. The latter has a truncated logarithmic normal distribution which applies only to part of the income distribution. This is another view of and an addition to the already existing income distributions which were designed in an attempt to describe income distributions completely by means of mathematical models. This work was accepted for publication.

In the research done on the normalization and stabilization of the variance of distribution functions a general condition for stabilizing the variance of a Poisson variable was derived. For the stabilization of the variance of a non-central t distribution an arcsinh transformation was obtained and for a non-central F distribution the transformation was of the arccosh type. Two papers were prepared for publication.

A study of the power of the statistic T of Wilcoxon (or U of Mann and Whitney) subject to as many different alternative hypotheses as possible for comparatively small sample values was started. For very small and for large sample values the power of T is known. For intermediate values its power is unknown. This statistic is often used in nonparametric statistics.

The properties of the negative binomial and negative factorial-binomial distributions of Lexis and Poisson were examined. The relationship between the variances was determined and it was found that this differs from that of the positive distributions. A negative factorial-binomial distribution was derived analogously to the double hypergeometric distribution of Isserlis. A further study of the properties of this distribution is being made.

TOEGEPASTE STATISTIEK

Die hoofprojekte waaraan meegewerk is, is die volgende: Bestudering van die tegnieke en gebruike ten opsigte van spesifikasies van verskillende standaard-organisasies; die ontwerp van eksperimente vir diëet-opnames; ontwerp van eksperimente en ontleding van gegewens in verband met pneumokoniose.

Verder is statistiese ontledings gemaak van: die resultate van voedingseksperimente op diere om die effek van sekere mikro-elemente vas te stel; 'n ondersoek om die proteïnkwaliteit van brood te bepaal; sekere radiochemiese eksperimente; toetsing van die akkuraatheid van instrumente soos gebruik in die bepaling van die asemhalingskoëffisiënt van geaktiveerde slyk; eksperimente om sekere eienskappe van hout te bepaal.

Meervoudige korrelasie- en regressie-analises is toegepas op gegewens in verband met: vervilting van wol; krimpings van mortelle; nominale skuifspanning waarby balke breek.

'n Statistiese ondersoek is ten behoeve van die Nasionale Padnavorsingsinstituut gedoen om die verband te bepaal tussen die voorkoms van ongelukke en die afstand wat gery is. Die sterfesyfer per miljoen voertuigmyle vir die Unie van Suid-Afrika blyk heelwat hoër te wees as in ander lande.

Die statistiese ondersoek oor die invloed van dyke (kleiner as 25 vt.) op rotsstortings in myne, is voltooi. Die grootste neiging tot stortings kom binne die dyke voor en eweas in die geval van groot dyke is die gevaar-interval ongeveer vyftig voet aan beide kante van die dyke.

BIOMETRIE

Ten behoeve van die Pneumokoniosenavorsings-eenheid is 'n statistiese analise gemaak van gegewens in verband met 2,098 mynwerkers wat gedurende die periode 1946 tot 1956 gesertifiseer is en wat eers deur die Pneumokonioseburo ondersoek is voordat hulle tot 'n stowwerige bedryf toetree het. Vir bogenoemde groep mynwerkers is die invloed van liggaamsbou, stof-blootstelling, ouderdom by toetrede tot 'n stowwerige

APPLIED STATISTICS

The principal projects attended to were the following: studying the techniques and uses of specifications of various standards organizations; designing experiments and analysing data concerning Pneumoconiosis.

Further statistical analyses were carried out on: the results of feeding experiments on animals in order to determine the effect of certain micro-elements; an investigation to determine the protein quality of bread; certain radio-chemical experiments; testing the accuracy of instruments used in determining the breathing coefficient of activated sludges; experiments for determining certain properties of wood.

Multiple correlation and regression analyses were applied to data concerning felting of wool, shrinking of mortars, nominal shearing stresses at which beams break.

On behalf of the National Road Research Institute a statistical study was made to determine the relationship between the occurrence of car accidents and the distance travelled. The mortality rate per million miles travelled appeared to be considerably higher for the Union of South Africa than for other countries.

Statistical investigations concerning the influence of dykes (less than 25 ft.) on rockbursts in mines were completed. Most of the rockbursts occurred in the dykes and, as in the case of larger dykes, the dangerous region was found to be approximately fifty feet on either side of the dyke.

BIOMETRY

A statistical analysis of data concerning 2,098 miners, certified during the period 1946 to 1956, who had been examined by the Pneumoconiosis Medical Bureau before they commenced their underground (dusty) career, was made on behalf of the Pneumoconiosis Research Unit. For this group of miners the influence of stature, exposure to dust, age at commencement of underground (dusty) career and kind of work in the

bedryf en tipe van werk in die myne, op die progressie en produksie van silikose ondersoek. Geen korrelasies is gevind nie. Die resultate is kortliks saamgevat in 'n referaat wat by die Wêreld-konferensie oor Pneumokoniose, in Johannesburg gehou vanaf 9 tot 22 Februarie, gelewer is.

By die bepaling van die graad van emfiseem in die longe van gestorwe mynwerkers, is dit nodig om die oppervlakte deur lug en weefsel beslaan, in baie dun snitte te bepaal. 'n Sekwensiële metode is ontwerp om deur middel van herhaalde meting die graad van emfiseem te bepaal.

Ten behoeve van die Amebiasenavorsingseenheid, is die moontlike passing van die logaritmiese normaal aan waargenome frekwensies in verband met die grootte van verskillende soorte amebas wat in dieselfde kosmos geplaas is, ondersoek. 'n Grafiese metode wat ontwikkel is vir die skeiding van die bimodale frekwensieverdeling in twee afsonderlike verdelings, was nie baie doeltreffend nie.

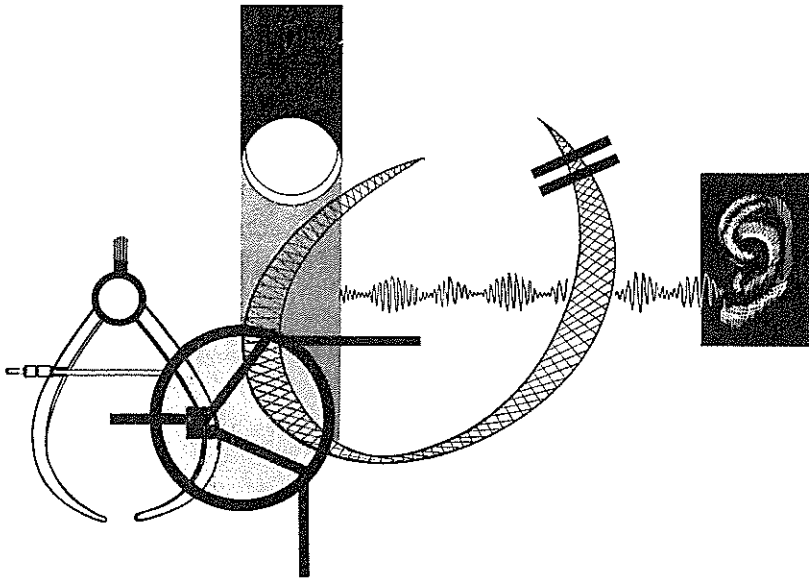
Vir voordragte wat by die Wêreldkonferensie deur lede van die Patologiese en Fisiologiese Afdelings van die Pneumokoniosenavorsingseenheid en die Borskliniek vir Mynwerkers gelewer is, is alle nodige statistiese verwerkings en toetsing van hipoteses gedoen.

mines on the progression and production of silicosis was examined. No correlations were found. The results were given in a paper presented at the World Conference on Pneumoconiosis, held in Johannesburg, 9-22nd February, 1959.

In determining the degree of emphysema in the lungs of deceased miners, it was essential to determine the area taken up by air and tissue in very thin sections. A sequential method was designed to determine the degree of emphysema by means of repeated measuring.

On behalf of the Amoebiasis Research Unit, the possibility of fitting a logarithmic normal distribution to observed frequencies of sizes of different kinds of amoebae placed in the same cosmos, was investigated. A graphical method, developed for separating the bimodal frequency distribution into two separate distributions, was not very efficient.

All the necessary statistical analyses were carried out on behalf of members of the Pathological and Physiological Divisions of the Pneumoconiosis Research Unit and the Miners' Chest Clinic, who participated in the World Conference.



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DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL V

NASIONALE BOU-
NAVORSINGSINSTITUUT

PART V

NATIONAL BUILDING
RESEARCH INSTITUTE

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. Box 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)

NASIONALE BOUNAVOR- SINGSINSTITUUT

Direkteur: N. STUTTERHEIM

Die grootskaalse voorsiening van voldoende behuising in goedbeplande dorpe is nog altyd 'n uiters belangrike vraagstuk in heel Afrika, en die Instituut het daarom, getrou aan sy beleid, voortgegaan om die ongehinderde uitwisseling van kennis en menings betreffende die tegniese aspekte van behuising, veral met betrekking tot goedkoop behuising geskik vir die toestande wat in Afrika aangetref word, aan te moedig. 'n Belangrike geleentheid in hierdie verband was die Inter-Afrikaanse Konferensie vir Behuising en Stedebou wat deur die Kommissie vir Tegniese Samewerking in Afrika Besuide die Sahara (C.C.T.A.) wat in Januarie 1959 te Nairobi gehou is. Die Instituut het hulp verleen by die organisasie van hierdie vergadering en elf referate deur personeellede is by die konferensie gelewer.

Dit stem tot dankbaarheid dat daar op die Konferensie dikwels met lof melding gemaak is van wat in Suid-Afrika op die gebied van goedkoop behuising bereik is, en ook van die werk van die Instituut in die besonder, en dit het duidelik geblyk dat baie van die Instituut se werk groot invloed op die denkwysse in verband met ontwerp en behuising en boupraktyk in baie dele van Afrika gehad het.

In die loop van die jaar is heelwat briewe ontvang waaruit geblyk het dat ook lande in ander wêrelddele as Afrika, en veral die onderontwikkelde nogal belang in die Instituut se navorsing in verband met behuising stel.

Onder die noemenswaardige ontwikkelings gedurende die jaar ten opsigte van die behuisingsnavorsingsprogram was daar die uitgebreide bestudering van minimale huisontwerpe vir blankes, behuising vir oues van dae en goedkoop huise vir die kleurlinggemeenskap in die Kaap. Die aanvoerwerk vir laasgenoemde studies word hoofsaaklik deur die Personeelnavorsingsinstituut onderneem vir hierdie Instituut.

Al hierdie werk is deur die Nasionale Behuisingskommissie ondersteun.

NATIONAL BUILDING RESEARCH INSTITUTE

Director: MR. N. STUTTERHEIM

The provision of adequate housing on a large scale in well-planned towns remains a major problem common to all parts of Africa, and the Institute has, therefore, continued its policy of encouraging the free exchange of knowledge and views concerning technical aspects of housing, particularly with regard to low-cost housing for African conditions. An important occasion in this connection was the Inter-African Conference on Housing and Urbanization arranged by the Commission for Technical Co-operation in Africa South of the Sahara (C.C.T.A.), which was held in Nairobi during January, 1959. The Institute gave assistance in organising this meeting and eleven papers by members of staff were presented at the conference.

It is gratifying to learn that the South African achievements in low-cost housing and the work of the Institute in particular, were often mentioned with acclaim at the conference, and it was evident that much of the Institute's work has had a profound influence on thinking in respect of design, housing and building practice in many parts of Africa.

Apart from Africa, a good deal of correspondence received during the year indicates that considerable interest is taken by other countries of the world, especially those which are under-developed, in the housing research carried out at the Institute.

Noteworthy developments in the housing research programme during the year were further extensions of the study on minimum house designs for Europeans, housing for the aged and low-cost housing to suit the Coloured community in the Cape. The initial work in the latter studies is being undertaken mainly by the Institute for Personnel Research on behalf of this Institute.

All this work was sponsored by the National Housing Commission.

Dit het gedurende die afgelope paar jaar al hoe meer duidelik geword dat daar heelwaarskynlik in die nabye toekoms 'n tekort aan geskoolde en ongeskoolde werkkragte in die boubedryf in Suid-Afrika sal wees, en dat die tekort ernstig sou kan word as daar 'n sterk opwaartse neiging in boukonstruksie ontstaan. Om enige studies, wat die bedryf by sy pogings om die arbeidsposisie te verbeter sou kan help, so spoedig moontlik aan die gang te sit, is 'n spesiale subkomitee deur die Instituut se Adviserende Bounavorsingskomitee aangestel, om te oorweeg op watter maniere hierdie en ander afdelings van die Wetenskaplike en Nywerheidsnavorsingsraad van hulp sou kan wees. Die moontlikhede omvat onder andere 'n opname van die beskikbare mannekrag en die insameling en ontleding van die betrokke statistiese gegewens. Die belangrike probleme in hierdie verband is die werwing en opleiding van persone vir die verskillende ambagte in die boubedryf, die toevoer van ongeskoolde arbeiders en die interaksie van geskoolde en ongeskoolde arbeid met die oog op die moderne neiging tot meganisering. Bykomstige faktore is die beleid in verband met werkreservering en die nie-blanke geskoolde arbeidspotensiaal.

Drie nuwe projekte is aan die navorsingsprogram toegevoeg. 'n Beurs ter waarde van £1,750 per jaar vir 'n minimum periode van drie jaar is gereël met die ondersteuning van die Suid-Afrikaanse Voorgespanne-Betonontwikkelingsgroep en 'n beurshouer is aangestel om die werk te doen. Die oogmerk met hierdie projek is om die eienskappe van voorspanstaal wat plaaslik vervaardig is, te ondersoek en aldus vir ontwerpers van bouwerke van voorgespanne beton aan basiese inligting te help. Die ander nuwe projekte gaan oor die stabilisering van fondamentgrondsoorte en die opstel van 'n handboek oor die werkmodes in grondlaboratoriums.

Die moontlikhede om navorsing te doen in verband met die wegruiming van riool- en afvalwater vir klein gemeenskappies, het heelwat belangstelling, sowel in die Unie as in die Federasie, gewek. Hierdie belangstelling is 'n direkte resultaat van die ondersoek wat in samewerking met die Nasionale Instituut vir Waternavorsing uitgevoer is en wat aan die lig gebring het dat munisipale en soortgelyke publieke organisasies wat verantwoordelik is vir sulke wegruimingskemas, met baie probleme te kampe het en dat as bevredigende oplossings gebied kan word, groot finansiële besparings dwarsdeur die land die gevolg sou wees. Daar is aanduidings dat die Wetenskaplike en Nywerheidsnavorsingsraad substansiële finansiële ondersteuning kan verwag om hierdie navorsing te onderneem.

It has become increasingly apparent during the past few years that there will probably be a shortage of skilled and unskilled labour in the building industry in South Africa in the near future and that the shortage could become serious if there were a strong upward trend in building construction. In order to initiate, at an early date, any studies which might help the industry in its efforts towards improving the labour position, a special sub-committee was set up during the year by the Institute's Building Research Advisory Committee to consider in which ways this and other divisions of the C.S.I.R. might assist. Possibilities include the carrying out of manpower surveys and the collecting and analysing of relevant statistical data. The important problems in this issue are recruiting and training for the skilled building trades, the supply of unskilled labourers and the inter-action of skilled and unskilled labour in relation to modern trends towards mechanisation. Additional factors are job reservation policies and non-white skilled labour potentials.

Three new projects were added to the research programme. A fellowship to the value of £1,750 per annum for a minimum period of three years was arranged under sponsorship of the South African Prestressed Concrete Development Group and a fellow appointed to carry out the work. The purpose of this project is to investigate the properties of locally-produced prestressing steel and thus provide basic information to assist designers of pre-stressed concrete structures. The other new projects deal with the stabilization of foundation soils and the compilation of a manual of soils laboratory practice.

The possibilities of carrying out research on the disposal of sewage and waste waters for small communities has aroused considerable interest both in the Union and the Federation. This interest is a direct result of the investigation which was carried out in collaboration with the National Institute for Water Research, and which revealed that municipal and similar public organisations responsible for such disposal schemes are faced with many problems and that if satisfactory solutions could be found, they would result in considerable financial savings throughout the country. There are indications that the C.S.I.R. can expect substantial financial support for undertaking this research.

Die Instituut het hierdie jaar aan meer tegniese konferensies, simposia en dergelike vergaderings as gewoonlik deelgeneem. Altesame is 28 referate gelewer deur personeellede by nege sulke byeenkomste waarvan een buite die Unie gehou is. Vier-en-twintig ander referate deur personeellede is ook in die tegniese pers gepubliseer.

Die Instituut het beurse, toekennings en kontrakte ter waarde van naasteby £26,000 gehanteer. Werk is gedoen in verband met 91 kontrakte, waarvan 54 gedurende die jaar opgedra is.

The Institute was involved in more technical conferences, symposia and similar meetings than usual this year. Altogether 28 papers by members of staff were presented at nine such gatherings, one of which was held outside the Union. In addition, 24 other papers by members of staff were published in the technical press.

The Institute handled fellowships, grants and contracts to an approximate value of £26,000. Work was done on 91 contracts, of which 54 were commissioned during the year.



Binnehof van die eksperimentele laerskool te Waterkloof, Pretoria

Foto: Dotman Pretorius

Internal courtyard of the experimental primary school at Waterkloof, Pretoria

Photo: Dotman Pretorius

AFDELING ARGITEKTUUR

Skoolnavorsing

Waarnemings by die eksperimentele laerskool in Waterkloof gedurende die eerste gebruiksjaar, het bewys dat dit bevredigend is ten opsigte van kind, onderwyser en ouer. Die belangrikste feit wat aan die lig gekom het, was dat onderwysruimte buigsamer behoort te wees om aan die veranderende eise deur die onderwys gestel,

ARCHITECTURAL DIVISION

Schools Research

Observations at the experimental primary school in Waterkloof during the first year of occupation showed that it has proved satisfactory from the point of view of the child, the teacher and the parent. The most important fact which emerged was that teaching space should be more flexible to meet the changing demands

te voldoen en dat groter klaskamers die onderwysers baie sou help. 'n Volledige verslag oor die skool is opgestel.

In die geval van die eksperimentele hoërskool wat op Lyttelton, naby Pretoria, gebou gaan word, is 'n tender van £80,988 aangeneem, wat heelwat laer is as die som wat vir die projek vasgestel is. Die skool wat vir 750 leerlinge ontwerp is, maar wat 'n maksimum van 900 sal kan huisves, word so beplan dat die grootste buigsaamheid van die onderwysruimtes wat die kapitaalbelegging toelaat, daardeur verseker sal wees. Die verskillende vereistes van spesiale onderwyskamers is bestudeer en die kamers is so beplan dat hulle vir sowel die onderwyser as die leerling van nut sal wees. Oortollige ruimte soos gange, ingangsruijtes en bedekte ruimtes is tot 'n minimum beperk om groter klaskamers toe te laat en om voorsiening te kan maak vir ekstra toebehore soos wasbakke, werktafels, rakke, berg-ruijtes en krytbordbeligting. Een van die groot probleme in hoërskoolbeplanning was die voorsiening van vergader- en gimnastieksale. Vir albei hierdie soorte sale is in die Lyttelton-Hoërskool met Afrikaans as voertaal voorsiening gemaak.

Die navorsing ten opsigte van skoolgeboue is finansieel ondersteun deur die vier Provinsiale Administrasies.

Hospitaalgeboue

'n Verslag oor alle aspekte van saalbeplanning is vir publiseering opgestel. Die werk dek 'n analise van oorsese planne, neigings in die verpleegpraktyk, bekwaamheid van die Bantoverpleegster, studies van die afstande deur verpleegsters afgelê tydens hul werk, die persentasies van geïsoleerde, bedlêende en semi-bedlêende en lopende pasiënte en die skepping van 'n groot administratiewe saaleenheid van 140 beddens, met volkome buigsaamheid vir onderverdeling volgens geslag, mediese dissipline of spesialiteit, sowel as die spesiale vereistes van kinder- en vrouesiektes.

'n Opname van verplegingsverkeer tussen diagnostiese kamers, behandelingsaal en diensdepartemente is voltooi en sal ingesluit word as 'n hoofstuk in *Das Handbuch für den Neuen Krankenhausbau* wat binnekort oorsese gepubliseer gaan word. Kombuisbeplanning en -toerusting is in alle besonderhede bestudeer en 'n verslag is geskryf, terwyl die voorbereiding van ander verslae oor „The Central Sterile Supply Department” en „A Central Infant Formula Laboratory” vir die bereiding van babavoedsels, ook onderneem is.

'n Verslag oor die ontwerp van poliklinieke is gepubliseer. Die Saulsville-polikliniek wat by die Instituut ontwerp is, is gebou teen 'n koste van £3,080 en beslaan 'n oppervlakte van 3,600 vk. vt. Advies is gegee aan die Transvaalse Provinsiale Administrasie oor die grootte, posisie en ontwerp van nog vier poliklinieke, om volle diens aan die inwoners van die

of education and that larger classrooms would assist the teachers considerably. A full report on the school was prepared.

In the case of the experimental high school which is to be built at Lyttelton, near Pretoria, a tender of £80,988 was accepted, this sum being well within the figure set for the project. The school, designed for 750 pupils but accommodating a maximum of 900, is planned to give the most flexible teaching spaces that the capital investment would allow. In addition, the various needs of special teaching rooms were studied and the rooms planned to assist both teacher and pupil. Waste space, in the form of corridors, entrance spaces and covered-ways, was reduced to a minimum to allow for the classrooms to be enlarged and for extra fittings, such as sinks, worktops, shelving, storage alcoves and chalkboard lighting, to be provided. One of the major problems in high school planning has been the provision of assembly halls and gymnasia. Both a hall and a gymnasium have been included in the Lyttelton Afrikaans Medium High School.

The research on school buildings was sponsored financially by the four Provincial Administrations.

Hospital Buildings

A report on all aspects of ward planning was prepared for publication. The work covers an analysis of overseas plans, trends in nursing practice, abilities of the Bantu nurse, nurse journey studies, the percentages of isolated, bedfast, semi-ambulant and ambulant patients, and the postulation of a large administrative ward unit of 140 beds, with complete flexibility for sub-division by sex, medical discipline, or speciality, as well as for the special requirements of paediatrics and obstetrics.

A survey of nursing traffic between diagnostic rooms, treatment ward and service departments was completed and will be included as a chapter in *Das Handbuch für den Neuen Krankenhausbau*, shortly to be published overseas. Kitchen planning and equipment were studied in detail and a report written, while preparation of other reports on 'The Central Sterile Supply Department' and 'A Central Infant Formula Laboratory' for the preparation of infant feeds were also undertaken.

A report on the design of polyclinics was published. The Saulsville polyclinic, which was designed at the Institute, was built at a cost of £3,080 and has an area of 3,600 square feet. Advice was given to the Transvaal

Weslike Naturellegebiede van Johannesburg te verskaf. Wanneer hierdie poliklinieke in gebruik geneem word, is dit die bedoeling om hulle invloed op die moederhospitaal waar te neem.

Op versoek van die Oranje-Vrystaatse Provinsiale Administrasie is aan twee argitekte hulp verleen by die beplanning van twee hospitale van 400 beddens.

Die navorsing in verband met hospitale is finansiële ondersteun deur die Uniedepartement van Gesondheid en deur die vier Provinsiale Administrasies.

Minimale Huisplanne

Die koste-ontleding vir die goedkoop huis vir bebouing deur blankes wat deur die Instituut ontwerp en naby Pretoria deur 'n privaats bouaannemer gebou is, het 'n totaal van ongeveer £1,600 aangetoon. Buitegeboue is ingesluit en die huis het 'n groter oppervlakte en is beter afgewerk as die eerste eksperimentele huise wat die jaar tevore te Witbank gebou is. Die verslag wat die ontwerp en konstruksie van die Witbankhuise beskryf, is voltooi vir publiserings in die Instituut se Bulletin.

'n Begin is ook gemaak met 'n skema vir die bou van goedkoop huise vir blankes in gebiede waar swellende grondsoorte voorkom. Die belangrikste aspek van hierdie projek is om die mees ekonomiese oplossings te vind deur noukeurige bestudering van die wisselwerking tussen minimum huisplanne en bevredigende fondamentontwerp.

Wat behuising vir bejaardes betref, word werk hoofsaaklik beperk tot die insameling van inligting en die voorbereiding van 'n verslag wat die belangrikste aspekte van die probleem in Suid-Afrika behandel. Ontledings van oorsese oplossings en navorsing is ondersoek met betrekking tot die plaaslike vraagstuk en die wyse is geformuleer waarop by verdere ondersoek te werk gegaan behoort te word.

Die werk ten opsigte van behuising is deur die Nasionale Behuiskommissie ondersteun.

AFDELING FUNKSIONELE DOELTREFFENDEHEID

Warmtevloei deur Geboukomponente

Na 'n tussenpoos van 'n paar jaar is die werk in verband met die fundamentele studies van periodiese warmtevloei deur geboukomponente hervat. Daar is nog maar min bekend deur die meganisme van warmtevloei in of uit 'n gebou deur sy verskillende komponente, by blootstelling aan Suid-Afrikaanse klimaatstoestande. Oor die algemeen is daar 'n warmtevermeerdering binne

Provinsiale Administrasie op die grootte, posisie en ontwerp van vier verdere poliklinieke om 'n volledige diens te verskaf aan die inwoners van die Westelike Nasionale Gebiede van Johannesburg. Wanneer hierdie poliklinieke in gebruik geneem word, is dit die bedoeling om hulle invloed op die moederhospitaal waar te neem.

Op versoek van die Oranje-Vrystaatse Provinsiale Administrasie, twee argitekte is gehelp in die beplanning van twee 400 bed hospitale.

Die navorsing op hospitale is finansiële ondersteun deur die Uniedepartement van Gesondheid en deur die vier Provinsiale Administrasies.

Minimum House Plans

Die koste-analise vir die lae-koste Europese huis wat ontwerp is deur die Instituut en gebou naby Pretoria deur 'n privaats bouaannemer, het 'n totaal van ongeveer £1,600 aangetoon. Buitegeboue is ingesluit en die huis het 'n groter oppervlakte en is beter afgewerk as die eerste eksperimentele huise wat die jaar tevore te Witbank gebou is. Die verslag wat die ontwerp en konstruksie van die Witbankhuise beskryf, is voltooi vir publiserings in die Instituut se Bulletin.

Werk is ook gestart op 'n skema vir die bou van lae-koste Europese huise in gebiede waar swellende grondsoorte voorkom. Die belangrikste aspek van hierdie projek is om die mees ekonomiese oplossings te vind deur 'n noukeurige bestudering van die wisselwerking tussen minimum huisplanne en bevredigende fondamentontwerp.

Wat behuising vir bejaardes betref, word werk hoofsaaklik beperk tot die insameling van inligting en die voorbereiding van 'n verslag wat die belangrikste aspekte van die probleem in Suid-Afrika behandel. Ontledings van oorsese oplossings en navorsing is ondersoek met betrekking tot die plaaslike vraagstuk en die wyse is geformuleer waarop by verdere ondersoek te werk gegaan behoort te word.

Die werk op behuising is deur die Nasionale Behuiskommissie ondersteun.

FUNCTIONAL EFFICIENCY DIVISION

Heat Flow through Building Components

Na 'n tussenpoos van 'n paar jaar is die werk in verband met die fundamentele studies van periodiese warmtevloei deur geboukomponente hervat. Daar is nog maar min bekend deur die meganisme van warmtevloei in of uit 'n gebou deur sy verskillende komponente, by blootstelling aan Suid-Afrikaanse klimaatstoestande. Oor die algemeen is daar 'n warmtevermeerdering binne

'n gebou gedurende die sonure en 'n warmtevermindering gedurende die nag. Dit is egter moeilik om die hoeveelheid warmtevloei vooraf akkuraat te bepaal op enige bepaalde tydstip, omdat daar soveel faktore is wat daartoe bydra.

Een resultaat is dat verwarmings- en verkoelingsbelasting vir geboue wat op die oomblik op onrealistiese, reëlmatige warmtevloei-omstandighede bereken word, in baie gevalle heelwat oorskot is. Die voorgestelde studie kan dus verreikende ekonomiese implikasies hê, vir sover dit die meganiese verkoeling en verwarming van geboue betref. Hierdie studie behoort ook 'n beter begrip van die uitwerking van die ontwerp van 'n gebou en van die materiale op die behaaglike toestand wat warmte in geboue sonder lugversorging betref, mee te bring.

Plafonisolasie

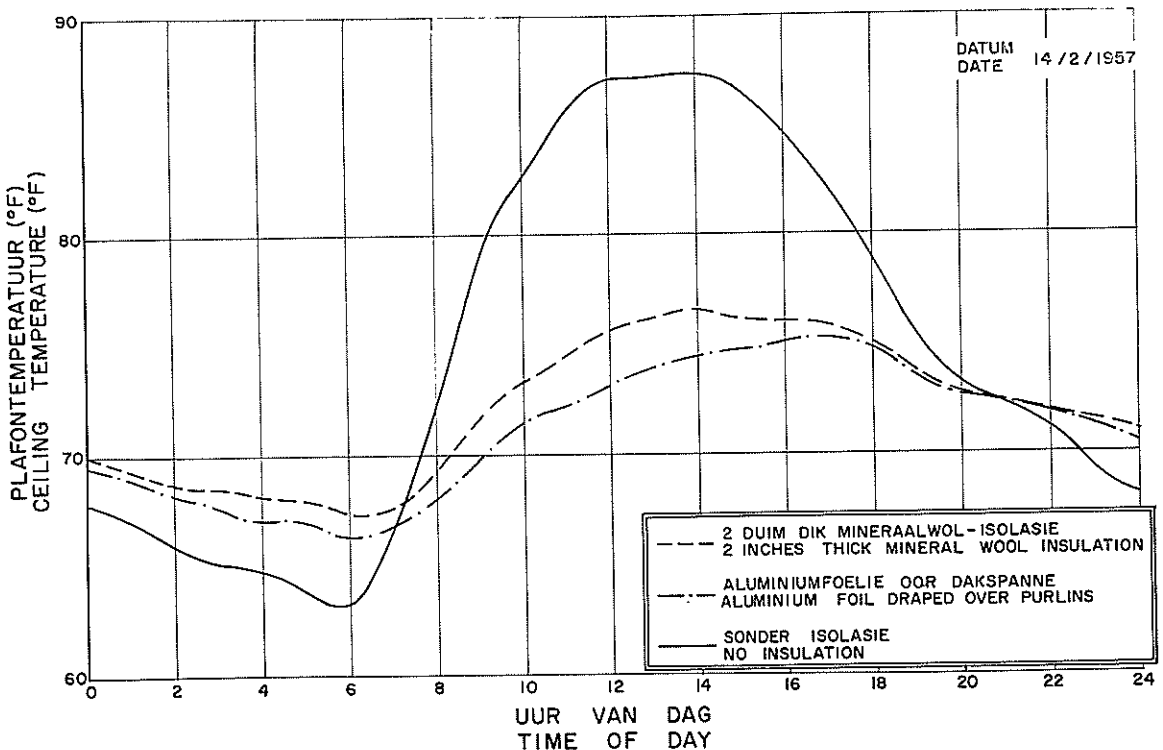
Vergelykende veldondersoek is voortgesit op 'n aantal gelyksoortige volkskaalse toetshuise, om die relatiewe warmte-isoleringsdoeltreffendheid van verskillende tipes en diktes plafonisolasie onder natuurlike

night. Because of the many contributory factors, however, it is difficult to pre-determine the rate of heat flow at any particular time, accurately.

One result is that heating and cooling loads for buildings, at present calculated on unrealistic steady-state heat flow conditions, are in many cases considerably overestimated. The proposed studies could, therefore, have far-reaching economic implications insofar as mechanical cooling and heating of buildings are concerned. In addition, they should provide a better understanding of the effects of building design and materials on indoor thermal comfort conditions in unconditioned buildings.

Ceiling Insulation

Comparative field investigations were continued on a number of similar full-scale test houses, to study the relative thermal insulating efficiencies of various types and thicknesses of ceiling insulation under natural



Punte van verskil in plafontemperatuur in eenderse eksperimentele huise te Pretoria gedurende 'n tipiese wolklose dag in die somer, wat die invloed van sommige soorte plafonisolasie aantoon

Plots of the variation in ceiling temperature in similar experimental houses at Pretoria during a typical cloudless day in summer, illustrating the effect of some forms of ceiling insulation

weersomstandighede te bestudeer. Voorlopige resultate dui daarop dat die vernaamste effek van plafonisolasi eerder in die groot vermindering in plafontemperatuur gesien word, as in die kamerlugtemperatuur. Toe die resultate vergelyk is met dié vir 'n huis wat geen plafonisolasi gehad het nie, is plafontemperatuurvermindering van 14° tot 18°F, waargeneem in huise wat óf die gelykstaande van 'n laag mineraalwol van 2 dm. dik op die plafon gehad het, óf waarin aluminiumfoelie oor die gordings gedrapeer was. Dit sal derhalwe nodig wees om verdere subjektiewe toetse uit te voer om die volle nut van plafonisolasi onder omstandighede van hoë isolasi, in terme van die invloed daarvan op menslike warmtesensasi te bepaal. Ongelukkig neem bestaande metodes om omgewingswarmte te bepaal, soos die gekorrigeerde effektiewe temperatuurskaal, nie die invloed van stralingsuitruiling tussen die plafon en die menslike liggaam in aanmerking nie.

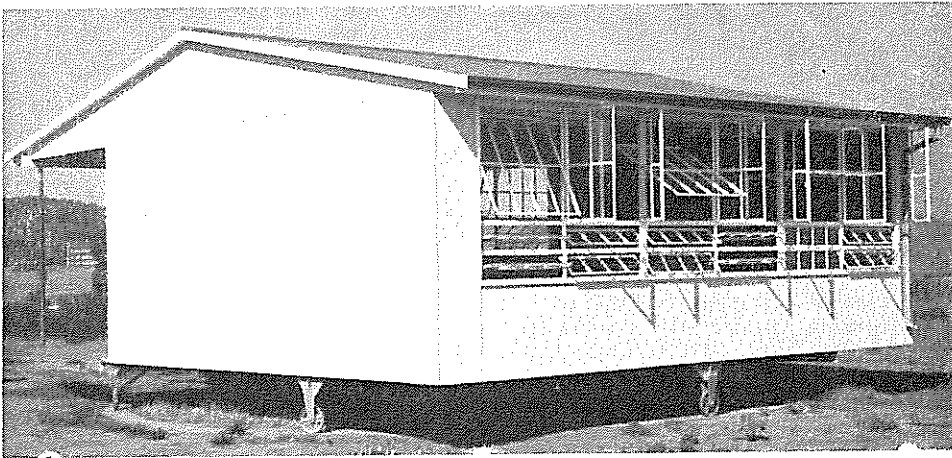
Verligting in Geboue

Verdere dagverligtingsopnames is op modelklaskamers in die kunsmatige hemel uitgevoer en in soortgelyke volskaalse geboue onder verskillende hemeltoestande. Spesiale aandag is daaraan gewy om die invloed op binnenshuisverligtingswaardes en distribusie van sulke faktore soos grootte, fatsoen en posisie van

weather conditions. Preliminary results show that the main effect of ceiling insulation is apparent in considerable reductions in ceiling temperature rather than in room air temperature. Comparing results with a house where there was no ceiling insulation, ceiling temperature reductions of from 14° to 18°F were observed in houses which had either the equivalent of 2 inches of mineral wool on the ceiling or aluminium foil draped over the purlins. Because of this, it will be necessary to conduct further subjective tests in order to assess the full benefit of ceiling insulation under conditions of high insulation, in terms of its influence on human sensations of warmth. Unfortunately, existing methods of assessing environmental warmth, such as the corrected effective temperature scale, do not take into full account the influence of radiation exchange between the ceiling and the human body.

Lighting of Buildings

Further daylight illumination surveys were carried out in scale model classrooms in the artificial sky and in similar full-scale buildings under a variety of sky conditions. Special attention was given to determining the influence on interior illumination levels and distribution of such factors as size, shape and position of



Volledige eksperimentele klaskamer op 'n draaitafel wat gebruik word vir ventilasi- en beligtingstudies

Full-scale experimental classroom on turntable used for ventilation and lighting studies

die vensters, variasies in plafonhoogte, posisie van krytborde, grondrefleksie en eksterne versperrings vas te stel. Aandag is ook gewy aan die kunsmatige verligting van klaskamers, veral ook aan die lokale beligting van krytborde. 'n Konsepverslag oor die verligtingsvereistes en ontwerp van skoolgeboue is opgestel.

windows, variations in ceiling height, position of chalkboards, ground reflection and external obstructions. Attention was also given to the artificial lighting of classrooms, in particular to the local lighting of school chalkboards. A report on the lighting requirements and design of school buildings was drafted.

'n Verslag is ook geskryf oor die opnames wat in Pretoria gemaak is van beide hemel- en totale buitelugverligting, hemelhelderheidstoestande en die stralingsdoeltreffendheid van die son.

Ventilasie- en Termiese Studies

Ventilasiestudies met skaalmodelklaskamers in die oop vrystralwindtonnel van 10 voet van die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese is voltooi. Hierdie studies is uitgevoer om die invloed van strukturele eienskappe, windrigting en eksterne versperrings op die natuurlike ventilasie van geboue vas te stel. Die gekombineerde deurstromingskoëffisiënt vir verskillende kombinasies van vensteropeninge is eksperimenteel vasgestel. Die resultate van hierdie ondersoek is in 'n konsepverslag ingesluit wat handel oor ventilasie en termiese ontwerpsoorwegings vir skoolgeboue.

'n Ander referaat, wat verdere uitslae bevat van navorsing op die ventilasie en termiese ontwerp van geboue om by die klimaat te pas, is ook voltooi.

'n Volskaalse eksperimentele klaskamer is op 'n draaitafel gebou, om die korrelasie tussen model en volskaalse toetsresultate onder egte weerstoestande te bestudeer. Spesiale aandag sal gewy word aan die invloed van atmosferiese onstuimigheid met inbegrip van windspoeddistribusie bokant die grond, op die natuurlike ventilasie van geboue.

Bouklimatologie

Windsnelhede vir ontwerpdoeleindes, inagnemend snelheid, rigting en herhalingsfrekwensie, is vasgestel ten opsigte van skole en kantoorgeboue vir die vernaamste bevolkingsentra van die Unie. Dit is nou in ons land vir die eerste keer moontlik om die ontwerp vir ventilasie realities te benader. Windsnelhede vir ontwerpdoeleindes vir die beoordeling van infiltrasie- of lek-snelhede deur vensters is vir dieselfde sentra vasgestel. Infiltrasiesnelhede is natuurlik belangrike oorwegings in lugversorgingsontwerp.

'n Metode om die behoefte aan skoolverwarming of -verkoeling vas te stel, is ontwikkel en toegepas in die geval van een-en-dertig sentra in die Unie waarvoor gedetailleerde lugtemperatuurgegewens oor 'n lang termyn beskikbaar was by die Weerburo. Die metode van vasstelling is gebaseer op die resultate van ooreenstemmende lugtemperatuurmetings, binnenshuis en buitenshuis, wat in die somer en in die winter in 'n aantal skole te Pretoria en te Kaapstad gedoen is. Die inligting toon nie alleen aan of verwarming of verkoeling wenslik is nie, maar maak dit ook makliker om die paslikste en mees ekonomiese metode van temperatuurkondisionering te kies vir enige bepaalde deel van die land.

A report was also written on the measurements made in Pretoria on both sky and total outdoor illumination, sky brightness conditions and the luminous efficiency of solar radiation.

Ventilation and Thermal Studies

Ventilation studies with scale model classrooms in the 10 ft. open jet wind tunnel of the National Mechanical Engineering Research Institute were completed. These were carried out to determine the influence of structural features, wind direction and external obstructions on the natural ventilation of buildings. In addition, combined coefficients of discharge for various combinations of window openings were determined experimentally. The results of these investigations were included in a draft report dealing with ventilation and thermal design considerations for school buildings.

Another paper, giving further results of research on the ventilation and thermal design of buildings to suit climate, was also completed.

A full-scale experimental classroom was erected on a turntable to study further the correlation between model and full-scale test results under actual weather conditions. Particular attention will be given to the influence of atmospheric turbulence, including wind speed distribution above ground, on the natural ventilation of buildings.

Building Climatology

Design wind speeds, taking into account wind speed, direction and frequency of recurrence, were determined in respect of schools and office buildings for the main population centres in the Union. For the first time in this country, it is now possible to approach the ventilation design of these buildings realistically. In addition, design wind speeds for the assessment of infiltration or leakage rates through windows were determined for the same centres. Infiltration rates are, of course, important considerations in air conditioning design.

A method of assessing the need for school heating or cooling was developed and applied in the case of thirty-one centres in the Union for which long-term detailed air temperature data were available at the Weather Bureau. The method of assessment is based on the results of coincident measurements of indoor and outdoor air temperatures conducted in a number of schools in Pretoria and Cape Town under both summer and winter conditions. The information not only indicates whether heating or cooling is desirable but also makes it easier to choose the most suitable and economical method of temperature conditioning for any particular region of the country.

Gebruik van Sonenergie

Toetse is voltooi om te bepaal hoe doeltreffend die eerste eksperimentele platplaatsonhitte-opnemer by die Instituut ontwerp is om water deur middel van die son te verwarm vir huishoudelike gebruik. Hoewel die opnemer onvoldoende geïsoleer was, is 'n gemiddelde doeltreffendheid van omtrent 40 persent verkry en het geblyk dat die doeltreffendheid nie veel tussen somer en winter verander het nie. 'n Verbeterde opnemer-ontwerp, wat vir die gemiddelde huiseienaar makliker sal wees om te maak, is ontwikkel in samewerking met die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese. Verdere werk met die oog op die ontwikkeling van goedkoper eenhede wat makliker is om te maak, is aan die gang. Groot belangstelling in waterverwarming deur middel van die son is gedurende die laaste paar jaar in Suid-Afrika getoon en die Instituut ontvang baie navrae in verband daarmee.

Die absorpsie van sonhitte deur die dakke van geboue skyn moontlikhede te bied, wat tot dusver nie ontgin is nie, om hierdie hitte vir ruimteverwarming in geboue te gebruik. Voorafgaande ondersoek wys daarop dat die doeltreffende gebruik van die relatief hoë solderlugtemperatuur wat normaalweg hier te lande gedurende die dag voorkom, waardevolle besparings in lopende koste tot gevolg sou kan hê ten opsigte van lugverwarmingsinstallasies in geboue soos skole.

Goedkoop Kookstowe

Verdere werk in verband met die ontwikkeling en toetsing van paslike goedkoop stowe vir Bantoe huise is uitgevoer deur personele van die Universiteit van Natal, in oorleg met die Instituut. Praktiese kooktoetse met prototipe eenhede is aan die gang in twee Bantoe dorpe te Durban. Voorlopige resultate is baie belovend en die projek nader voltooiing, waarna die ontwerp vir massaproduksie gefinaliseer sal word.

'n Opmerklieke eienskap van die stoof is dat die koper 'n eenvoudige maar tog doeltreffende warmplaat kan koop, met die moontlikheid dat later 'n oond of selfs 'n warmwaterrenk van beperkte inhoud aan die bokant aangebring kan word. Daar skyn geen rede te wees waarom dit nie moontlik sou wees nie om met min ekstra koste 'n doeltreffende en aantreklike stoof vir die gebruik van hoër inkomstegroepe soos Indiërs, Kleurlinge en Blankes, beskikbaar te stel nie.

Gesteunde Ondersoeke

Gesteunde navorsing is gedoen op die meting van die termiese eienskappe van boumateriale en die vasstelling van termiese gedrag van konstruksies wat vir Naturelle behuising voorgestel is.

Utilization of Solar Energy

Tests were completed to determine the efficiency of an experimental flat plate solar heat collector for domestic solar water heating, the first made at the Institute. Although the collector was inadequately insulated, average efficiencies of about 40 per cent were obtained and it was found that the efficiencies did not change much between summer and winter. An improved collector design, which should be easier for the average householder to make, was evolved in collaboration with the National Mechanical Engineering Research Institute. Further work to develop cheaper and more easily made units is in progress. Considerable interest in solar water heating has been shown in South Africa in the past few years and the Institute is now receiving many enquiries on the subject.

The absorption of solar heat by the roofs of buildings would seem to offer possibilities, as yet unexploited, of using this heat for space heating in buildings. Preliminary investigations show that the effective utilization of the relatively high attic air temperatures which are normally experienced during daytime in this country could lead to worthwhile savings in running costs of warm air heating installations in buildings such as schools.

Low-Cost Cooking Stoves

Further work in developing and testing suitable low-cost stoves for Bantu housing was carried out by members of staff of the University of Natal, in consultation with the Institute. Practical cooking tests with prototype units are in progress in two Bantu Townships in Durban. Preliminary results are very promising and the project is now in its closing stages prior to finalizing the design for mass production.

A particular feature of the stove is that the purchaser is able to buy a simple yet effective hot plate, to which an overhead oven can be added at a later stage, or even a hot water boiler of limited capacity. There seems no reason why, with little additional cost, it should not be possible to offer an effective and attractive looking unit to progressively higher income groups such as Indians, Coloureds and Europeans.

Sponsored Investigations

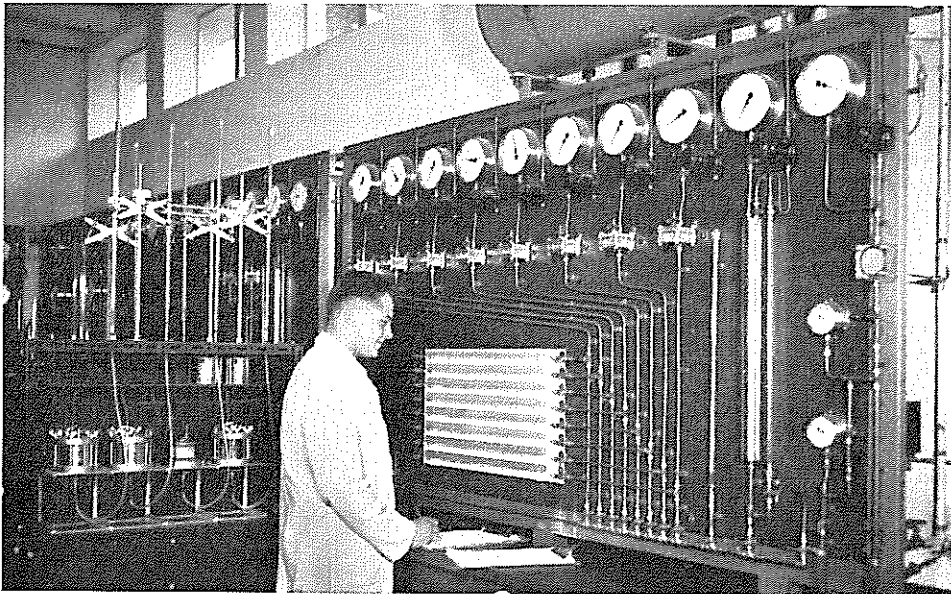
Some sponsored work was done on the measurement of the thermal properties of building materials and the assessment of the thermal performance of constructions proposed for Native housing.

Studie van Uitsettende Klei

Die belangrikste probleme in verband met die fondering van geboue in Suid-Afrika doen hul voor as gevolg van die swel van sekere grondsoorte deur toename van die voginhoud. Hierdie toename is die onvermydelike gevolg van die veranderde omgewingsfaktore te wyte aan die oprigting van geboue op dié grondsoorte. Op die hoëveld en in sommige ander dele van die land, kan hierdie uitsetting onrusbarende afmetings aanneem en aanmerklike skade aan geboue veroorsaak. Alhoewel bevredigende metodes deur die Instituut vir die ontwerp van geboue ontwikkel is om te voorkom dat hulle kraak, kan dit in die praktyk tot aansienlike verhoging van die konstruksiekoste lei; die addisionele uitgawe is afhanklik van die mate van uitsetting wat waarskynlik in elke afsonderlike geval

Study of Expansive Clays

The most important problems connected with the foundations of buildings in South Africa arise from the swelling of certain soils, following increases in their moisture content. These inevitably occur as a result of changed environmental conditions due to the erection of buildings on the soils. In the highveld and in certain other parts of the country, this swelling can reach alarming proportions and causes considerable damage to buildings. Although satisfactory methods have been developed at the Institute for designing buildings to prevent cracking, in practice they can add considerably to the costs of construction, the additional expenditure depending on the degree of expansion likely to occur in each particular case. During the past year, therefore, some effort was devoted to evolving methods of design



Volumeters wat gebruik word vir die meting van die verhouding tussen volume en voginhoud van grondsoorte

Bank of volumeters used for measuring the relationship between volume and moisture content of soils

sal plaasvind. Gedurende die afgelope jaar is dus getrag om ontwerpmetodes te ontwikkel wat daardie addisionele koste sou kan verminder. Veral die moontlikheid om gebruik te maak van voorafgegiete betonpale wat teen geringe koste gemaak en opgerig kan word, is ondersoek.

Om die uitsettingsprobleem beter te kan verstaan, is 'n deeglike studie gemaak van voglobeweging in die

which could reduce these additional costs. In particular, the possibilities of using precast concrete piles which could be made and installed at low cost were investigated.

In order to obtain a better understanding of the heaving problem, fundamental studies were made of the mechanism of moisture migration in soils and the

grond en die uitwerking van vogveranderinge op die grond. By hierdie werk is gebruik gemaak van die volumemeter wat in die laboratorium ontwerp is en waarin die voginhoud van 'n onversteurde grondmonster verander en die gevolglike volumeveranderinge gemeet kan word. Die toetse is uitgevoer onder gekontroleerde druktoestande wat gewoonlik dieselfde gemaak is as dié wat in die grond *in situ* heers.

'n Aanvang is gemaak met veldmetings van vogverandering in grondsoorte deur gebruik te maak van 'n stadige neutronvogmeter wat spesiaal vir die doel gemaak is in samewerking met die Vruchtenavorsingsstasie van die Westelike Provinsie, waar dit oorspronklik ontwerp en ontwikkel is. Hierdie apparaat werk op die beginsel dat vinnige neutrone wat uitgestraal word deur 'n radium-berilliumbron gedeflekteer en vertraag word deur botsings met waterstofkerne in die grondvog. Die aantal stadige neutrone wat per tydseenheid 'n telbuis binnegaan, gee 'n meting van die voginhoud van die omliggende grond. Die instrument het die vorm van 'n aluminiumproefpen wat 'n uitstralingsbron bevat en 'n detektorbuis (vinderbuis) wat d.m.v. 'n omhulde kabel met die oppervlakte verbind is. Die proefpen word in 'n boorgat afgelaat en 'n opname van stadige neutrone word aan die oppervlak gemaak deur 'n impulsdeler. Die voordele is dat dit 'n metode is om die voginhoud te meet sonder vernietiging, en dit skakel die oorheersende invloed van neutronestrooiing in die voginhoud van die grond uit, wat voorheen verhoed het dat enige belangrike resultate verkry is deur direkte monsternemingsmetodes vir bepaling van die voginhoud.

'n Groot deel van die werk in verband met die studie van uitsettende grond, was die direkte waarneming van die werklike beweging van geboue op sulke grondsoorte. Waarnemings is voortgesit in verskeie dele van die Unie, veral Vereeniging, die Oranje-Vrystaatse Goudvelde en Pretoria. 'n Reeks oppervlakwaarnemings is ook begin op 'n gebou in Kaapstad. Van spesiale belang by laasgenoemde studie is dat terwyl 'n progressiewe opwaartse beweging gewoonlik in die hoëveldse somerreëvalstreke waargeneem is, daar vermoed word dat 'n soortgelyke fondamentgrond in 'n winterreëvalstreek merkbare opwaartse en afwaartse seisoensbewegings ondergaan. Die meetresultate wat tot dusver verkry is, toon aan dat dit moontlik die geval is.

Verwydering van Vliegias

Die Instituut is deur die Suid-Afrikaanse Steenkool, Olie- en Gaskorporasie genader om hulle te help om 'n ekonomiese metode uit te werk vir die verwydering van hulle afvalvliegias en growwe as. Nadat die toestand deeglik ondersoek is, is 'n skema voorgestel waarvolgens die as, wat as 'n suspensie in water na die

effect of moisture changes on the soil. In this work, use was made of the volumemeter which was developed in the laboratory, and in which the moisture content of an undisturbed soil sample can be changed and the resulting volume changes measured. The tests were performed under controlled pressure conditions which were usually made equal to that of the soil *in-situ*.

Field measurements were commenced of moisture changes in soils using a slow neutron moisture meter which was specially made for the purpose in collaboration with the Western Province Fruit Research Station where the original design was developed. This apparatus operates on the principle that fast neutrons emitted from a radium-beryllium source are deflected and retarded owing to collisions with hydrogen nuclei in the soil moisture. The number of slow neutrons per unit time entering a counting tube gives a measure of the moisture content of the surrounding soil. The instrument takes the form of an aluminium probe containing an emitting source and a detector tube connected to the surface by a sheathed cable. The probe is lowered down a borehole and a count of slow neutrons made at the surface by a scaler. The advantages are that it is a non-destructive method of measuring moisture content and it eliminates the over-riding effect of scatter in soil moisture content, which has previously prevented any significant results being obtained by direct sampling methods of determining moisture content.

A major part of the work in connection with the study of expansive soils was the direct observation of the actual movement of buildings on such soils. Observations were continued in several areas of the Union, notably Vereeniging, the Orange Free State Goldfields and Pretoria. A series of level observations was also started on a building in Cape Town. The special interest in the latter study is that while a progressive upward movement has generally been observed in the highveld summer rainfall areas, it is thought that a similar foundation soil in a winter rainfall area undergoes marked seasonal upward and downward movements. The measurements made so far indicate that this is probably true.

Disposal of Ash

The Institute was approached by the South African Coal, Oil and Gas Corporation for assistance in providing an economic method for disposal of their waste fly-ash and coarse ash. After a comprehensive investigation of the situation, a scheme was proposed whereby the ash, which is pumped to the disposal site as a

afvalterrein gepomp word, neer slaan as 'n „hidrouliese vulling”—'n metode wat soms gebruik word vir grond-damkonstruksie. Die vry dreinerende growwe as sou rondom die omtrek van die dam afsak en die fyner materiaal sou na die middel van die dam toe spoel. Op hierdie wyse sou 'n dam, soortgelyk aan die slykdamme van die goudmynindustrie, opgebou word. Die grootste voordeel van die voorgestelde metode van damkonstruksie is dat namate die soliede materie aanhou om op te bou, sy formasie bevredigend behoort te bly wat stabiliteit betref. Teen die einde van die onderhawige jaar was die dam 30 voet hoog en ongeveer 'n kwart myl in die vierkant en het die bewys gelewer dat dit 'n ekonomiese en doeltreffende metode vir die verwydering van as is.

Soortgelyke werk is ook onderneem vir die Elektrisiteitsvoorsieningskommissie.

Studie in verband met die Stabiliteit van Slykdamme

Werk in verband met die studie van die stabiliteit van slykdamme is voortgesit en die finale verslag, wat die bevindinge van hierdie navorsing bevat, word voorberei.

Stabilisasie van Fondamentgrond

'n Navorsingsprojek is begin om die moontlikheid te ondersoek van chemiese stabilisasie van onstabiele fondamentgrond. Resultate wat verkry is by voorlopige toetse op sowel uitsettende as incensakkende grond was baie belowend.

Verwerking van Rotse

Verskeie projekte van oorblywende verweerde rotse is bestudeer en op hierdie wyse is die verweringsprosesse vir verskeie rotssoorte ontleed. Die inligting wat verkry is van die studie in verband met die formasie van sekere grondsoorte, was baie waardevol vir die voorspelling van die toekomstige gedrag van hierdie en soortgelyke grondsoorte.

Gesteunde Ondersoeke

Verskeie kontrakondersoeke is uitgevoer; die belangrikste daarvan het bestaan uit die gee van advies in verband met die bou van 'n tunnel deur 'n sand- en sandsteenformasie, advies in verband met die fondament van 'n groot oseaaneindpuntgebou en vir 'n groot reaktor vir 'n chemiese fabriek en uitvoering van grondondersoeke in verband met brúe en duikweë vir 'n nuwe pad.

Bowendien is 'n uitgebreide grondondersoek uitgevoer namens die Groepsgebiedehervestigingsraad in verband met die fondamenttoestand vir 'n voorgestelde behuisingskema vir kleurlinge en is advies gegee.

suspension in water, is deposited as an “hydraulic fill”—a method sometimes used for earth dam construction. The free-draining coarse ash would be deposited round the periphery of the dam and the finer material would be washed into the middle of the dam. In this way a dam, similar to the slimes dams of the gold mining industry, would be built up. The main advantage of the suggested method of dam construction is that as the solid matter continues to build up, its formation should remain satisfactory from the stability point of view. At the end of the year under review the dam was 30 ft. high and approximately a quarter of a mile square and was proving to be an economic and efficient method of ash disposal.

Work along similar lines was undertaken for the Electricity Supply Commission.

Study of the Stability of Slimes Dams

Work continued on the study of the stability of slimes dams and the final report, embodying the findings of this research, is being prepared.

Stabilization of Foundation Soils

A research project was started to investigate the feasibility of chemical stabilization of unstable foundation soils. Results obtained from preliminary tests on both expansive and collapsing soils appeared promising.

Decomposition of Rocks

Various studies of residual decomposed rocks were undertaken and in this way the weathering processes for various rock types were analysed. The information, obtained from the study regarding the formation of various soil types proved most valuable in predicting the future behaviour of these and similar soil types.

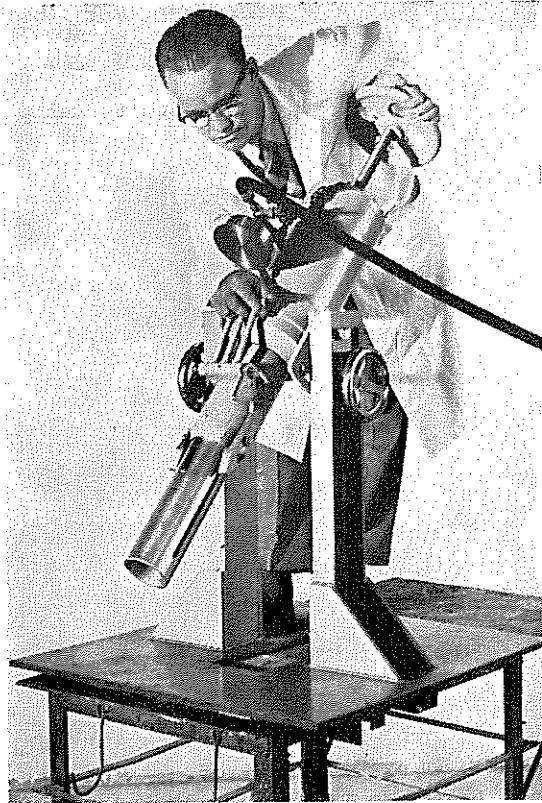
Sponsored Investigations

Several contract investigations were carried out, the more important of which were advising on the construction of a tunnel through a sand and sandstone formation, advising on the foundation for a large ocean terminal building and for a large reactor for a chemical plant and carrying out soil exploration work in connection with a system of bridges and under-passes for a new road.

In addition, extensive soil exploration was carried out on behalf of the Group Areas Resettlement Board in connection with the foundation conditions for a proposed Coloured housing scheme, and advice given.

Haelweerstand van Materiale

'n Geweer wat met saamgeperste lug werk en gebruik word vir die afskiet van kunsmatige haelstene, is ontwerp vir gebruik by die toets van die haelweerstand van dak- en bekledingsmateriale, om sodoende die nadele



Saamgeperste luggeweer vir die afskiet van kunsmatige haelstene
Compressed air gun for firing artificial hail stones

van die geweer te vermy wat in die verlede gebruik is en wat met loskruitpatrone gewerk het. Die belangrikste kenmerk van die nuwe geweer, 'n prototipe wat in die W.N.N.R.-werkplaas gebou is, is dat beter kontrole moontlik is oor die snelheid van die kunsmatige haelstene wanneer hulle teen die materiale wat getoets word, aangeskiet word.

Strukturele Implikasies as gevolg van die Krimping van Beton

Die ondersoek wat uitgevoer is gedurende hierdie studie, het aangetoon dat die breekbuigsterkte van

Hail Resistance of Materials

A compressed air gun for firing artificial hail stones was designed for use in testing the hail resistance of roofing and cladding materials in order to overcome the disabilities of the gun which had been used in the past and which was operated by means of blank cartridges. The main feature of the new gun, a prototype of which was built in the C.S.I.R. Workshops, is that better control over velocity of the artificial hailstones is possible when they are fired at the material under test.

Structural Implications of the Shrinkage of Concrete

The investigations carried out in the course of this study have indicated that ultimate flexural strength of reinforced concrete beams is not significantly different if concrete of a type which shrinks excessively is used instead of sound concrete, provided the two concretes have similar quality. It was found also that the ultimate shear strength of such beams was not affected by excessive shrinkage of the concrete although the initial cracking load might be affected.

Grouts and Grouting for Prestressed Concrete Construction

Research was carried out into the effects of water/cement ratio, the use of different cements and the use of various additions such as air-entraining agents, intrusion aids, fly-ash, lime and blastfurnace slag on the fluidity, bleeding, setting, shrinkage and strength of grout mixes for use in grouting cable ducts in prestressed concrete construction. In addition, the effects of hand mixing and machine mixing were compared and pumping tests were carried out to determine the pressures required to pump grouts of different mixes and fluidities through ducts of various diameters.

Shear Failure in Reinforced Concrete Beams

A considerable amount of experimental work was done to determine the effects of various factors on the strength of reinforced concrete beams subjected to shear forces. Statistical analysis of the results showed that there is a highly significant correlation between the load at which the main diagonal cracks form and the percentage of longitudinal reinforcement, the tensile strength of concrete as determined by the ("Brazilian") method and the a/d relationship. The ultimate failure of reinforced concrete beams under shear loads has

gewapende betonbalke nie noemenswaardig anders is as 'n soort beton wat uitermate krimp gebruik word nie in plaas van goeie beton, mits die twee betonsoorte dieselfde kwaliteit het. Daar is ook gevind dat die breekskuifsterkte van sulke balke nie beïnvloed is deur die uitermatige krimp van die beton nie, alhoewel die aanvangskraakbelasting wel beïnvloed mag word.

Sementbry en Bryvulling vir Voorgespanne-betonkonstruksie

Navorsing is gedoen in verband met die invloed van water/sementverhouding, die gebruik van verskillende sementsoorte en die gebruik van verskeie byvoegings, soos lugblaasvormers, indringingshulpmiddels, vliegask, kalk en hoogoonsslakke op die vloeibaarheid, bloei, verharding, krimp en sterkte van voegbryngemengsels vir gebruik in die bryvulling van kabelbuis in konstruksies van voorgespanne beton. Daarbenewens is die uitwerking van hand- en masjienmenging vergelyk en pomptoetse is uitgevoer om die druk vas te stel wat nodig is om die sementbry van verskillende mengsels en vloeibaarheid deur buise met verskillende deursnee te pomp.

Skuifswigting in Gewapende Betonbalke

'n Aansienlike hoeveelheid eksperimentele werk is gedoen om die uitwerking van verskillende faktore vas te stel op die sterkte van gewapende betonbalke, wat aan skuifkragte onderwerp is. Statistiese ontleding van die resultate het aangetoon dat daar betekenisvolle korrelasie bestaan tussen die belasting waarby die vernaamste diagonale kraak vorm en die persentasie langsbewapening, die treksterkte van beton soos bepaal deur middel van die Brasiliaanse metode en die a/d-verhouding. Die uiteindelijke breukswigting van gewapende betonbalke onder skuifbelasting, is toegeskryf aan die herverdeling van interne spannings na die vorming van die vernaamste diagonale kraak, en 'n teoretiese benadering gebaseer op hierdie hipotese, is ontwikkel om skuifswigting te verduidelik. Tot dusver is goeie korrelasie verkry tussen die voorgestelde teorie en proefondervindelijke resultate.

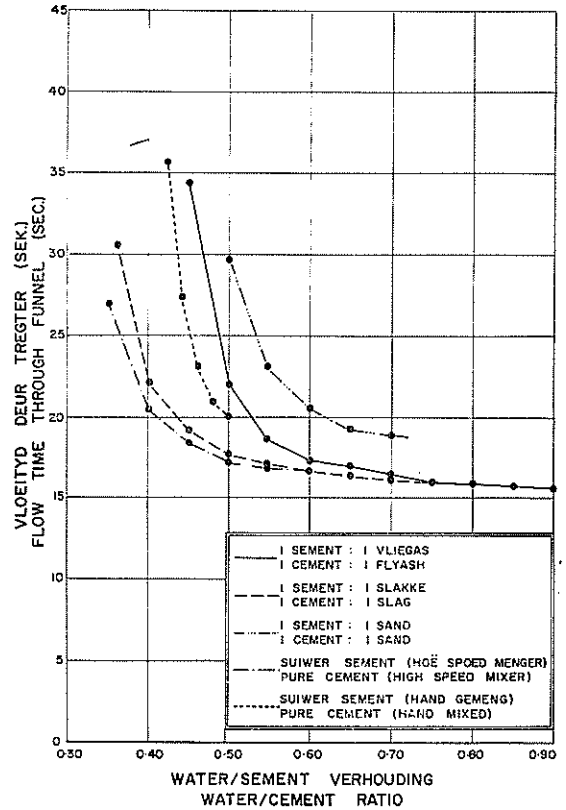
Strukturele Implikasies van die Korrosie van Staalbewapening in Beton

Toetse wat uitgevoer is op monsters ontvete swart gewapende staal wat in beton vasgesit is, het aangetoon dat die staal 'n groter hegsterkte het in monsters, wat sewe maande aan 'n korrosieproduserende omgewing blootgestel is, as die staal in die kontrolemonsters. Die verskil in hegspanning by die aanvangsglippering het baie groter geblyk te wees as die verskil in die uiteindelijke

been attributed to the redistribution of internal stresses after the formation of the main diagonal crack and a theoretical treatment based on this hypothesis was developed to explain shear failure. So far, good correlation has been found between the proposed theory and experimental results.

Structural Implications of the Corrosion of Steel Reinforcement in Concrete

Tests carried out with specimens consisting of degreased black reinforcing steel embedded in concrete showed that the steel in specimens which had been exposed to a corrosion-producing environment for

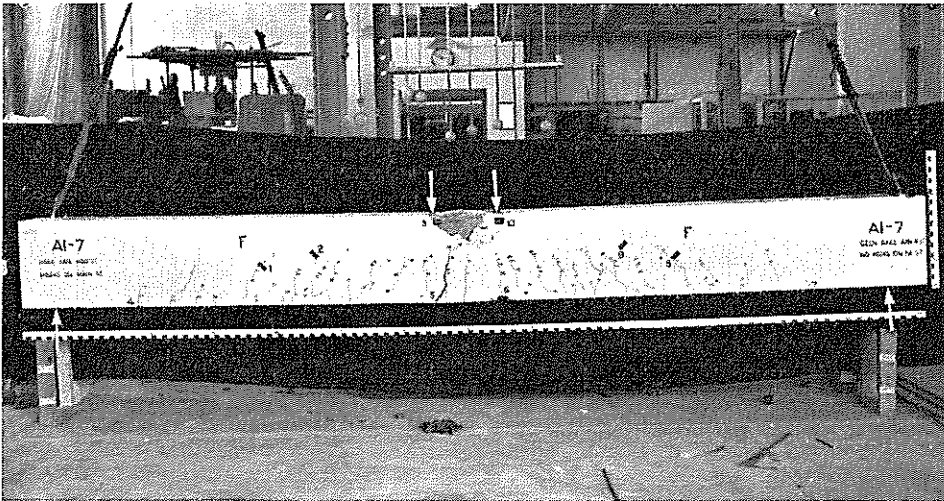


Kurwes wat die verskillende verbande tussen water/sement verhouding en vloeibaarheid aantoon, verkry van verskillende bryvulsels vir voorgespanne betonkonstruksie. Vloeibaarheid is vasgestel in terme van vloeityd in 'n tregtertoets

Curves indicating the different relationships between water/cement ratio and fluidity, obtained for different grouts for prestressed concrete construction. Fluidity was determined in terms of flow time in a funnel test

hegspanning, wat aantoon dat die graad van korrosie wat op die staal plaasgevind het, 'n groter verhoging in die eerste „adhesiehegting” veroorsaak het as in die uiteindelijke „meganiese wrywingsverband”. Aansienlike verskille in hegspanning is ook gevind in die staal

seven months gave a higher bond strength than the steel in the control specimens. The difference in bond stress at initial slip was found to be very much greater than the difference in ultimate bond stress, which suggests that the degree of corrosion which had taken



Gewapende betonstaaf na belastingstoets, toon aan ontwikkeling van kraakpatroon

Reinforced concrete beam after loading test illustrating development of crack pattern

bo-in en dié onderin die monsters wat aan die korrosie-produiserende omgewing blootgestel was. Die spanning in die boonste dele was baie minder as in die onderste dele. Dit staan vermoedelik in verband met die groter watertoename onder stawe wat hoër in die monster geleë is en is dus waarskynlik 'n funksie van die bloei van die beton.

place on the steel caused a greater increase in initial “adhesion” bond than in ultimate “mechanical friction” bond. Considerable differences were also found in bond stress for the steel cast in the top and for the steel cast in the bottom of the specimens which were exposed to the corrosion-producing environment, the stress for the top sections being very much less than for the bottom sections. This is considered to be related to greater water gain under bars higher in the section and is therefore probably a function of bleeding of the concrete.

Suid-Afrikaanse Voorgespanne Staal

'n Navorsingsbeurs, gesteun deur die Suid-Afrikaanse Groep vir die Ontwikkeling van Voorgespanne Beton, is teen die begin van Desember 1958 ingestel, om die eienskappe te ondersoek van staal met 'n hoë treksterkte wat in Suid-Afrika gemaak word en hier te lande in voorgespanne beton gebruik word. 'n Oorsig van die bestaande literatuur in verband hiermee is onderneem en 'n begin is gemaak met die vervaardiging van 'n geskikte apparaat.

South African Prestressing Steel

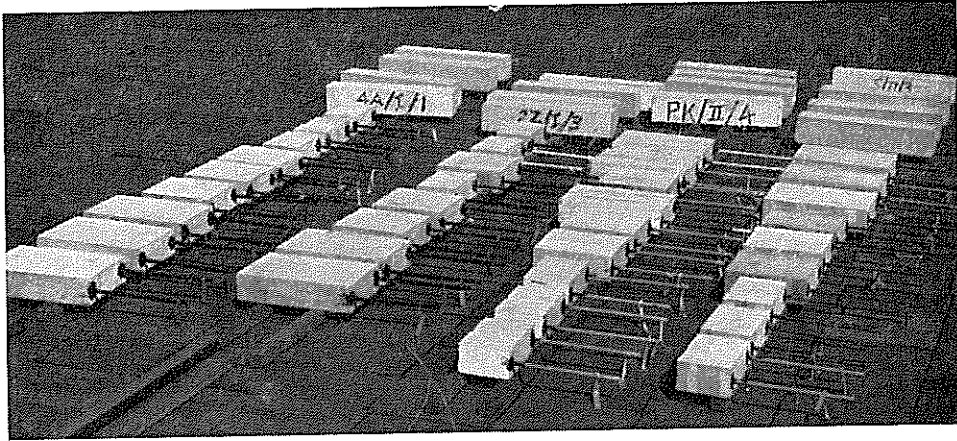
A Research Fellowship sponsored by the South African Prestressed Concrete Development Group to investigate the properties of high tensile steel made in South Africa and used in prestressed concrete under conditions experienced in this country, was inaugurated at the beginning of December, 1958. A review of the relevant literature was undertaken and a start made with the manufacture of suitable apparatus.

Dun Diep Balke

'n Ondersoek is begin met die doel om ontwerpprosedures vir dun diep balke te ontwikkel. Voorlopige foto-elastiese toetse is uitgevoer op plastiese modelle en die moontlikheid om 'n tegniek van elektriese potensiaalanalogie te gebruik, is ondersoek met die doel om die bepaling van hoofspannings te vereenvoudig.

Thin Deep Beams

An investigation with the object of developing design procedures for thin deep beams was commenced. Preliminary photo-elastic tests on plastic models were carried out and the possibilities of using an electrical potential analogy technique was investigated with a view to simplifying the calculation of principal stresses.



Toetsmonsters wat gebruik word vir die ondersoek van die invloed van staalkorrosie op die aanhegtingsterkte van gewapende beton

Test specimens used for investigating the effect of steel corrosion on bond strength in reinforced concrete

Sterkte van Dun Baksteenmure

'n Reeks druksterkte- en slagtoetse is uitgevoer op monsterruimtelike panele, sommige met deuropeninge, om sodoende 'n aanduiding te kry van die sterkte van mure van drie duim dik, waarin die stene op hul sykante opmekaar lê. Die resultate het aangetoon dat die sterkte van hierdie mure, selfs dié wat nie gepleister is nie, meer as genoeg was om die belastings te weerstaan wat moontlik in 'n enkelverdiepinghuiskonstruksie teëtkom kan word.

Strength of Thin Brick Walls

To obtain an indication of the strength of 3 inch thick brick-on-edge walls a series of compressive strength and impact tests was carried out on specimen wall panels, some of which contained door openings. The results indicated that the strength of these walls, even those not plastered, was more than adequate to resist loads likely to be encountered in single-storey house construction.

Gesteunde Ondersoeke

Talryke gesteunde ondersoeke is gedurende die jaar uitgevoer in verband met sake soos die strukturele eienskappe van houtprodukte, wat deur die eienaars self verduursaam is, die strukturele gedrag van verskillende soorte huiskonstruksies bestem vir gebruik in Naturellebehuising, die skade aan dakke veroorsaak deur sterk winde en die haelweerstand van verskillende soorte dak- en bekledingsmateriaale.

Sponsored Investigations

Numerous sponsored investigations were carried out during the year into such matters as the structural properties of proprietary processed timber products, the structural performance of different types of construction intended for use in Native housing, the damage to roofs caused by high winds and the hail resistance of different types of roofing and cladding materials.

Nie-vernietigende Metodes om Beton te Toets

Verdere ondersoek wat gedurende die jaar uitgevoer is, het aangetoon dat die verband tussen ultrasoniese impulsnelheid en die druksterkte van beton nie onafhanklik is van ouderdom en water-sementverhouding van die beton nie, alhoewel die verband, vir praktiese doeleindes, wel as onafhanklik daarvan beskou kan word vir sterktes tot 4,000 pd./vk. dm. Daar is ook gevind dat vir beton met 'n gegewe aggremaat-sementverhouding, lae impulstempo op 'n vroeë ouderdom waarskynlik geringe sterkte op later ouderdomme beteken.

'n Aanvang is gemaak met 'n studie in verband met die invloed van holtes op die verband tussen impulsnelheid en die druksterkte van beton. Alhoewel daar bewys is dat sowel impulsnelheid as sterkte beïnvloed word deur die graad van digtheid van die beton, is die huidige werk 'n poging om die kwantitatiewe verwantskap vas te stel.

Verskeie studies in verband met die uitwerking van voggehalte, het duidelik aangetoon dat beton, wanneer dit getoets word terwyl dit nat is minder sterk is as wanneer dit getoets word terwyl dit droog is; in verband met impulsnelheid egter, is die omgekeerde waar. Eksperimente is begin om die uitwerking van die voggehalte van beton op die snelheid-sterkteverwantskap te ondersoek.

Kurwes wat die verband aantoon wat gevind is tussen ultrasoniese polsspoed en die drukvastheid van beton wat 'n aggremaat|sement verhouding van 8 tot 1 het

Curves showing relationship found between ultrasonic pulse velocity and the compressive strength of concrete having an aggregate|cement ratio of 8 to 1

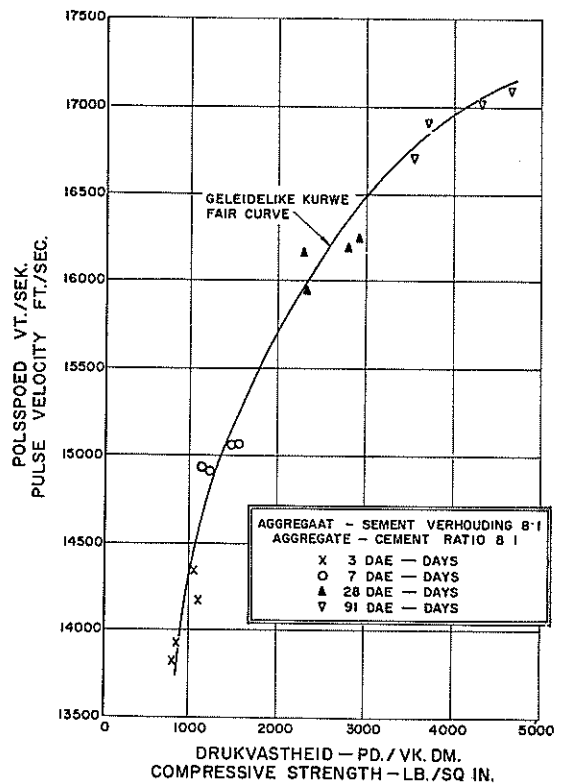
Toetse vir Sementkwaliteit

Verdere ondersoek wat uitgevoer is in verband met tegnieke vir die toets van sementkwaliteit, het aan die lig gebring dat daar aansienlike verskille is in die resultate wat verkry is by die mortelkubuskompressietoets en die resultate van 'n indirekte trektoets op silinders met 'n deursnee van 2 dm., al na rubber-, staal- of hardbordpakkingsmateriaal tussen die monsters en die

Non-destructive Methods of Testing Concrete

Further investigations carried out during the year showed that the relationship between ultrasonic pulse velocity and the compressive strength of concrete is not independent of age and water-cement ratio for the concrete, although for strengths up to 4,000 lb./sq. in. the relationship may, for practical purposes, be so regarded. It was also found that for concrete of a given aggregate-cement ratio, low pulse velocity at an early age is predicative of low strength at later ages.

A study of the effects of voids on the relationship between pulse velocity and the compressive strength of concrete was commenced. Although it has been shown that both pulse velocity and strength are affected by the degree of compaction of the concrete, the present work is an attempt to determine quantitative relationships.



Various studies of the effects of moisture content have clearly indicated that concrete when tested wet has lower strength than when tested dry, but in regard to pulse velocity the reverse is true. Experiments were commenced to study the effects of moisture content of concrete on the velocity-strength relationships.

drukplate van die toetsmasjien geplaas is. In die geval van die druksterktetoets het staalpakkingmateriaal die hoogste sterkte en rubber die laagste opgelewer, terwyl die teenoorgestelde geblyk het by die indirekte of Brasiliaanse trektoets.

Krimpemde Aggregate

Navorsing in verband met die kenmerke van beton wat gemaak is met krimpemde aggregate, is begin deur die bewerkbaarheid, krimpning, sterkte, kruipning, elastisiteit en soniese en ultrasoniese eienskappe daarvan vas te stel. Parallele toetse word vir vergelykingsdoeleindes uitgevoer op beton wat gemaak is met gawe aggregate.

Tests for Cement Quality

Further investigations carried out in connection with techniques for testing cement quality showed that there are considerable differences in the results obtained by the mortar cube compression test and the results of an indirect tensile test on 2 in. diameter cylinders, depending on whether rubber, steel or hardboard packing is placed between the test specimens and the platens of the testing machine. In the case of the compression test, steel packing gave the highest strength value and rubber the lowest, whilst in the indirect or Brazilian tensile test the opposite was found to be true.

Shrinking Aggregates

Research into the properties of concrete made with shrinking aggregates was started to determine work-

Tabel 1 / Table 1

Gevaarplek waar brand in geboue ontstaan het en regstreekse geldelike verliese gely is (1957)
Hazard in which building fires started and direct monetary loss sustained (1957)

| Gevaarplek waar brand ontstaan het | Getal brande Number of fires | | Verlies Loss | | Hazard in which fire started |
|--|---------------------------------|-------|-----------------|-------|---|
| | Getal Number | % | £ | % | |
| Landbouperseel | 18 | 1.1 | 10,350 | 1.2 | Agricultural premises |
| Leer-, vloot-, lugmag- of polisie-inrigting ... | 5 | 0.3 | 900 | 0.1 | Army, navy, airforce and police establishments |
| Klub, hotel, restourant, kafee | 105 | 6.7 | 22,250 | 2.5 | Clubs, hotels, restaurants, cafes |
| Kommersiëleperseel | 134 | 8.6 | 275,100 | 31.0 | Commercial premises |
| Gas-, water-, elektrisiteits- of rioolonderneming | 17 | 1.1 | 550 | 0.1 | Gas, water, electricity and sewage undertakings |
| Nywerheidsperseel (met inbegrip van werk-winkels) | 263 | 16.8 | 336,000 | 37.8 | Industrial premises (including workshops) |
| Inrigting vir die versorging van siekes of swakkes | 14 | 0.9 | 5,100 | 0.6 | Institutions for care of the sick and infirm |
| Mynperseel | 10 | 0.6 | 23,200 | 2.6 | Mining premises |
| Woonperseel vir Nie-blankes | 186 | 11.9 | 24,000 | 2.7 | Non-European residential premises |
| Kantoor | 31 | 2.0 | 6,450 | 0.7 | Offices |
| Plek vir openbare vermaak | 13 | 0.8 | 2,200 | 0.2 | Places of public entertainment |
| Skool of kerk | 20 | 1.3 | 30,300 | 3.4 | Places of education and worship |
| Private woonhuis of woonstel (vir Blankes) .. | 665 | 42.5 | 114,100 | 12.8 | Private residential houses and flats (European) |
| Pakhuis | 41 | 2.6 | 12,400 | 1.4 | Storage premises |
| Vervoer- of kommunikasiegebou | 40 | 2.6 | 25,250 | 2.8 | Transport and communication buildings |
| Ander gebou | 4 | 0.2 | 200 | 0.1 | Other buildings |
| Totaal | 1,566 | 100.0 | 888,350 | 100.0 | Total |

Voorbeeld van statistiese ontleding van gegewens oor brande wat deur alle brandwerers in die Unie in 1957 aangegee is.

(L.W.: Wat regstreekse geldelike verliese betref, sluit die syfer £888,350 nie die verliese in Kaapstad en Durban in nie, aangesien die verliese weens individuele brandskade vir hierdie twee stede nie verkry is nie. Die totale verlies deur die 30 munisipale brandwerers in 1957 aangegee, het £1,249,933 beloop.)

Example of the statistical analysis of information on fires reported by all fire brigades in the Union during 1957.

(Note: In regard to direct monetary loss, the total figure of £888,350 does not include the losses in Cape Town and Durban, as the losses in individual fires were not obtained for these two cities. The total loss reported by the 30 municipal fire brigades in 1957 was £1,249,933.)

Slakkesementbeton

'n Deeglike ondersoek is gedurende die jaar begin om die uitwerking op die kwaliteit van beton gemaak van korrelrige hoogoonslakke en Portlandsement, te vergelyk wanneer hierdie twee materiale, in die vereiste verhoudings, saam fyngemaak word voordat hulle gebruik word en wanneer hulle apart bygevoeg word in die betonmenger. Monsters hoogoonslakke verkry van drie verskillende bronne in die Unie word by hierdie ondersoek gebruik.

Gesteunde Ondersoeke

Die volgende ondersteunde ondersoeke is voltooi: die gebruik van korrelrige hoogoonslakke as 'n fyn aggremaat in beton, die bepaling van die dinamiese Youngmodulus van beton in kolomme, die kwaliteit van beton in 'n bestaande dam, die gebruik van vliegias in beton en die betonmakende eienskappe van verskillende aggremente.

Brandnavorsing

Die ontleding van die brandstatistieke vir 1957 voortvloeiend uit die stelsel van Brandverslae op 'n nasionale basis soos ingestel deur hierdie Instituut, is voltooi en 'n verslag in verband met hierdie werk is voorgelê vir publisering in die Nasionale Bounavorsingsinstituut Bulletin. Gedurende 1958 is die stelsel van brandverslae uitgebrei om die vrywillige brandweerstasies in te sluit en 'n begin is gemaak met die ontleding van die verslae wat gedurende hierdie jaar ontvang is.

Riolering en Sanitasie

In samewerking met die Nasionale Instituut vir Waternavorsing is 'n voorlopige ondersoek voltooi in verband met die probleme van die verwydering van afvalwaters in klein gemeenskappies in Suid-Afrika en uit hierdie inligting is voorstelle opgestel vir 'n program vir navorsing. Hulle is oorweeg op 'n vergadering van verteenwoordigers van staatsdepartemente, munisipaliteite, provinsiale administrasies en ander belanghebbende organisasies in die Unie sowel as die Rhodesië. Algemene ondersteuning vir die onderneming van die navorsing is op die vergadering uitgespreek en 'n subkomitee is aangestel om die moontlikhede vir die verkryging van finansiële steun vir die werk te ondersoek. Die reaksie op die subkomitee se aktiwiteite was tot dusver baie bemoedigend.

ability, shrinkage, strength, creep, elasticity and sonic and ultrasonic characteristics. Parallel tests are being carried out on concrete made with sound aggregates, for comparison purposes.

Slag-cement Concrete

A comprehensive investigation was initiated during the year to compare the effects on the quality of concrete made with granulated blastfurnace slag and Portland cement when these two materials, in the required proportions, are interground before they are used and when they are added separately at the concrete mixer. Specimens of blastfurnace slag from three different sources in the Union are being used in these studies.

Sponsored Investigations

The following sponsored investigations were completed: the use of granulated blastfurnace slag as a fine aggregate in concrete, the determination of dynamic Young's modulus of concrete in columns, the quality of concrete in an existing dam, the use of fly-ash in concrete and the concrete-making properties of different aggregates.

Fire Research

The analysis of the fire statistics for 1957, emanating from the system of fire reporting on a national scale introduced by this Institute, was completed and a report on this work submitted for publication in the N.B.R.I. Bulletin. During 1958 the system of fire reporting was extended to include voluntary fire brigades and a start was made on the analysis of the reports received for this year.

Sewerage and Sanitation

In collaboration with the National Institute for Water Research, a preliminary investigation on the problems of the disposal of waste waters in small communities in South Africa was completed and from this information suggestions for a programme of research were drawn up. These were considered at a meeting of representatives of government departments, municipalities, provincial administrations and other interested organizations both in the Union and the Rhodesias. General support for undertaking the research was expressed at this meeting and a subcommittee was appointed to explore the possibilities of obtaining financial support for the work. The activities of the Sub-Committee have so far met with very encouraging response.

Verwe

Verdere waarnemings in verband met die gedrag van die verbeterde dakverwe wat in die Instituut ontwikkel is, het in die praktyk die bewys gelewer dat hulle beter is as alle kommersiële dakverwe wat ondersoek is.

Hierdie nuwe verwe word in toenemende mate en met uitstekende resultate gebruik. Baie navrae in verband met hierdie verwe is van ander dele van Afrika en van oorsee ontvang.

Blootstellingstoetse op die witkalk wat in die Instituut ontwikkel is, het verder hulle doeltreffendheid en belang vir goedkoop verf en waterdigting van mure getoon.

Natuurlike Bouklip

'n Opname van natuurlike bouklipsoorte in die land en 'n aantal navrae wat gedurende die jaar ontvang is, het aangetoon dat die verwerking van natuurlike bouklip 'n baie belangrike probleem is.

Werk is gedoen in verband met die gedrag in aggressiewe omgewings, van sandsteen wat behandel is met verskeie steenpreserveringsmiddels. Die toetse het aan die lig gebring dat baie van die kommersiële preserveringsmiddels nie bevredigende beskerming verleen nie en dat verdere ondersoek nodig is voordat enige betroubare aanbevelings gedoen kan word met betrekking tot beskermende behandelings.

Gebakte Kleiprodukte

Oorsese navorsing en ondervinding het aangetoon dat die korrelgrootteverdeling van klei baie belangrik is vir die bevredigende vervaardiging van stene en erdewerk, en in besonder dat geskikte korrelgrootteverdeling noodsaaklik is vir die maak van goeie gehalte holstene en seksies met dun wande. Hierdie bevinding en die toenemende belangstelling wat deur die steenvervaardigingsindustrie aan die dag gelê is vir die nuwe soorte bou-eenhede van klei, soos groter maar ligter stene en hol kleiblokke, het gelei tot die ondersoek gedurende die jaar van 'n groot aantal kleisoorte van baie dele van die land afkomstig.

Verdere werk is ook gedoen om die mineralogiese samestellings van kleisoorte te korreleer met hulle geskiktheid vir die vervaardiging van stene. Dimensionele veranderings in gebakte kleiprodukte is ondersoek.

Bestandheid van Geboue teen Reëndeurdringing

Die kunsmatige reëndeurdringingstoetsapparaat is met sukses gebruik op verskeie soorte muurmateriale en muurkonstruksies, veral dié wat gebruik word in goedkoop behuising. Nuwe soorte vensterseksies is getoets

Paints

Continued observations on the performance in practice of the improved roof paints developed in the Institute appear to have demonstrated their superiority to all commercial roof paints examined. These new paints are being used to an increasing extent with excellent results. Many enquiries about these paints have been received from other parts of Africa and from overseas.

Exposure tests on the white-washes developed in the Institute further showed their effectiveness and importance for low-cost painting and water-proofing of walls.

Natural Building Stones

A survey of natural building stones throughout the country and the number of enquiries received during the year indicated that the weathering of natural building stones is a problem of major importance.

Work was done on the behaviour, in aggressive environments, of sandstones treated with various stone preservatives. The tests indicated that many of the commercial preservatives afford no satisfactory protection and that further investigation is required before any reliable recommendations can be made regarding protective treatments.

Burnt Clay Products

Overseas research and experience have shown that the particle size distribution of clays is very important for the satisfactory manufacture of bricks and clayware, and in particular that correct particle size distribution is essential for the making of good quality hollow bricks and thin-walled sections. This finding, and the growing interest shown by the brick-making industry in the new types of clay building units such as larger but lighter bricks and hollow clay blocks, led to the investigation of a large number of clays from many parts of the country during the year.

Further work was done to correlate the mineralogical composition of clays with their brick-making qualities. Dimensional changes in fired clay products were investigated.

Rain Resistance of Buildings

The artificial rain penetration test apparatus was used with success on various types of walling materials and wall constructions, especially those for use in low-cost housing. New types of window sections were tested

en dit was moontlik om wysigings voor te stel om die waterdigtheid te verbeter. Met behulp van hierdie apparaat is daar ook getoon dat hol goedkoop dubbel-verdiepinghuise met buitemure waarin die stene op hul sykant lê, aanneemlike bestandheid teen reëndeurdringing kan hê as die detaillering op vloerhoogte reg is.

'n Draagbare apparaat word gebou vir die vinnige vasstelling van die voggehalte van mure deur die absorpsie van radiofrekwensie-energie te meet.

Betonaggregate met Abnormale Dimensionale Veranderingseienskappe

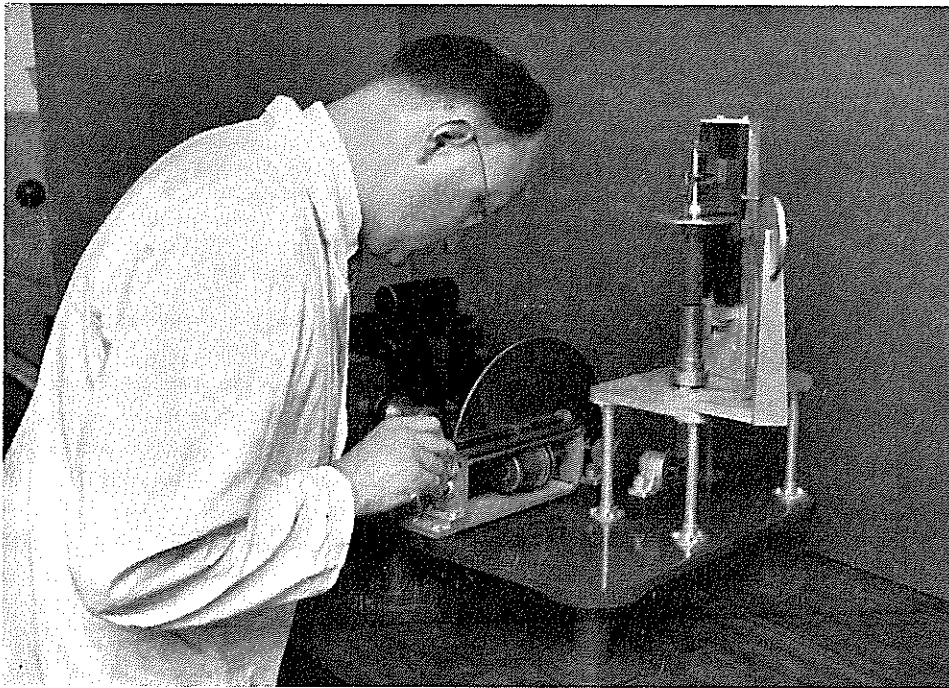
Ernstige mislukkings het in die verlede plaasgevind toe materiale van hierdie aard in sementprodukte gebruik is. Die werk op krimpende en uitsettende aggregate, wat 'n aantal jare gelede by die Instituut

and it was possible to suggest modifications to improve watertightness. With the aid of this apparatus it was shown that low-cost double-storey housing with external brick-on-edge cavity-walls can have acceptable rain resistance properties if the detailing at floor level is correct.

A portable apparatus is being constructed for the rapid determination of the moisture content of walling by measuring the absorption of radio frequency energy.

Concrete Aggregates having Abnormal Dimensional Change Characteristics

Serious failures have occurred in the past when materials of this nature have been used in cement-bonded products. The work on shrinking and expanding aggregates, started some years ago at the Institute and



Draaiende viskosimeter wat gebruik word om die vloeieigseienskappe van kalke en semente te bepaal

Rotational viscometer used for determining rheological properties of limes and cements

begin is en later gesteun is deur die Portlandsement Instituut, is voltooi en die finale verslag word opgestel. As die fundamentele en praktiese kennis wat in die loop van die ondersoek vergaar is, rasioneel in die praktyk

later sponsored by the Portland Cement Institute, was completed and the final report is being prepared. If the fundamental and practical knowledge gained during the course of this investigation is rationally applied

toegepas word, kan sulke mislukkings verhoed word. 'n Eenvoudige goedkoop veldtoets is ontwikkel om sulke aggregate uit te ken; die resultate maak dit moontlik om te besluit of 'n gegewe aggregaat geskik is vir 'n sekere aanwending, of dit nodig is om alternatiewe materiale te gebruik.

Boukalk

Die suksesvolle en ekonomiese gebruik van kalk en sement in die boubedryf hang grotendeels van hul bewerkbaarheid en vloeieienskappe af. Hierdie reologiese eienskappe van bry en mortel is bestudeer met behulp van fundamentele metodes en daar is gevind dat deur gebruik te maak van die tegnieke van draaiende viskometrie, die besonderhede van die reologiese eienskappe van kalkbry gou vasgestel kan word. Studies in verband met die gaafheid van mortel en pleister met spesiale verwysing na die verhouding van binder en sand, het getoon watter belangrike rol die sand se korrelgrootteverdeling en die sandinhoud op gaafheid het.

Korrosie van Wapeningstaal in Beton

'n Aansienlike hoeveelheid werk is gedoen in verband met hierdie probleem en nuttige inligting is verkry met betrekking tot die doeltreffendheid van byvoegings tot die beton om die korrosie van wapeningstaal te verminder en die gebruik van oppervlakbedekkings op die blootgestelde oppervlakte van beton om die indringing van sout en vog te verhoed.

Dit het geblyk dat die byvoeging van klein hoeveelhede van sekere chemikalieë by die beton 'n merkbare vermindering in die korrosietempo van die omslote staal tot gevolg het, maar daar word gereken dat die toetse nie vir 'n lang genoeg periode aangehou het nie, om op hierdie tydstip aanbevelings te doen in verband met die gebruik van die chemikalieë in die praktyk. Daar is gevind dat baie soorte oppervlakbedekkings vir beton doeltreffende beskerming verleen, maar natuurlik sal die duursaamheid van enige bedekkingsmateriaal bepaal hoe lank dit doeltreffend sal bly. Hoewel bekend is dat sommige van die bedekkings wat getoets is, redelik gou versleg met verloop van tyd, sodat herbedekking dikwels nodig sal wees om altyd 'n membraan oor die oppervlak van die beton te behou, toon die resultate wat met sekere spesiaal geformuleerde bedekkings verkry is aan dat hulle baie goeie duursaamheids-eienskappe sal hê.

Sement en Sementprodukte

Navorsingswerk met die doel om 'n beter begrip van die samestellings wat gevorm word in gehidreerde sementsoorte is voortgesit en die kennis wat opgedoen is, is baie nuttig om die gedrag van beton en ander

in practice, such failures can be avoided. A simple low-cost field test was developed for identifying such aggregates; the results make it possible to decide whether a given aggregate is suitable for a particular application or whether it is necessary to use alternative materials.

Building Lime

The workability and flow properties of lime and cement pastes have a bearing on their successful and economic use in building. These rheological properties of pastes and mortars were studied by fundamental methods and it was found that by using rotational viscometry techniques, the rheological properties of lime pastes can be rapidly characterised. Studies on the soundness of mortars and plasters, with particular reference to the ratio of binder and sand, have shown the importance of sand grading and content on soundness.

Corrosion of Reinforcing Steel in Concrete

A considerable amount of work was done on this important problem and useful information was obtained in regard to the effectiveness of additives to the concrete for reducing corrosion of the reinforcing steel and the use of surface coatings on the exposed surfaces of concrete to prevent the entry of salt and moisture.

The addition of small amounts of certain chemicals to the concrete was found to effect a marked reduction in the rate of corrosion of the embedded steel, but it is considered that the tests have not continued for a sufficiently long period to permit, at this stage, recommendation of the use of the chemicals in practice. Many types of surface coatings for concrete were also found to provide effective protection, but obviously the durability of any coating material will determine how long it will remain effective. While some of the coatings tested are known to deteriorate fairly rapidly with time, so that frequent recoating would be necessary to maintain a continuous membrane over the surface of the concrete, the results obtained with certain specially formulated coatings indicate promise that they will have very good durability qualities.

Cement and Cement Products

Research work aimed at a better understanding of the compounds formed in hydrated cements was continued and the knowledge gained proved very useful for predicting the behaviour of concrete and other cement

sementprodukte waarby chemikalieë gevoeg is vooraf te bepaal. Daardeur was dit moontlik om aan te toon dat oplosbare soos chloriede, nitrate en nitriete wanneer hulle by beton gevoeg word, met die sementminerale verbind tot samestellings met lae oplosbaarheid wat nie maklik deur uitloog verwyder kan word nie.

Die duursaamheid en weerstand teen chemiese aantasting van verskillende sementsoorte in verskillende aggressiewe omgewings, en metodes om swakheid van die sement in hierdie opsig te oorkom, het 'n groot deel van die werk in verband met sementnavorsing uitgemaak. Hierdie werk het tot gevolg gehad dat betroubare aanbevelings gemaak kon word met betrekking tot die keuse en gebruik van sementsoorte in 'n aantal gevalle waar verslegting van sementprodukte reeds geblyk het ernstig te wees, of dit waarskynlik kon word.

Gesteunde Ondersoeke

Daar was 'n toenemende aanvraag na kontrakwerk en verskeie ondersoeke is onderneem, hoofsaaklik in die volgende rigtings: gedrag van oppervlakbedekkings op hout en ander materiale, die skoonmaak van klipwerk en die kwaliteit van bouklip, toets van mosaïke, geskiktheid van klip en soortgelyke materiaal vir die voorwerk van geboue, verslegting van pleister, kwaliteit van sementprodukte en die geskiktheid van kleisoorte om stene te maak en vir keramiek.

AFDELING BOU-EKONOMIE

Werk ten opsigte van kosteprobleme in verband met bou en behuising is uitgevoer onder die leiding van die afdeling Bedryfsekonomie van die Wetenskaplike en Nywerheidsnavorsingsraad.

Boukoste

Studies onder hierdie hoof het te doen met die ontwikkeling van 'n geskikte sistematiese raamwerk vir die beplanning en koste van boubedrywigheede. Dit sal tot gevolg hê dat die verhouding tussen die arbeidskoste, materiale en uitrusting, en die vooruitgang van die werk in verhouding tot die persone en die uitrusting op die terrein, maklik vasgestel kan word. Hierdie werk is voltooi en 'n verslag is geskryf.

Verskeie soortgelyke probleme is ondersoek, hetsy vir die Instituut se ander navorsingsafdelings, of met die doel om te help in die ontwikkeling van bogenoemde raamwerk. Hierdie studies het veral ingesluit: die bepaling van die koste van 'n prototipe goedkoop

products to which chemicals had been added. Thus it was possible to show that when soluble salts such as chlorides, nitrates and nitrites are added to concrete they combine with the cement minerals to form compounds of low solubility which are not easily removed by leaching.

The durability and resistance to chemical attack of different cements in various aggressive environments, and methods of overcoming this disability, constituted a major portion of the work on cement research. This work permitted reliable recommendations to be made with regard to the selection and use of cements in a number of cases where deterioration of cement products had already proved serious, or was likely to do so.

Sponsored Investigations

There was an increased demand for contract work and various investigations were undertaken, principally in the following fields: performance of surface coatings on wood and other materials, the cleaning of stonework and the quality of building stones, testing of mosaics, suitability of stone and similar facings for buildings, plaster failures, qualities of cement products and the suitability of clays for brick-making and ceramic ware.

BUILDING ECONOMICS SECTION

Work on problems of costs in relation to building and housing is carried out under the guidance of the Industrial Economics Division of the C.S.I.R.

Building Costs

Studies under this heading were concerned with the development of a suitable systematic framework for the planning and costing of building operations. This would enable the inter-relationship between the costs of labour, materials and equipment, and the progress of men and equipment on the site, to be easily established. This work was completed and a report written.

Various *ad hoc* problems were investigated, either on behalf of the Institute's other research divisions or with the object of assisting in the development of the framework mentioned above. Specifically, these studies involved: the determination of the costs of a prototype low-cost European house designed by the National

nuis vir blankes, ontwerp deur die Nasionale Bounavorsingsinstituut; 'n studie van die ekonomiese implikasies van die aankoop en werking van hyskrane ('n referaat oor hierdie onderwerp is gelewer by die Jaarlikse Algemene Vergadering van die „Federation of Building Trade Employers”) en die bepaling van die konstruksiekoste van mure van verskillende materiale, dikte en afwerkings.

Economie van Stedelike Bantoeorpe

Werk in verband met die ontwikkeling van 'n skema om die koste en huur vir Bantoeorpe vas te stel, is voortgesit. 'n Referaat wat handel oor die grondbeginsels van die voorgestelde skema is opgestel en 'n verdere referaat wat bedoel is om as 'n gids te dien vir plaaslike owerhede wanneer hulle die skema gebruik, is begin.

Die studies in verband met die ekonomiese aspekte van die voorsiening van dienste in Bantoeorpe het 'n ondersoek ingesluit na die ekonomie van die watermeters op die terrein, 'n studie van die ekonomiese aspekte van behuisingstandhouding en 'n ondersoek na die koste van verskeie alternatiewe skemas vir sanitasie. 'n Voorlopige verslag is geskryf oor die ondersoek na die ekonomie van watermeters op die terrein en kopieë is vir kommentaar aan verskeie belanghebbende partye voorgelê. Die finale verslag wat die ontvange voorstelle insluit, nader voltooiing.

'n Studie in verband met die ekonomie van behuisingaanleg en digtheid met die doel om die beginsels vir die bepaling van ekonomiese optimum aanleg en digtheid in stedelike Bantoeorpe te ontwikkel, is begin.

Hierdie studies is gesteun deur die Nasionale Behuisingkommissie.

DANKBETUIGING

As blyk van waardering van die werk wat die Nasionale Bounavorsingsinstituut doen, het 'n nyweraar £600 ten behoeve van 'n personeelid geskenk om verskeie lande in Europa te deurreis ten einde die nuutste ontwikkelings op die gebied van boumateriaalnavorsing te bestudeer.

Die Provinsiale Argitek van Transvaal het 'n argitek aan die Nasionale Bounavorsingsinstituut vir sewe maande afgestaan om te help met die ontwerp van 'n

Building Research Institute; a study of the economic implications of the purchase and operation of tower cranes (a paper on this subject was presented at the Annual General Meeting of the Federation of Building Trade Employers) and the determination of the construction costs of walls of different materials, thicknesses and finishes.

Economics of Urban Bantu Townships

Work on the development of a system for cost and rent determination for Bantu townships was continued. A paper dealing with the principles of the proposed system was prepared and a further paper, which is intended to serve as a guide to local authorities when applying the system, was commenced.

The studies concerned with the economic aspects of services provision in Bantu townships involved an investigation into the economics of the site metering of water, a study of the economic aspects of housing maintenance and an investigation into the costs of various alternative systems of sanitation. A preliminary report was written on the investigation into the economics of site metering of water and copies submitted to various interested parties for comment. The final report incorporating the suggestions received is in preparation.

A study of the economics of housing layouts and densities, with the object of developing principles for the determination of economically optimum layouts and densities in urban Bantu townships, was commenced.

These studies were sponsored by the National Housing Commission.

ACKNOWLEDGEMENTS

As an expression of his appreciation of the work carried out by the National Building Research Institute, an industrialist donated £600 for a member of staff to tour various countries of Europe to study the latest developments in research on building materials.

The Provincial Architect of the Transvaal seconded an architect to the staff of the National Building Research Institute for a period of seven months to assist

proefgebou vir 'n hoërskool; 'n private argitek het 'n lid van sy personeel vir drie weke afgestaan om hom te help met die ontwerp van 'n Bantohospitaal; en die Nasionale Behuisingskommissie het 'n bourekenaar afgestaan om behulpsaam te wees met die ontleding van planne vir sielsieke-inrigtings.

Die Nasionale Bounavorsingsinstituut betuig hiermee sy dank vir hierdie en baie ander gevalle van samewerking en steun.

in the design of an experimental high school; a private architect seconded a member of his staff for three weeks in order to assist him in planning a Bantu hospital; and the National Housing Commission seconded a quantity surveyor to assist in the analysis of plans for mental institutions.

The National Building Research Institute records its appreciation of these and many other instances of co-operation and support.

PUBLICATIONS / PUBLIKASIES

Periodical Publications

Bulletin (Series DB)—half-yearly articles in relation to the work of the Institute.

Information sheets (Series DIS)—bi-monthly selections of technical enquiries with replies.

Gereelde Publikasies

Bulletin (Reeks DB)—halfjaarlikse artikels i.v.m. die werk van die Instituut.

Inligtingspamflette (Reeks DIS)—tweemaandelikse seleksie van tegniese navrae met antwoorde.

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2. KAPLAN, M. F. and H. T. Dannenfeldt. Fire research in South Africa with particular reference to the fire statistics for the year 1957.
3. SCOTT, T. W. An approach to the design of low cost European housing.
4. VAN AARDT, J. H. P. The resistance of concrete and mortar to chemical attack—progress report on concrete corrosion studies, Part II.
5. VAN DEVENTER, E. N. Some aspects of climatological interpretation with reference to building design.
6. VAN STRAATEN, J. F. Some practical aspects of kitchen ventilation.

Artikels Gepubliseer in N.B.N.I.-Bulletin

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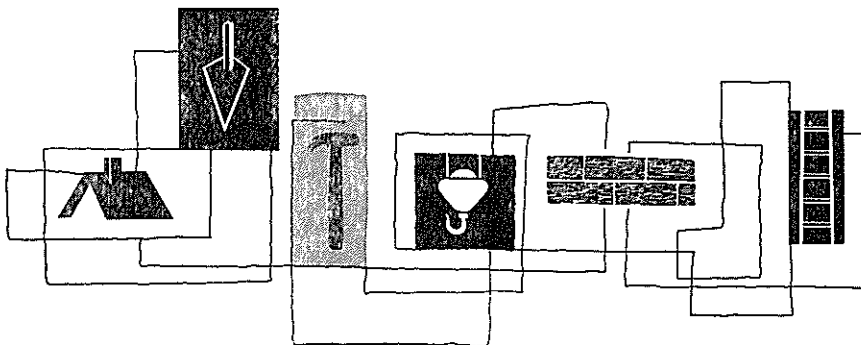
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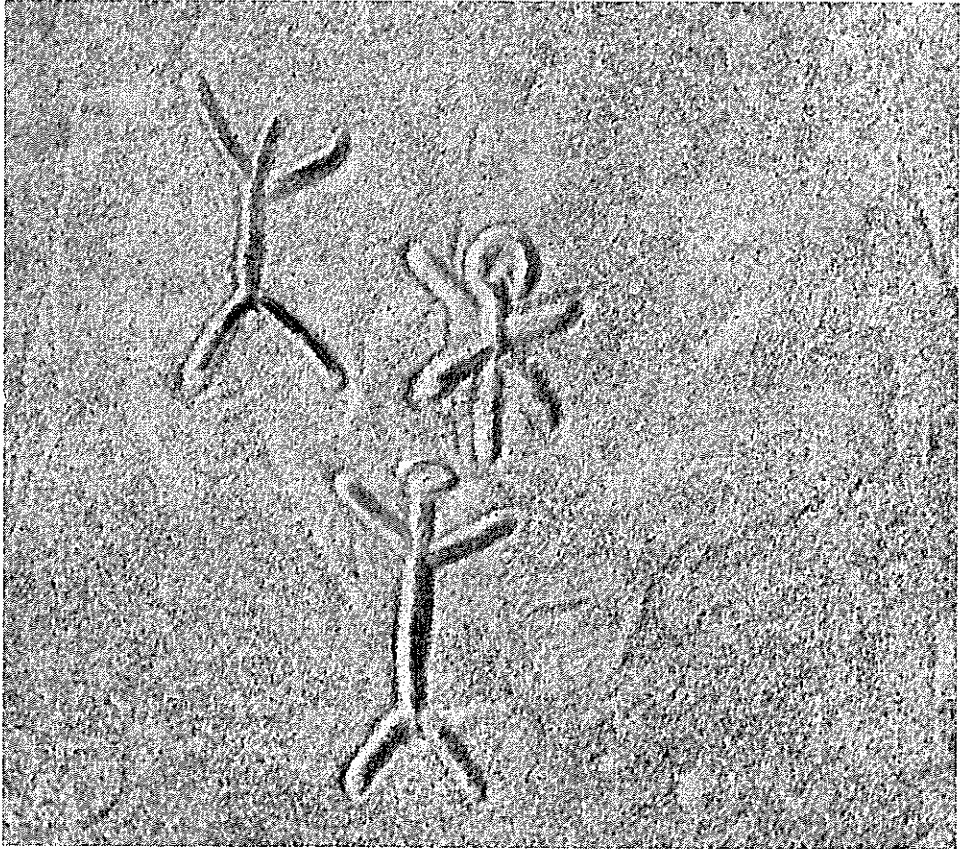


DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1959)

DEEL VI
NASIONALE INSTITUUT
VIR
PERSONEELNAVORSING

PART VI
NATIONAL INSTITUTE
FOR
PERSONNEL RESEARCH

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. Box 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)



*Veldtoets op nomadiese Boesmans—'n Sand-
tekening: „'n Boesman, 'n steenbok en nog 'n
Boesman”*

*Field tests on nomadic Bushmen—a sand draw-
ing: “A Bushman, a Steenbok and another
Bushman”*

NASIONALE INSTITUUT VIR PERSONEELNAVORSING

Direkteur: DR. S. BIESHEUVEL

Tydens die afgelope jaar het die nywerheid weereens in steedstoemende mate van die Instituut se dienste gebruik gemaak, veral met betrekking tot die keuring van senior personeel, opleidingsprobleme en die bepaling van die faktore wat menslike verhoudings in die bedryf beïnvloed. Hoewel 'n groot gedeelte van sulke werk nie spesifiek navorsingswerk is nie, vorm dit dikwels die aanknopingspunt vir basiese navorsingsprojekte.

Die tipe werk wat deur die nywerheid en plaaslike besture aan die Instituut opgedra is, het weer duidelik getoon dat mannekrag van die gevraagde peil van bekwaamheid, opleiding en uitkyk moeilik te bekom is. Gevolglik het die Instituut baie aandag aan studies gewy wat daarop gemik is om hierdie belangrike determinante van beroepsukses te bepaal.

Die mannekragnopname is verder gevoer met 'n ondersoek om vas te stel in hoeverre geestesgawes ener syds toegelaat word *om braak te lê* as gevolg van vroeë skoolverlating, en andersyds aan *oormatige eise* blootgestel word as gevolg van die tekort aan deeglik opgeleide mannekrag, wat daartoe lei dat mense, wat feitlik nie oor die basiese aanleg beskik nie, poog om Universiteits- en ander professionele opleiding te bekom. Resultate sal tydens 1959 beskikbaar wees.

Studies van beroepsmotivering is op die werksman- en professionele vlak uitgevoer. Hiervoor moes metings verkry word van houdings en hul verhouding tot werksvoorwaardes, vooruitsigte en die wyse waarop die individu in die bedryf behandel word. Hierdie studies het die belang van sodanige en meer uitgebreide opnames beklemtoon indien die aspirasies in die werksituasie op verskeie vlakke onder die blanke werkerskorps duidelik omlin moet word, aangesien werksmotivering sterk beïnvloed word deur die beskawingspeil van die gemeenskap waarin die individu opgegroeï het. 'n Groot gedeelte van ons blanke bevolking is nuweling in die nywerheid en het nog nie die gewoontes en verwagtings waardeur hierdie gebied gekenmerk word aangekweek nie. Om hierdie nuweling te help om by die werksituasie aan te pas, kan kennis aangaande hulle houdings en die faktore wat die ontwikkeling daarvan beïnvloed, van groot waarde wees.

Weens die noodsaaklikheid om die karige blanke mannekrag in ons land meer doeltreffend te benut, is beroepsvoorligting veral belangrik. Die Nasionale Instituut vir Personeelnavorsing bied 'n beperkte diens op hierdie terrein in die vorm van voorligting aan matriculante en studente. In die loop van hierdie diens is die Instituut ook besig om tegniese en toetse te ontwikkel

NATIONAL INSTITUTE FOR PERSONNEL RESEARCH

Director: DR. S. BIESHEUVEL

During the past year, industry made increasing use of the Institute in personnel matters, particularly with regard to the selection of higher grade personnel, problems relating to training and factors that influence human relations. Whilst much of this was not specifically of a research nature, the undertaking of such work often opens the door to basic research projects.

The kind of work undertaken at the request of industry and local government once more emphasized that it is hard to come by manpower with the right level of ability, training and outlook. Consequently the Institute devoted much attention to studies that have a bearing on these important determinants of occupational success.

Further work was done on a manpower survey. In particular, the Institute investigated the degree to which ability is being *allowed to lie fallow* as a result of early school leaving, or ability is *over-extended* at the higher levels, in that the demand for highly trained manpower induces people who really lack the basic ability to try to qualify at University and other professional levels. Results will be available during 1959.

Studies of occupational motivation were also carried out at the operative and at the professional level. These involved the measurement of attitudes and their relation to conditions of service, prospects and the way the individual is treated on the job. These studies stressed the importance of more extensive surveys of the occupational and other aspirations in various sections of our white population, as motivations are strongly coloured by the culture of the community in which the individual has grown up. Many sections of our population are new to the industrial scene and they display a lack of habits and expectations appropriate to industrial life. Knowledge concerning their attitudes and the factors that influence their development can be most helpful in adjusting such persons to the work situation.

Because of the need to make the best possible use of our scarce white manpower, vocational guidance is particularly important in South Africa. The N.I.P.R. renders a limited service in this field, providing guidance to matriculants and students. In the course of this work, it is also developing procedures and tests that will be applicable at other levels. A battery of tests was completed on behalf of the Department of Labour for use at the Juvenile Affairs Board. This battery includes tests to measure mental alertness, attitudes, social intelligence, space perception, arithmetic, language, and clerical ability. In the construction of

wat tewens op ander vlakke van toepassing is. In besonder kan gemeld word dat 'n battery toetse namens die Departement van Arbeid voltooi is vir gebruik deur die Jeugraad. Hierdie battery sluit toetse in vir die meting van verstandelike wakkerheid, houdings, intelligensie in die omgang, ruimteverhoudings, rekenkunde, taalvaardigheid, en klerklike bekwaamheid. By die opstel van hierdie toetse is etlike honderd kinders by Arbeidsburo's en Engels- en Afrikaansmedium sekondêre skole getoets. 'n Groot aantal Spoorwegleerjongens het ook meegedoen. Tydens 1959 sal die toetse in roetinegebruik wees.

Een van die simptome van gebrekkige aanpassing by die bedryfsluwe is hoë diensversuim- en personeelwisselingsyfers. Tydens die afgelope jaar is 'n ondersoek by 'n groot nywerheidsonderneming voltooi, waar groepe werkers met hoë en lae afwesigheidssyfers onderskeidelik vergelyk is ten opsigte van 'n breë verskeidenheid van werks- en agtergrondomstandighede. Daar is bevind dat jeugdigheid 'n belangrike oorsaak van afwesigheid is, maar dat nuwe werksgewoontes ontwikkel en afwesigheid afneem namate die nuwe werkers aan die werksroetine gewoond raak, en, deurdat hulle in die huwelik tree, groter verantwoordelikheid aanvaar.

Daar is egter by sommige werkers gebrekkige karakterontwikkeling, wat ongetwyfeld aan omgewingsinvloede te wyte is. Hierdie persone soek altyd die fout by die werksomstandighede, hulle werkgewers en voormanne in plaas van hulself. Gewoonlik ontvang sulke werkers 'n swak syfer by die beoordeling van hul verdienstelikheid—die diensversuim as sodanig is slegs simptome van algemene onbekwaamheid. Die fout is dus eerder in die omgewing waaruit hulle spruit, geleë, as in die bedryf wat hulle in diens neem. Laasgenoemde kan egter die toestand verbeter deur sorgvuldige keuring en opleiding van onmiddellike toesighouers, gekoppel aan die toepassing van streng maar oordeelkundige tugsmaatreëls wat op 'n deeglike erkenning van die beginsels van goeie menslike verhoudings berus.

Nog 'n belangrike aspek van doeltreffende produksie by werkers in die bedryf is hulle reaksie op aansporingslone. 'n Houdingstudie van blanke werkers het aange-ton dat hulle oor die algemeen ten gunste van aansporingslone is, maar 'n individuele bonusstelsel verkies bo 'n groepbonus. Hulle het heelwat kritiek uitgespreek omtrent die wyse waarop produksiestandaarde vasgestel en gehandhaaf is, asook omtrent die aandeel wat die werker ten opsigte van besparings in produktietyd ontvang. Hierdie studie het die mening wat vroeër uitgespreek is, bevestig, naamlik dat aansporingslone 'n nadelige uitwerking op die moraal en welsyn van werkers kan hê, tensy so 'n stelsel deur deskundiges, ná raadpleging met die werkers, ingestel word in omstandighede waar menslike verhoudings andersins op 'n goeie grondslag berus. Tans is 'n veel meer omvattende ondersoek aan die gang om die verdere implikasies van hierdie studie na te vors.

these tests, many hundreds of children were tested at English and Afrikaans Secondary schools, and at Labour Bureaux. A large sample of Railway apprentices also co-operated. The tests will be in routine use in 1959.

One of the symptoms of poor adjustment to industrial life is high rates of absenteeism and labour turnover. During the year a study was completed at a large industrial enterprise, where groups of operatives with good and poor absence rates were compared with reference to a wide variety of work and background circumstances. It was found that youth is an important determinant, but that as the new workers get used to the routines of industrial employment and as they acquire responsibilities through marriage, new work habits develop and regularity of attendance improves.

In a proportion of operatives, however, there is some defective character development, no doubt largely due to environmental circumstances. These people find fault with the work environment as well as with their employers and supervisors, rather than with themselves. Generally they also obtain poor merit ratings—absenteeism per se being but one symptom of general ineffectiveness. The fault thus lies in the community from which they are drawn rather than in the enterprise employing them. The latter can, however, improve the situation by careful selection and training of first line supervisors, together with the application of strict but discriminating discipline based on sound appreciation of the factors that determine good human relations.

Another important aspect of productive efficiency is the reaction of industrial workers to incentives. In a study of the attitudes of a group of white operatives working under a group incentive scheme, it was found that wage incentives as such were generally approved, but that an individual bonus was preferred to a group bonus. Considerable criticism was, however, expressed against the manner in which production standards were set and maintained and concerning the share which the worker obtained of the saving that was effected in production time. The study confirmed the view previously expressed that incentive schemes may have adverse side-effects on the morale and well-being of workers, unless they are established by experts in consultation with the workers, and are operated in a context where human relations are otherwise sound. A much more comprehensive investigation is now in progress in which the implications of this study will be further pursued.

Keuringstoetse vir Bantoe personeel

Die groot aanvraag deur die nywerheid om personeel-keuringstoetse vir Bantoe-arbeiders het voortgeduur en toetsetegnieke vir die bepaling van aanleg is in 'n aantal bedrywe ingevoer, insluitende vervaardigers van suiker, chemikalieë, keramiek, sement en gipspleisterbord. Daarbenewens is navrae in verband met die toepassing van aanlegtoetse in 'n aantal ander nywerhede ontvang, insluitende ligte ingenieurswese, steenmakery, tekstiel-vervaardiging en katoenverhouding. Hierdie navrae is afkomstig van groepe in Suid-Afrika, asook uit gebiede ten noorde van die Unie. Tans is die hoofdoel van die keuringsprosedures om kandidate in drie groot bedryfskategorieë in te deel, naamlik dié van nie-meganiese, meganiese en toesighoudende werk. Daar word ook aandag bestee aan die daarstelling van keuringstoetse vir geskoolde, klerklike en hoërgraadse werksaamhede.

Weereens is aangetoon dat die toepassing van wetenskaplike prosedure by personeelbestuur tot meer doeltreffende aanwending van mannekrag in die mynbedryf, plaaslike bestuur en in die sekondêre nywerhede lei. 'n Groot munisipaliteit het die fasiliteite van die Nasionale Instituut vir Personeelnavorsing benut in 'n omvattende studie van sy nie-blanke arbeidskragte met die doel om doeltreffendheid te verhoog en arbeidskoste te verminder. Hierdie studie het taakontleding, meganisering van arbeidsregisters en die opleiding van personeelbeamptes behels.

Die Instituut het ook 'n studie van die werksmotivering van naturelletrekarbeid op die myne voltooi. Dit het aan die lig gebring dat sulke werkers sterk streef na die kleinboerlewe in stamverband, en dat werk buite hierdie sfeer slegs 'n tussenspel uitmaak, wat geensins die basiese motivering vir voortsetting van die tradisionele leefwyse verander nie.

Deur die Unie se deelname aan 'n pan-Afrikaanse studie van die produktiwiteit van naturelle-arbeiders wat deur die Kommissie vir Tegniese Samewerking in Afrika besuide die Sahara gefinansier word, sal meer lig gewerp word op die van die verstedelike naturel, ten opsigte van werk sowel as op die houding van die naturel wat nog stamkontakte behou. Hierdie ondersoek behels ook die inwin van gegewens aangaande diensversuim en personeelwisseling in sekere uitgesoekte bedryfsfere, waaraan die Unie van Suid-Afrika, die Verenigde Koninkryk, die Federasie van die Rhodesië en Njassaland, Portugal, België en Frankryk sal saanwerk. Die navorsingspan van die Unie samel tans gegewens in die boubedryf en verskeie sekondêre nywerhede in, waaronder tekstiel-, seep-, metaalhouers- en tabbakfabrieke.

In hierdie studie word die arbeidsgroepe se herkoms, aspirasies, en houdings ten opsigte van werksomstandighede en bestuursgebruike ontleed. 'n Vergelykende studie van verskillende gebiede met betrekking tot

Native Personnel Selection Tests

The great demand by industry for personnel selection tests for native labour continued, and aptitude testing techniques were introduced into a number of industries, including those producing sugar, chemicals, ceramics, cement and building board. In addition, enquiries were received for the application of aptitude testing in light engineering, brickmaking, textiles and cotton cultivation, both in South Africa and in territories to the north. At this stage, the major purpose of these selection programmes is to classify candidates into three major occupational categories, namely non-mechanical, mechanical and supervisory work. Attention is, however, also being paid to the development of tests for skilled, clerical and higher grade duties.

Once more it was shown that the application of scientific personnel management procedures leads to the adequate utilization of manpower in secondary industry, mining and local government. A large municipality made use of N.I.P.R. facilities for a comprehensive study of its non-European labour force in order to improve efficiency and to reduce labour costs. This study included job analysis, mechanization of labour records and a training programme for personnel officers.

The Institute has also completed a study of the work motivation of migratory native mine labour. It was found that such labour remains strongly motivated towards peasant life in a tribal context, and that work away from this sphere is merely an interlude, which does not alter the basic motivation to continue a traditional way of life.

More information on occupational attitudes in urbanized native populations, as well as those who still have rural connections, will be derived from the Union's participation in a pan-African study of the productivity of native labour sponsored by C.C.T.A. This includes an enquiry into absenteeism and labour turnover in certain selected occupational areas to be conducted on a co-operative basis by the Union of South Africa, the United Kingdom, the Federation of Rhodesia and Nyassaland, Portugal, Belgium and France. The Union team is at work in building construction and secondary industries, namely textiles, soap, metal containers and tobacco.

In this study the origins, aspirations, and attitudes towards conditions of service and managerial practices of the labour force are being analysed. Comparisons

klimaat, ontstamming, beskawingspeil, nywerheids-wetgewing, werktipe, opvattinge omtrent bestuur en bestuursgebruik, opleiding en opvoeding van die werkers, en sosio-ekonomiese omstandighede sal lig werp op die mees belangrike determinante van die produktiwiteit van natuurlike-arbeiders.

Die arbeidslewing van natuurlike-arbeiders word ook in 'n ander verband nagevors, naamlik die uitwerking van klimaat (warmte en vogtigheid) op arbeidsbekwaamheid. In medewerking met fisioloë, ondersoek die Nasionale Instituut vir Personeelnavorsing onder watter omstandighede 'n afname in arbeidslewing verwag kan word en in watter mate sodanige afname eerder die uitvloeisel van motiverings- as van blote fisiologiese faktore is.

Vir die Departement van Bantoe-administrasie en -ontwikkeling is 'n studie voltooi in verband met faktore wat die bekwaamheid van Bantoe-staatsamptenare beïnvloed. Hierdie ondersoek het aan die lig gebring dat bekwaamheid geensins slegs afhanklik is van die vereiste mate van basiese vermoë en opleiding nie, maar ook bepaal word deur die soort persoonlikheid en karaktersamestelling wat opgewasse moet wees teen die botsende eise wat deur 'n betreklik ingewikkelde rassituasie aan die individu gestel word deur 'n samelewing waarin die Bantoe-klerk 'n grensposisie beklee. Hierdie grensposisie bestaan enersyds ten opsigte van sy blanke toesighouers en die natuurlikepubliek wat hy bedien en andersyds ten opsigte van sy eie agtergrond en kultuur, die Westerse bestuursstelsel waarin hy dien, die regulasies wat hy moet uitvoer en die houding van die natuurellegemeenskap—waarvan hy lid is—teenoor die hele stelsel. Daar is bevind dat 'n bepaalde persoonlikheidsamestelling onontbeerlik is vir aanpassing by hierdie ingewikkelde situasie. Hierdie aspek van personeelkeuring lê feitlik nog braak, en 'n aansienlike gedeelte van ons navorsing sal in die toekomst hieraan bestee moet word.

Praktiese Probleme

By die praktiese probleme waarvoor die Instituut se hulpmiddele hoofsaaklik ingespan word duik gedurig vroe op aangaande die vermoëns en persoonlikheidsamestelling van die mens, wat die onderwerp uitmaak van 'n aantal studies van langtermyn, basiese en soms uiters teoretiese aard. Sulke studies sluit navorsing in ten opsigte van die elektriese spannings in die brein onder verskillende omstandighede, byvoorbeeld dié wat ontstaan as gevolg van die toediening van sulke psigotobootsende middels soos meskalin en lisergiensuur wat albei 'n toestand van tydelike geestesontwriging kan veroorsaak, wat ooreenkom met skisofrenie en manies-depressiewe osigose.

Hierdie psigotobootsende middels is in 'n spesiaal-geboorde ligdigte laboratorium toegedien, wat toegerus is met 'n aantal bykomende stimuleer- en registrasie-apparate, insluitende 'n agtkanaal-elektroënkefalograaf,

between different areas in respect of climate, detribalisation, culture, industrial legislation, type of work, managerial outlook and practices, training and education of workers, and socio-economic circumstances will throw light on the most important determinants of productivity in native labour.

The work output of native labour is being studied in another context, namely the effect of climatic factors (high temperature and humidity) on work efficiency. In collaboration with physiologists, the N.I.P.R. is investigating under what conditions a decline in output may be expected to occur, and to what extent this decline is the result of motivational rather than physiological factors.

A study for the Department of Bantu Administration into the factors influencing the efficiency of Bantu Civil Servants was completed. This investigation showed that efficiency is not merely a matter of the requisite degree of basic ability and training, but also of the kind of personality and character make-up that can cope with the conflicting demands made on the individual by a rather complex racial situation in which the Bantu clerk occupies a marginal position. This marginal position exists in relation to his white supervisors and to the native public he serves, as well as to his own background and culture and the Western administrative system in which he serves, the regulations he must administer and the attitudes of the native public and community (of which he is a member), towards the entire system. A particular personality make-up was found to be essential for adjustment to this complex situation. This is an aspect of personnel selection where comparatively little progress has been made, and towards which much of our future research effort will have to be devoted.

Practical Problems

The practical problems to which the N.I.P.R. devotes the major portion of its resources raise many questions concerning the abilities and personality make-up of man, which are the subject of a number of long-term basic and often very theoretical investigations. Among these are studies of the electric potentials of the brain under various conditions, including those resulting from the administration of psychotomimetic drugs such as mescaline and lysergic acid, both of which can induce a state of temporary mental disorganization comparable to schizophrenia or manic-depressive psychosis.

These psychotomimetic drugs were administered in a specially constructed light-proof laboratory with considerable ancillary stimulating and recording apparatus,

wat met transistors toegerus is vir die meting van die breinritmes. Hopelik sal hierdie proefnemings nie slegs lig werp op die onderliggende neurofisiologiese prosesse waarop die instandhouding van 'n gesonde, goedaangepaste en gebalanseerde geesteslewe berus nie, maar ook 'n wegwysers uitmaak op die pad na die objektiewe meting van die fundamente van die persoonlikheid.

Ander basiese navorsing het in verband gestaan met uithouvermoë, aspirasievlak en die verhouding tussen visuele waarneming en temperamentele karaktertrekke. Die ontwikkeling van vermoëns en persoonlikheid by

including an eight-channel transistorized electroencephalograph for the measurement of the brain rhythms. It is hoped that these experiments will not only throw further light on the neuro-physiological basis underlying the maintenance of a sane, adjusted and balanced mind, but will also point the way to objective measurement of the fundamental bases of personality.

Other basic studies were concerned with staying power, level of aspiration and the relationship between visual perception and temperamental characteristics.



Vierjarige normale kind ondergaan 'n EEG-ondersoek vir vergelyking met Kwashiorkor-pasient

Four-year-old normal child undergoing EEG examination for comparison with Kwashiorkor patient

die inheemse naturellerasse van Afrika is 'n besonder belangrike saak, aangesien dit 'n invloed op die toekomstige ontwikkeling van die vasteland sal uitoefen. Verdere werk is gedoen in die vasstelling van standaarde, waarmee die ontwikkeling van Bantoe-kinders vanaf geboorte tot die sesde lewensjaar gemeet kan word. Wanneer sodanige standaarde eers vasgestel is, sal dit moontlik wees om die uitwerking op die intellektuele- en persoonlikheidsgebied van ons inheemse rasse te meet van aspekte soos voeding, kulturele en sosio-ekonomiese omstandighede, oerstandpunte en kind-grootmaakgebruike. Navorsers uit ander Afrika-gebiede het tydperke by die Instituut deurgebring om

The development of abilities and personality in the indigenous native populations of Africa is a particularly important subject, as it has a bearing on the future development of the continent.

Further work has been done on the setting up of standards by which to measure the development of native infants from birth to the sixth year of life. Once these standards are available, it will be possible to gauge the effects of nutritional, cultural and socio-economic conditions, parental attitudes and child-rearing practices on the intellectual and personality development of our native races. Workers from other parts of the continent have spent some time at the

kennis te maak met ons metodes, wat hulle weer elders op so 'n wyse sal toepas dat vergelykings moontlik sal wees.

As voorbereiding vir studies in verband met die uitwerking van voeding op intellektuele ontwikkeling is 'n proewereeks op opeenvolgende geslagte van rotte uitgevoer, wat almal grootgemaak is op 'n dieet met 'n tekort aan proteïene. Die resultate toon 'n duidelike minderwaardigheid by die oplossing van probleme en dus ten opsigte van intelligensie, onder die proefdiere wat 'n proteïen-gebreklike rantsoen ontvang in vergelyking met 'n normale kontrolegroep.

Verdere navorsing vind plaas om die aard van die minderwaardigheid en die mate waarin dit verminder kan word te bepaal.

Waarnemingsvermoëstudies

Ondersoek van die waarnemingsvermoë van inboorlingegroepes wat in verskillende stadia van opvoeding verkeer en die Westerse beskawing in verskillende mate oorgeneem het, het aan die lig gebring dat Bantogroepes met 'n laerskoolopleiding prentemateriaal *tweedimensioneel* vertolk. Sels voorgraadse studente en gegradueerders toon neiging om hierdie vertolking te gee. Onder blanke groepe is *driedimensionele* vertolking van standaard drie af algemeen. Onlangse ondersoekes het getoon dat nie-blanke groepe minder onderhewig is aan sekere visuele geometriese illusies, soos die Müller-Lyer-illusie, as blanke groepe wat op hulle beurt weer minder vatbaar is vir die Horisontale-vertikale sinsbedrog as nie-blanke groepe; hieruit kan egter nie afgelei word dat hierdie verskille van genetiese oorsprong is nie. Ongetwyfeld kan kulturele faktore 'n belangrike rol speel by die ontwikkeling van visuele waarnemingsreaksies, hoewel die omstandighede waaronder hulle inwerk verdere navorsing vereis. Om inligting in dié verband in te win, het die Instituut aan die Kalahari-ekspedisie van die Witwatersrandse Universiteit deelgeneem, wat deur die Nuffieldstigting gefinansieer is.

Vir die eerste maal in die geskiedenis van die Sielkunde is 'n reeks handelings-toetse, meerendeels sonder taalgebruik met sukses op Boesmans in hulle natuurlike omgewing toegepas. Hierdie toetse het die volgende prosesse behels; die teken van sandpatrone met die voorvinger, patroonvoltooiing deur herkenning van bilaterale (skoelapper) eweredigheid, die abstraksie van reëlmatigheid in 'n reeks eenvoudige voorwerpe van verskillende kleur en vorm, lengtediskriminasie onder toestande van optiese sinsbedrog en kleurvisie.

Die samewerking van die Boesmans by die toetsprogram is geredelik verkry. Die meeste van die toetslinge het die „aangename speletjie” geniet, hoewel aanvanklike vrees en senuweeagtigheid by baie van hulle eers te bowe oorwin moes word. Oor die algemeen kon die Boesmans die toetsvereistes verbasend goed nakom. 'n Wye omvang van intellektuele vermoëns is

N.I.P.R. in order to get acquainted with the methods used, and to apply them elsewhere in such a manner as to render comparisons possible.

In preparation for studies on the effects of nutrition on mental development, a series of experiments has been run in which successive generations of rats have been reared on a protein-deficient diet. The results indicate a distinct inferiority in problem-solving and therefore in intelligence on the part of the animals receiving a protein-deficient diet, in comparison with a normal control group.

The precise nature of this inferiority and the degree to which it can be remedied are undergoing further investigation.

Perceptual Studies

Perceptual studies on indigenous native populations at various levels of education and assimilation of Western culture revealed that Bantu samples with primary school training interpret pictorial material *two-dimensionally*. This interpretation tends to occur even among undergraduates and graduates. In European samples, *three-dimensional* interpretation of pictorial matter is common by the standard three school level. Recent investigations showed that pigmented groups are less subject to certain visual geometric illusions such as the Müller-Lyer illusion than white groups, which in turn are less subject to the Horizontal-vertical illusion than pigmented groups, though it cannot be concluded from this that the difference is of genetic origin. Cultural factors could undoubtedly play an important part in the development of visual perceptual responses, though the circumstances under which they do so require to be further investigated. To obtain further information on this problem, N.I.P.R. participated in the University of the Witwatersrand Expedition to the Kalahari, sponsored by the Nuffield Foundation.

For the first time in the history of psychology a number of performance tests, most of them language free, were successfully administered to Bushmen living in their natural environment. The tests involved finger drawings in sand, pattern completion by recognition of bilateral (butterfly) symmetry, the abstraction of regularities in series of simple objects varying in colour and shape, length discrimination under conditions of optical illusion and colour vision.

The Bushmen's co-operation in the testing programme was easily obtained. Most of the subjects enjoyed the "nice game", although initial anxiety and nervousness had to be overcome by many of the testees. In general, the Bushmen could cope surprisingly well with the test requirements. A wide range of intellectual abilities was

weerspieël in sommige kwantitatiewe toetsresultate, en aansienlike wisseling ten opsigte van emosionele en ander persoonlikheidsienskappe is in die reaksies op die toetssituasie opgemerk. Die waarnemers is beïndruk deur die groot mate van dissipline in groepsgedrag en die natuurlike takt deur elke afsonderlike lid van hierdie innemende volke getoon, wat in die verlede deur hulle liggaamlik sterker bure so snood behandel is.

Hoewel hierdie eerste ondersoek veral met metodologiese probleme gemoeid was, het die resultate nogtans aangedui dat 'n voortsetting van die program allig meer lig sal werp op die aantal onbeantwoorde vrae in verband met hierdie innemende mensies, waarskynlik een van die oudste rasse in die wêreld.

Die vertolking van die metings van intelligensietoetses verkry is deurentyd 'n netelige saak, veral wanneer verskillende rasse- en kultuurgroepe betrokke is. Die Wechsler-toets vir die intelligensie van volwassenes, wat binne afsienbare tyd vir algemene gebruik vrygestel sal word, en wat op verteenwoordigende Engels- en Afrikaanssprekende monsters in die ouderdomsgroepe 18-60 gestandaardiseer is, het die geleentheid gebied om te bepaal of daar 'n beduidende verskil is in die reaksies van die twee taalgroepe. Daar is 'n beduidende verskil ten gunste van die Engelsprekendes op alle sosio-ekonomiese vlakke bevind; hierdie verskil was egter minimaal by die hoogste en laagste sosio-ekonomiese kategorieë. Bewyse is gevind dat selfs die geringe verskille tussen die kulturomgewing van die twee taalgroepe 'n uitwerking op toetsprestasie uitoefen. Die ontplooiing van intelligensie verg stimulasie op verskeie maniere. Hoe groter die verskeidenheid van die omgewing, hoe meer volop die geleentheid vir kontakte—sowel met mens as materiaal—des te heilsamer sal die uitwerking op intellektuele groei wees.

WERKVERRIGTING- EN WERKSTUDIES

Werkstudie, Johannesburgse Munisipaliteit

'n Sisteem vir die beskrywing en waardering van alle take deur natuurlike-arbeid vir die munisipaliteit verrig, is ontwerp. 'n Aanvang is gemaak met die keuring en opleiding van Personeelbeamptes, wat taakbeskrywing en -herontwerp onder leiding van die Instituut se afdeling vir Werkstudie kon uitvoer. Raad is verstrek in verband met die meganisering van die Stadsraad se arbeidsregisters vir nie-blankes.

Model vir Organisasiestruktuur

'n Stokkasiestiese model is opgestel wat die teorie van Markov-prosesse gebruik. Dit het 'n meetmiddel van organisatoriese doeltreffendheid daargestel, asook vir die gemiddelde tydsduur vir die voltooiing van 'n taak aan die organisasie opgedra. Die model is voldoende buigsaam om enige organisasie voor te stel.

reflected by some of the quantitative results in the tests, and considerable variation in respect of emotional and other personality characteristics was observed in the reactions to the test situations. The observers were impressed by the great amount of discipline in group behaviour and the natural tact revealed by each individual member of these charming little people, so badly treated in the past by physically stronger neighbours.

Although this first investigation was concerned with methodological problems, the results justified the expectation that a continuation of the programme may shed more light on the many open questions relating to this fascinating group of people, presumably one of the oldest races on earth.

The interpretation of intelligence test measurement is always a moot point, particularly when different racial or cultural groups are involved. The Wechsler test of adult intelligence, which will shortly be available for practical use and which has been standardised on representative samples of Afrikaans- en English-speaking people between the ages of 18 and 60, provided an opportunity to test out whether there is any difference in response between the two language groups. It was found that at all socio-economic levels, there is a difference in favour of the English-speaking groups, this difference being least in the highest and lowest socio-economic categories. Evidence was found that even the slight differences that obtain between the cultural environment of the two language groups exercise some effect on test performance. The deployment of intelligence requires stimulation in various ways. The more diversified the environment, the more plentiful the opportunities for contacts, human and material, the more beneficial will be the effect on intellectual growth.

OPERATIONS RESEARCH

Work Study, City of Johannesburg

A system for the description and evaluation of all jobs done by Native labour in the Municipal Service was devised. A start was made with the selection and training of Establishment Officers, who could carry out job description and redesign under the Institute's Work Study section. Advice was given on the mechanization of the Council's Non-European labour records.

Model of Organizational Structure

A stochastic model, utilising the theory of Markov processes, was constructed. It yielded a measure of organizational efficiency, and of the average time taken to complete a task assigned to the organization. The model is sufficiently flexible to represent any kind of organization.

„Kostebegrip” op Personeelnavorsing toegepas

Die toewysing van mannekrag in 'n navorsingsinstituut is ondersoek, met inagneming van die minimum inkomste van die organisasie, die minimum hoeveelheid tyd deur individue aan basiese, nie-inkomstegewende navorsing bestee en die totale personeel beskikbaar. Die probleem van personeeltoewysing in terme van die maksimale tydsbesteding aan basiese navorsing sonder verontagsaming van die ander behoeftes van die organisasie is opgelos, hoewel die huidige stelsel van koste-beheer van die Wetenskaplike en Nywerheidsnavorsingsraad 'n oplossing vir die hele organisasie uitgesluit het.

'n „Bemanningspel” is ontwerp, wat 'n denkbeeldige organisasie voorstel, waarin 'n aantal poste gevul moet word. Die proefpersoon ontvang inligting aangaande die verspreiding van aanleg, personeelwisseling en -bekwaamheid en opleidingsresultate, en hy moet dan personeel toewys en vakatures wat ontstaan vul om tegelykertyd maksimale werklewering teen minimale koste te verkry. Die doel van die spel is om die leerproses en die neem van besluite onder toestande van onsekerheid te bestudeer. Dit kan ook by personeelkeuring en -opleiding toegepas word.

'n Aanvang is gemaak met 'n ondersoek in medewerking met 'n teëlvervaardiger wat oor verspillingsyfers beskik om die uitwerking van personeelkeuring op die onkoste van die bedryf te bepaal. Die syfers sal grafies op kontrolekaarte voorgestel word. Indien personeelkeuring materiaalverspilling beïnvloed, sal die kaarte dit aantoon deur buite beheer te beweeg. 'n Indiensplasingindeks is ontwerp wat die mate van korrekte taakplasing van personeel aandui. Indien die klassifikasieprosedure geldig is, behoort die indeks met materiaalverspilling te korreleer en terselfdertyd 'n beraming van die koste verbonde aan foutiewe personeelklassifikasie te verstrek. Indien praktiese, onbeheerbare faktore nie hierdie ontwerp versteur nie, sal 'n belangrike mylpaal in die metodologie van personeelkeuring bereik wees.

Navrae

Talryke navrae is by wyse van onderhoude en briefwisseling afgehandel.

Belangstellingsvraelys vir Sielkundiges

Die finale administrasie van hierdie vraelys het by die Suid-Afrikaanse universiteite berus.

PERSONEELKEURING VIR DIE WEERMAG

Tydens 1958 het die personeel wat vir Weermagverpligtings verantwoordelik is die nuwe Instituut vir Lugvaartmedisyne betrek. Sodoende is samewerking tussen die Nasionale Instituut vir Personeelnavorsing

Cost Concept applied to Personnel Research

Manpower allocation in a research institute was investigated, taking into account the minimum earnings of the organization, the minimum time devoted to basic, non-revenue producing research by individuals and the total staff available. The problem of manpower allocation in terms of maximizing the total time spent on basic research whilst satisfying the restrictions of the organization was solved, although the present system of cost control of the Council for Scientific and Industrial Research precluded a solution for the entire organization.

A “Manning-game” was constructed, which describes a fictitious organization where a number of jobs are to be filled. Information on distribution of aptitude, labour turnover and efficiency and training results is supplied to the subject, who is required to staff jobs and fill occurring vacancies so as to maximize output and minimize costs simultaneously. The purpose of the game is to study learning and decision making under conditions of uncertainty. It may also be used for the selection and training of personnel.

A start was made with an investigation aimed at relating the effects of personnel selection to cost figures in industry. The work is being done in collaboration with a firm of tile manufacturers, who have wastage figures available. These will be plotted on control charts. Should personnel selection affect product wastage, the charts will show this by moving out of control. A placement index was developed showing the degree of correct job placement of personnel. If the classification procedure is valid the index should correlate with product wastage, and also provide an estimate of the cost of wrongly classifying personnel. If practical, uncontrollable factors do not upset this design, an important step forward will have been taken in personnel selection methodology.

Enquiries

Numerous enquiries were dealt with by interview and letter.

Interest Questionnaire for Psychologists

The final administration of this questionnaire was arranged at South African Universities.

PERSONNEL SELECTION FOR DEFENCE FORCE

The Institute staff set aside for Defence commitments moved into the new Institute for Aviation Medicine during 1958. This greatly facilitated co-operation between the Institute and the Defence Force. Staff

en die Weermag vergemaklik. Personeel van die Instituut het besoeke afgelê by Weermag-, Vloot- en Lugmaginrigtings met die oog op personeelkeuring, taakbekendmaking en beraadslaging in verband met 'n aantal verskillende sake wat militêre personeel betref.

'n Verkorte vorm van die toetsbattery vir die keuring van Lugverkeersleiers is aan die Aanlegtoetsseksie van die Departement van Gevangeniswese in Kenia voorsien.

Validasiestudie: Leerlingvlieëners

'n Oorsig is gemaak van alle vorige validasiestudies betreffende leerlingvlieëners om die aard van en oorsaak vir skommeling in die geldigheid van keuringstoetse vir leerlingvlieëners te bepaal, teneinde die Direkteur in staat te stel om 'n referaat te lewer aan die Adviesraad vir Verdedigingswetenskap van die Gemeenebes wat in Melbourne vergader het. Daar is bevind dat die geldigheid van jaar tot jaar gewissel het weens veranderinge in kriteria en beperking van omvang. Twee betreklik onafhanklike aspekte van kriteria is geïsoleer: bekwaamheid in die vliegkuns en prestasie in grondonderrigvakke. Toetsbattery is uitgesoek om sukses op hierdie gebiede te voorspel. 'n Kwaliteitsbeheerstelsel is ingevoer om die noodsaaklikheid vir gedurige hervalidasie uit te skakel.

Motivering van Vliegpersoneel

Die Vliegkunsbelangstellingsvraelys is gewysig om die rol van belangstelling as komponent van motivering te bepaal. Daarna is 'n studie onderneem om vas te stel watter voorspelwaarde vir vlieënersukses die vraelys besit en in hoeverre dit algemene intelligensie peil.

Meting van Vliegpersoneelhoedanighede

Met behulp van die Willemse-plank is die leerlingvlieëners van 1958 en 1959 getoets. Hierdie objektiewe meetmiddel van persoonlikheidsveranderlikes—veral van aspirasievlak en psigomotoriese funksies—het 'n korrelasie van .47 met algemene vliegbekwaamheid getoon. Dit mag 'n waardevolle toevoeging tot die keuringbattery vir vliegpersoneel uitmaak.

Grondgeleide Onderskepping (Vegterbeheerders)

'n Taakbeskrywing vir grondgeleideonderskeppers is opgestel en metodes is voorgestel vir die opstel van standaardtoetse op 'n elektroniese nabootser. Daar word verwag dat hierdie toetse verdienstelikebepalings betroubaarder en meer objektief sal maak en ook 'n waardevolle criterium sal uitmaak waarteen die toetse van die Instituut gevalideer kan word.

Die Keuring en Opleiding van Ambagsmanne

'n Validasiestudie het aangetoon dat die resultate in die toetse van die Instituut positief korreleer met dié in intermediêre amogstoetse behaal, hoewel die probleem van 'n geskikte criterium nog onopgelos bly.

members visited various establishments of the Army, Navy and Air Force for the purpose of personnel selection, job familiarization and consultations on a variety of matters pertaining to military personnel.

The Aptitude Test Section of the Department of Prisons in Kenya was supplied with a curtailed version of the test battery for the selection of Air Traffic Controllers.

Pupil Pilots Validation Study

For the purpose of a paper which was read by the Director at the Commonwealth Advisory Committee Defence Science Conference at Melbourne, a review was made of all the previous pupil validation studies to determine the causes and nature of fluctuations in the validities of pupil pilot selection tests. The validities were found to fluctuate from year to year because of changes in criteria and of restriction of range. Two relatively independent aspects of criteria were isolated: flying ability and ability in ground subjects. Test batteries have been selected for prediction of success in these areas. To obviate the need for constant revalidation a quality control system was instituted.

Air Crew Motivation

To determine the part played by interest as a component of motivation the Flying Interest Questionnaire was modified. A study was conducted to determine its predictive value for pilot success and the extent to which it measures general intelligence.

Measurement of Aircrew Personality Qualities

The 1958 and 1959 groups of pupil pilots were tested with the Willemse Board. This objective measure of personality variables, particularly aspiration level, and of psycho-motor factors yielded a correlation of .47 with general flying ability. It may prove a valuable addition to the aircrew selection battery.

Ground Control Interception (Fighter Controllers)

A job description for ground control interceptors was prepared and methods suggested for the construction of standard tests on an electronic simulator. These tests are expected to make assessments more reliable and objective, in addition to providing a valuable criterion against which the Institute's tests can be validated.

Artisan Selection and Training for Air Force

A validation study with respect to the tests of the Institute showed a positive relationship with intermediate trade test results, although the problem of a suitable criterion remains to be solved.

Vliegtuigongelukke

Personel van die Instituut het voortgegaan met bywoning van vergaderings van die Vliegtuigongeluk-ondersoekraad.

Radiobedieners vir die Lugmag

'n Validasiestudie en taakontleding vir radiobedieners (lug) het die belang van temperamentele en persoonlikheidsienskappe vir sukses op hierdie gebied aangetoon, asook die waarde van 'n battery wat 'n aanlegtoets vir die Morse-kode insluit sowel as 'n toets vir meganiese insig as voorberekenaar.

Navorsing i.v.m. Leerlingvlieëniers

Ontleding van biografiese gegewens, temperamentbeoordelings en toetsprestasies van suksesvolle en onsuksesvolle leerlingvlieëniers het aangedui dat persone wat oor superieure bekwaamheid beskik—gemeet deur geskrewe en bedreweheidstoets—en wat afkomstig is uit huise wat nie deur die dood of ernstige siekte van enige van die ouerpaar getref is nie, 'n heelwat beter vooruitsig het op sukses by die leerlingvlieëniersopleiding.

Keuring van Offisier-kadette

Die resultate van geskrewe toets het 'n korrelasie van .45 met prestasies in die eksamen van die Weermag-gimnasium getoon. Deur bytelling van die resultate van die sosiometriese toets, en die beoordelingsyfers wat Opvoedkundige Geskiedenis, Motivering en Stabiliteit betref, is 'n saamgestelde korrelasie van .81 verkry. 'n Ondersoek na die betroubaarheid van leierskapsbeoordelings in leierlose groepsprosedures het betroubaarheidskoëffisiente van .8 in die beoordelings van verskillende personeellede opgelewer.

'n Aantal faktore wat met sukses in verband staan, is geïsoleer, insluitende 'n eersteklas in die Matrikulasie-eksamen, vroeëre militêre opleiding in 'n skoolkadet-korps, skietkommando of Aktiewe Burgermag, vorige belangstelling in militêre sake, motivering en stabiliteit. Sentiment is negatief verwant aan sukses.

Toetshersiening

'n Aantal toets en vraelyste vir die sifting en klassifisering van verskillende kategorieë militêre personeel is in verkorte, hersiene vorm opgestel.

KEURING VAN BLANKE PERSONEEL EN BE-ROEPSVOORLIGTING

Namens die verskillende afdelings van die Wetenskaplike en Nywerheidsnavorsingsraad is 650 persone getoets. 'n Studie is tans aan die gang om die werksbenodigdhede van die Raad en die doeltreffendheid van huidige personeelkeuringsmetodes te bepaal.

Aircraft Accidents

Institute personnel continued to attend meetings of the South African Air Force Accident Board.

Radio Operators, Air Force

A validation study and job analysis of radio operators (air) revealed the importance of temperamental and personality characteristics for success in this field and the value of a battery containing a Morse aptitude test and a test for mechanical comprehension as a predictor.

Pupil Pilot Research

Analysis of biographical data, temperament assessments and test scores of both successful and "washed out" pupil pilots indicated that those individuals possessing superior ability—as measured by written and skill tests—and coming from homes unaffected by the death or serious illness of either parent had a considerably better chance of success in pilot training.

Officer Cadet Selection

Paper and pencil test results yielded a correlation of .45 with those in the Army Gymnasium examination. By adding results of the Sociometric Test, Educational History and Motivation and Stability ratings a multiple correlation of .81 was yielded. An investigation into the reliability of leadership ratings in leaderless group procedures revealed reliability coefficients of .8 in the ratings of different staff members.

A number of factors relating to success were isolated, including first class pass in Matriculation, previous military training in cadet corps, rifle commando, or Active Citizen Force, previous interest in the military sphere, motivation and stability. Sentiment was negatively related to success.

Revision of Tests

A number of tests and questionnaires used for the screening and classification of various categories of military personnel was revised and streamlined.

EUROPEAN PERSONNEL SELECTION AND VOCATIONAL GUIDANCE

A total of 650 people was tested for the various divisions of the Council for Scientific and Industrial Research. A study is in progress to determine the job requirements of the Council and to follow up the effectiveness of current personnel selection methods.

Van die 322 persone aan wie beroepsvoorligting gegee is, was 66% skoolleerlinge, 13% studente en 21% was persone wat alreeds gewerk het. Vraelyste is aan 50 persone gestuur wat tydens 1954-56 beroepsvoorligting by die Instituut ontvang het. Van die 35 persone wat die vraelys voltooi het, het 30 die advies van die beroepsvoorligter gevolg en 5 nie. Agt-en-twintig was „tevrede” met die voorligting wat gegee is en 7 was „ontevrede”.

Kwekelinge vir Toesighoudende en Bestuursfunksies

Ten behoeve van een van die grootste nywerhede in die Unie is die faktore bestudeer wat die sukses van gematrikuleerdes beïnvloed wat as leerlingbeampies vir toesighoudende en bestuursfunksies aangestel is. Tydens die tweejarige opleidingskurse sak 'n groot aantal leerlingbeampies uit, hoofsaaklik uit eie keuse. Toetse is ingevoer om bekwaamheid, houding en motivering te bepaal, terwyl opleidings- en werksomstandighede asook die houding van die bestuur teenoor leerlingbeampies bestudeer is. Daar is aanduidings dat die rede vir kursus-staking nie seer geleë is in die aanleg of persoonlikheidsamestelling van die leerlingbeampies self nie, maar wel in motiveringsfaktore en die bepaalde omstandighede by die verskillende eenhede van die bedryf waarin die leerlingbeampies hulle bevind. Die opvolgstudie sal oor etlike jare strek.

Toetsdemonstrasies en -Opleiding

'n Aantal persone in diens van munisipaliteite en nywerhede is by die Instituut opgelei om toetsmateriaal van die Instituut in hulle werkskringe toe te pas.

Personeelkeuring vir Oopdraggewers

Opdragte vir personeelkeuring is uitgevoer ten opsigte van klerke, personeelbeampies, leerlingtabakverkopers, winkelbedienendes en werkers in die voedselbedryf.

KEURING VAN NATURELLEPERSONEEL

Bantoe-staatsamptenare

Teneinde standaarde vir die keuring van Bantoe-staatsamptenare te verkry, is 120 klerke met behulp van die Engelse en Afrikaanse Begripstoets en 'n nie-verbale Intelligensietoets getoets. Om die Psigometriese Afdeling in staat te stel om standaarde te bepaal is leerlinge uit die drie hoogste skoolstanderds in die Johannesburg-Pretoria-gebied getoets.

Gebruik van Nie-blanke Arbeidskrigte aan die Witwatersrandse Universiteit

'n Aanvang is gemaak met 'n ondersoek in verband met die doeltreffendheid van die gebruik van nie-blanke arbeid aan die Universiteit.

Of the 322 individuals seen for vocational guidance 66% were scholars, 13% were students and 21% were people already in employment. Questionnaires were sent to 50 persons who received vocational guidance at the Institute during 1954-56. Of the 35 people replying 30 had followed the advice given, while 5 had not. Twenty-eight were “satisfied” with the guidance provided and 7 were not.

Trainees for Supervisory and Management Functions

On behalf of one of the Union's largest industries a study was undertaken of the factors that determine the success of matriculated men taken on as trainees for supervisory and managerial functions. During a 2-year training course considerable training losses occur, largely because men terminate training of their own accord. Tests of abilities, attitudes and motivation were introduced and the circumstances under which training took place were studied, as well as working conditions and attitudes towards trainees. There are indications that the explanation for non-completion does not lie in the aptitudes or personality make-up of the trainees, but that it depends on motivational factors and the specific circumstances obtaining in the various units of the industry where the men are employed. The follow-up study will take some years.

Testing Demonstrations and Training

The Institute trained a number of people from municipalities and industries in the use of Institute test material for their specific purposes.

Selection of Personnel for Sponsors

Among the personnel selection assignments were those for clerks, process workers, personnel officers, tobacco salesmen trainees and counter assistants.

NATIVE PERSONNEL SELECTION

Bantu Civil Servants

In order to obtain standards for the selection of Bantu Civil Servants 120 clerks were tested on the English and Afrikaans Comprehension Tests and on a non-verbal Intelligence Test. To enable the Psychometrics Division to set up standards, pupils in the upper three school forms in the Johannesburg-Pretoria area were tested.

Labour Utilization, University of Witwatersrand

A start was made with an investigation into the efficiency of Native labour utilization at this University.

Keuring van Naturelle-ambagsmanne, Johannesburgse Stadsraad

Die toetsprogram by die munisipale vakopleidingsentrum te Orlando is voortgesit om die doeltreffendheid van die Algemene Aanpassingsbattery vir die plasing van leerlingambagsmanne in verskillende ambagte te bepaal. Die gegewens word tans ontleed.

Hertoetsbetroubaarheid, Algemene Aanpassingsbattery

Die gegewens van 383 toetslinge by drie toetsentra verkry, word tans ontleed. 'n Gewysigde, verbeterde toetsadministrasiefilm is vervaardig vir die Algemene Aanpassingsbattery; resultate met die nuwe film op 825 toetslinge by 'n myntoetsentrum verkry, word nou ontleed vir vergelyking met die verkry met gebruik van die ou film.

Aanlegtoetsing

Toetsentra is in vyf bedrywe ingestel, wat teëls, sement, chemikalieë, laaghout en suikerriet produseer. In elke geval het die Instituut een of meer personeellede van die betrokke bedryf in toetstoepassing opgelei.

Opleidingskursusse in Toetstoepassing

Verteenwoordigers van 'n Suid-Afrikaanse goudmyn Suid-Afrikaanse motormonteerfabriek, 'n Suid-Afrikaanse raadpleger, 'n Njassalandse vakopleidingskool en 'n Rhodesiese kopermyn is in toetstoepassing opgelei.

Werkverrigtingsstudies

Die Instituut het werkverrigtingsstudies ten behoeve van ses fabrikante uitgevoer wat betrokke is by die produksie van houtkissies, katoen tekstiel, staal kabels, staalpersstukke en bakstene en teëls.

Keuring van Naturelle-opsieners in die Nywerheid

Keuringsmetodes vir naturelle-opsieners in die sekondêre nywerheid, is bestudeer teneinde verbeterde tegnieke met inbegrip van leierlose groeptoetse, te ontwikkel.

TOEGEPASTE EKSPERIMENTELE PSIGOLOGIE

Invloed van Motivering op Arbeidsprestasie

In medewerking met die laboratorium Toegepaste Fisiologie van die Transvaalse en Vrystaatse Kamer van Mynwese is 'n reeks proewe uitgevoer, waartydens suurstofverbruik, polsslag en liggaamstemperatuur met gereelde tussenpose aangeteken is, terwyl die proefpersone (naturellemynwerkers) besig was om 'n koekepan op 'n sirkelvormige, gelykliggende baan teen $2\frac{1}{2}$ myl per uur te stoot. Elke proefpersoon kon die werk staak sodra hy moeg word. Vyf verskillende vragte is gebruik, wat gewissel het van die leë koekepan tot 'n

Native Artisan Selection, Johannesburg Municipality

Testing continued at the municipal vocational centre, Orlando, to determine the suitability of the General Adaptability Battery for the placement of artisan trainees in different trades. Data analysis is proceeding.

Re-test Reliability, General Adaptability Battery

Data on 383 testees from three testing centres are being analysed. A modified, improved version of the test administration film for the General Adaptability Battery was made; results obtained from its administration to 825 testees at a mines testing centre are being analysed for comparison with those obtained from the administration of the old film.

Aptitude Testing

Testing centres were set up in five industrial enterprises, producing tiles, cement, chemicals, laminated boards and sugar cane. In each case the Institute trained one or more members of the industry in test administration.

Test Administration Training Courses

Representatives of a South African gold mine, a South African motor assembly plant, a South African consultant, a Nyasaland Vocational Training School and a Rhodesian copper mine were trained in test administration.

Operational Investigations

The Institute carried out operational investigations for six manufacturers interested in the production of wooden boxes, cotton, textiles, wire rope, steel pressings and bricks and tiles.

Native Supervisor Selection for Industry

Selection methods for Native supervisors in secondary industry were studied, with a view to developing improved techniques, including leaderless group tests.

APPLIED EXPERIMENTAL PSYCHOLOGY

Influence of Motivation on Work Performance

In collaboration with the Applied Physiology Laboratory of the Transvaal and Orange Free State Chamber of Mines a series of experiments was performed during which oxygen consumption, heart rate and body temperature were recorded at regular intervals while the subjects (Native mine workers) were engaged on *tramping*, that is, pushing a mine car on a levelled circular track at $2\frac{1}{2}$ miles per hour. Each subject could stop the operation as soon as he was tired. Five different loads were employed, ranging from an empty chassis to

vrug van 1,500 pond. Resultate het aanmerklike individuele verskille in motivering aangedui, insoverre dat diegene wat die langste volgehou het met 'n ligte vrag, ook geneig was om langer vol te hou met 'n swaarder vrag. Die mees uitstaande bevinding wat verkry is beide deur navrae en waarneming van gedrag was dat „neutrale motivering” (geen lofspraak of kritiek van die proefpersoon se prestasie) inderdaad 'n „negatiewe dryfveer” uitgemaak het. Motivering het 'n groter rol gespeel by take wat nie 'n hoë mate van liggaamlike inspanning geverg het nie, terwyl die fisiologiese toestand (werksvermoë) by swaar liggaamlike inspanning die beperkende faktor was.

Uitwerking van Hitte op Arbeidsprestasie en Motivering

In medewerking met die Laboratorium vir Toegepaste Fisiologie en 'n mynmaatskappy is eksperimente op 'n spesiale werkplek 8,000 voet ondergrond uitgevoer waar die werklike arbeidsprestasie van 'n werksman van een voorjong en twee wegruimjongens bykans geheel-en-al afhanglik was van die fisiologiese kapasiteit en inspanning van die werkers. Die lugtoevoer na die werkplek is sodanig gereël dat enige bepaalde temperatuur vasgestel en konstant gehou kon word. Twee hoofsoorte prestasietoetse is gebruik: prestasie teen 'n vasgestelde tempo van verbruik van liggaamlike energie vir solank die proefpersoon wou voortgaan, en prestasie teen die proefpersoon se selfgekoose tempo van energieverbruik vir 'n voorafbepaalde tydperk.

Eersgenoemde stel toetse het werk op die koekepanspoor ingesluit, en laasgenoemde die pinset-tuit-, bal-en-trappe-, agtervolgmeter- en trappetoetse. Benewens toetstellings wat elke minuut aangeteken is, is die polsslag aan die begin van die toetsiklus en na afloop van elke toetsuitvoering vasgestel. Sodoende is 'n taamlik oorsigtelike beeld van die proefpersoon se prestasie oor 'n tydperk van bykans twee uur van fietlik onafgebroke toetsaktiwiteit verkry. In die proefeksperiment is 37 tweemanspanne getoets, waarvan 9 onder toesig van 'n „bene-de-gemiddelde” voorjong opgetree het, 8 onder 'n „bo-gemiddelde” voorjong en 20 sonder voorjong gewerk het.

Die spanne onder toesig van 'n „bo-gemiddelde” voorjong het die mees stabiele resultate gelewer. Hoewel arbeidsprestasie aansienlik verminder het by toenemende temperatuur onder aldie toetsomstandighede, was die absolute kriteriumtellings onder „bo-gemiddelde” toesig hoër as dié onder ander toetsomstandighede verkry. 'n Uitvoerige toetsprogram met toesig onder „bo-gemiddelde” voorjongens is geloods, wat sal voortduur totdat voldoende gegewens ingewin is om betroubare temperatuur/arbeidsprestasiewerkskromme te bepaal en om afleidings moontlik te maak aangaande die relatiewe voorspelwaarde van motiveringsbeoordelings vir die voorspelling van arbeidsprestasie onder wisselende temperatuur.

1,500 pounds load. Results indicated that there are marked individual differences in motivation in as much as those subjects who tended to work for the longest period with a light load did so also with heavier loads. The most striking finding from enquiry and from observations of behaviour was that “neutral motivation” (no praise or criticism of the subject's performance) was in fact a condition of “disincentive”. Motivation played a more important role in tasks not involving a high degree of physical effort, whereas in heavy physical work the physiological condition (work capacity) appeared to be a limiting factor.

Effects of Heat on Work Performance and Motivation

In collaboration with the Applied Physiology Laboratory and a mining company experiments were conducted on a special working place 8,000 feet below the surface, where the actual work output of a team of one boss-boy and two lashing boys was almost entirely a function of the physiological capacity and effort of the subjects. The ventilation of the working place was so arranged that any specified temperature could be set and maintained constant. Two main types of performance tests were employed: performance at a fixed rate of physical energy expenditure for as long as the subject was prepared to continue, and performance at the subject's own rate for a predetermined length of time.

The first set of tests included work on the tramping track, and the second included the tweezer-nozzle, ball and steps, pursuit meter and stepping tests. In addition to the test scores taken at one-minute intervals pulse rates were taken at the beginning of the cycle and at the end of each test performance. In this way a fairly comprehensive picture of the subject's performance during more than 2 hours of almost continuous test activity was obtained. In the pilot experiment 37 two-boy teams were tested: 9 teams working under a “below average” boss-boy, 8 under an “above average” boss-boy and 20 without boss-boy supervision.

The most stable results were yielded by teams under an “above average” boss-boy. Although output decreased considerably with rising temperature under all three conditions of supervision, the absolute criterion scores under the “above average” boss-boys were higher than those under other conditions of supervision. An extensive testing programme with supervision by “above average” boss-boys was begun, which will continue until sufficient data have been collected to establish dependable temperature-output work curves and to permit conclusions about the relative predictive value of motivation assessment for the prediction of work performance under varying temperature conditions.

Navorsing van die Pauli-toets

Insameling van gegewens het voortgeduur en die uitwerking van deksedrien op toetsuitvoering is ondersoek met twee afgepaarde proefgroepe studente van 32 persone elk. Die toetsgroep het elk 10 milligram dekstro-amfetamien ontvang, terwyl die kontrolegroep 'n fop-pil toegedien is. Deksedrien het 'n sterk uitwerking op die „helling”-telling gehad, dit wil sê die toename in uitvoeringsnelheid, terwyl dit *foute* verminder het, beide in terme van die totaal en as persentasie van totale prestasie. Die aantal *verbeterings* het toegeneem na toediening van deksedrien. Hierdie bevindings is by 'n hertoets met 'n klein monster bevestig.

Ontleding van toetsresultate van 30 vroulike en 30 manlike proefpersone volgens ouderdom afgepaar (gemiddelde ouderdom 19.6 jaar; grootste verskil tussen enige paar .08 jaar) het aangetoon dat slegs een aspek van die kromme by mans meer prominent vertoon, naamlik „konveksiteit”. Hierdie bevinding kom ooreen met vraelysresultate wat deur Eysenck beskrywe word (mans meer ekstrovert as vroue) en toon verder dat mans hulle vinniger aanpas en hulleself met minder voorbehoud inspan as hulle vroulike porture, altans in die Pauli-toetsituasie.

Op grond van toetsresultate by 149 nie-blanke klerke is voorlopige norme vir die verwerking van roupunt-tellings tot stanientellings vir ses veranderlikes vasgestel.

Toets-hertoets „profiel” is vergelyk. Die resultate toon dat die eerste toetskromme en „profiel” van 'n persoon oor die algemeen meer ooreenkoms met sy eie tweede toetskromme en „profiel” as met enige ander persoon s'n by die eerste of tweede toets toon.

Sewevierkanttoets

Hierdie toets is op 60 kwekelinge aan die Weermag-gimnasium toegepas; na verloop van 90 dae sal dit weereens toegepas word om die betroubaarheid van die toets te bepaal. Daarbenewens is 'n klein aantal normale persone en 50 skisofrene getoets. Die normale groep is op drie opeenvolgende dae getoets; voor, tydens en na toediening van lysergiensuurdiëtielamied (LSD-25). Die resultate is nog nie beskikbaar nie.

Die geldigheid en betroubaarheid van die toets word nog nagevors. 'n „Grammatika” is ingevoer, wat wesenlik uit 'n demonstrasie met voorbeelde en verduideliking van die vernaamste vorms van patroon-rangskikking van die vierkante op die toetspapier bestaan. 'n Sisteem van kwantitatiewe puntetoekenning is ontwerp, wat 'n skerp-omlynde „profiel” van 21 elemente lewer. Deur middel van objektiewe ooreenkomslyste kan die „profiel” in klasse ingedeel word. Die toets is aan 'n groep natuurellearbeiders toegepas met die opdrag „Maak 'n olifant”. 'n Interessante bevinding is dat die produksie van 'n normale regopposisie

Studies of the Pauli Test

Collection of data continued and the effects of dexedrine on test performance were investigated, using two matched groups each consisting of 32 students. The test group received 10 milligrams of dextro-amphetamine each and the control group a placebo. Dexedrine strongly affected the “slope” score, that is the increase in speed of performance, and decreased *errors*, both absolute and as a percentage of total performance. However, the number of *corrections* became more frequent under dexedrine. Retests on a small sample confirmed these findings.

An analysis of test results of 30 females and 30 males matched for age (mean age 19.6 years with the greatest age difference between the members of any one pair .08 years) indicated only one aspect of the curve to be more pronounced in males than in females, namely “convexity”. This finding is in agreement with questionnaire results reported by Eysenck (males more extrovert than females), and shows that males adapt more quickly and exert themselves more unreservedly than their female counterparts, at least in the Pauli Test situation.

On the basis of test results from 149 Non-European clerks provisional norms for the conversion of raw scores into stanine scores were established for six variables.

Test-retest “profiles” were compared. The results showed that an individual's first test curve and “profile” are in general much more similar to his own second test curve and “profile” than to those of any other person's first or second test.

Seven-squares Test

This test was administered to 60 pupils at the Military Gymnasium; after 90 days it will be re-administered to determine the reliability of the test. In addition 50 schizophrenics were tested and a small number of normal subjects. The latter were tested for three consecutive days before, during and after the administration of lysergic acid diethylamide (LSD-25). The results are not yet available.

Research continued into the reliability and validity of the test. A “grammar” was introduced, which is essentially a demonstration with examples and explanation of all principal forms of arranging the squares on the test sheet. A quantitative scoring system was developed, yielding a well-defined “profile” of 21 elements. The profiles can be grouped into types by means of objective similarity indices. The test was administered to a sample of Native labourers with the instruction “Make an Elephant”. An interesting finding was that the normal upright position of the pattern

in verband staan met die opvoedkundige peil van die toetsling, maar nie met sy telling op die Algemene Aanpassingsbattery nie.

Patroonvoltooiingstoets (Patco)

Hierdie toets is op 50 hoërskoolleerlinge toegepas tesame met die Meier-toets vir Kunsbeoordeling, 'n spesiale Kunsbelangstellings inventaris, die Persoonlikheidsinventaris van Willoughby en die Nuwe Suid-Afrikaanse Groepstoets vir Intelligensie. Punte deur die groep vir Kuns en algemene skoolprestasie verkry was beskikbaar. Die interkorrelasie tussen Patco- en ander tellings is nog nie beskikbaar nie.

'n Gekleurde vorm van die toets is ontwikkel vir die toetsing van kinders en ongeletterdes. Dit is op ongeletterde naturellemynwerkers, wat alreeds die toets van die Algemene Aanpassingsbattery afgeleë het, toegepas. Daar is bevind dat die aantal korrek opgeloste vrae beduidend hoër was by die gekleurde teenoor die monochroomvorm, en dat daar 'n bykans volmaakte verband bestaan tussen tellings by die Patco-toets en die Algemene Aanpassingsbatterytoets.

Gestaltvoltooiingstoets

Hierdie papier-en-potloodtoets is ontwerp om sommige van die moeilikhede wat natuurlike met waarneming en hoekediskriminasie ondervind na te vors. Tot dusver is dit op 150 toetslinge toegepas.

EKSPERIMENTELE ETNOPSIGOLOGIE

Sielkundige Ondersoeke van Kalahari-Boesmans

Twee lede van die Afdeling Toegepaste Eksperimentele Psigologie het die 1958-Ekspedisie van die Witwatersrandse Universiteit na die gebied besuide Ghanzi in Brits-Betsjoeanaland meegemaak. Die algemene doel was om biologiese en fisiologiese navorsing te doen, terwyl die personeellede van die Instituut wou bepaal of die Boesmans vatbaar was vir eenvoudige uitvoeringstoetse, watter toetse op hulle toegepas kon word en wat aangaande hulle sielkundige karaktertrekke uit hulle toetsprestasies afgelei kon word.

Een-en-tagtig swerwer-Boesmans is onderwerp aan die gekleurde vorm van die Patco-toets, die Voorwerpverhoudingstoets van Zilian, die Kleurblindheidskaarte van Ishihara en 'n spesiaal ontwerpte Sandteken-toets. Ses-en-veertig plaas-Boesmans is getoets met behulp van die Sinsbedrogwaarnemingsreeks van Herskovitz e.a. (die Sanderparallelogram en Poggen-dorffiguur uitgeslote), die Ishiharakaarte en 'n spesiale vorm van die Müller-Lyer-sinsbedrog. Daarbenewens is 16 swerwer-Boesmans met laaggenoemde getoets, en 8 prisoner-Boesmans met 'n Vormuikennings-toets. Een Boesman is getoets met die Kubuskonstruksietoets en 'n Sorteertoets („Konzentration-Verlaufstest") wat albei te moeilik bevind is vir algemene toepassing.

produced is correlated with the educational level of the subject, but not with his score on the General Adaptability Battery.

Pattern Completion (Patco) Test

This test was given to 50 High School pupils together with the Meier Art Judgement Test, a special Art Interest Inventory, the Willoughby Personality Inventory and the New South African Group Intelligence Test. The marks attained by the sample in Art and in general school performance were available. The results of the intercorrelation between Patco and other scores are not yet available.

A coloured version of the test was developed for the testing of children and illiterates, and applied to an illiterate Native mine worker sample, which had been tested on the General Adaptability Battery. It was found that the number of items correctly solved was significantly higher with the coloured than with the monochrome version, and that there was an almost perfect relationship between scores obtained on the Patco Test and the General Adaptability Battery.

Gestalt-Continuation Test

This paper and pencil test was designed to enquire into some of the difficulties experienced by Native subjects into the perception and discrimination of angles. To date it has been applied to 150 testees.

ETHNIC EXPERIMENTAL PSYCHOLOGY

Psychological Studies of Kalahari Bushmen

Two members of the Applied Experimental Psychology team participated in the 1958 Expedition organized by the University of the Witwatersrand to study Kalahari Bushmen in the area south of Ghanzi (Bechuanaland Protectorate) from various biological and physiological angles. The aim of the team from the Institute was to find out whether the Bushmen were amenable to simple performance testing, what tests could be applied to them, and what conclusions about the psychological characteristics of the Bushmen could be drawn from their test results.

Eighty-one nomadic Bushmen were tested with the coloured version of the Patco Test, Zilian's Object-Relations Test, the Ishihara Colour Blindness Cards and a specially designed Sand-drawing Test. Forty-six farm Bushmen were tested with the Perceptual Illusions Series of Herskovitz and others (omitting the Sander Parallelogram and the Poggen-dorf Illusion) the Ishihara Tables and a special version of the Müller-Lyer Illusion. In addition 16 nomadic Bushmen were tested with the last-mentioned, and 8 Bushmen prisoners with a Form Recognition Test. A single Bushman was tested with the Cube Construction Test and a Sorting Test ("Kon-

Daar is bevind dat toetse wat uitvoerige mondelinge instruksies vereis (soos die Kubuskonstruksie-, Sorteeren Sinsbedrogswaarnemingstoetse) slegs toegepas kan word indien 'n spesiaal opgeleide tolk beskikbaar is. Die Müller-Lyer-sinsbedrog het vir die Boesmans groot moeilikhede opgelewer, hoewel hulle die eerste vier toetse in die voorafgaande paragraaf gemeld met gemak kon hanteer. In die Sandtekeningtoets het hulle tekenings slegs die meesnoodsaaklike kenmerke bevat in teenstelling met dié van ongeletterde naturelle, wat geneig is om hulle tekenings met fyn besonderhede te oorlaai. Dikwels het die Boesmans tekenings gelewer wat ooreenkom met 'n dier se vel wat op die grond oorgespaalk lê, en 70% van hulle tekenings was in die „normale” of regop posisie.

Vir die meting van Boesman-intelligensie is die Patco- en Voorwerpverhoudingstoetse besonder geskik gevind. Die totale tellings by hierdie toetse het 'n korrelasie van .53 gelewer, waarskynlik weens elemente wat aan albei toetse gemeen is.



Sandtekeningtoets vir nomadiese Boesmans. 'n Jong vrou (24 jaar) by 'n tolk

Sand-drawing test for nomadic Bushmen. A young woman (24 years) with an interpreter

Gesigsbedrog

Behalwe die Boesmans is monstergroepe naturelle-mynwerkers en blanke voorgraadse universiteitstudente en gegradueerdes met die Müller-Lyer-figuur twee vorms van die Horisontale-Vertikale-gesigsbedrog, die Parallelogram van Sander en 'n perspektiewe gesigsbedrog-figuur van Poggendorff getoets. In toetse 1 en 3 het die nie-blanke groepe hulle minder as die blanke groepe deur gesigsbedrog laat beïnvloed. Hierdie resultate bevestig dié wat Rivers in 1901 by die Murray-eilandbewoners en die Todas verkry het. By toets 2 is die blanke groep minder as die nie-blankegroep beïnvloed.

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zentration—Verlaufstest”), both of which were found too difficult for general administration.

It was found that tests (such as Cube Construction, Sorting, and Perceptual Illusion Series) requiring elaborate verbal instructions can only be used if a specially trained interpreter is available. The Müller-Lyer Illusion presented great difficulties to the Bushmen, who could cope very well with the first four tests mentioned in the preceding paragraph. In the Sand-drawing Test they restricted their productions to the most essential features, in contrast to illiterate Natives, who tend to overload their productions with fine details. The Bushmen frequently produced pictures resembling an animal's skin stretched out on the ground, and 70% of their figures were in the “normal” or upright position.

The Patco and Object-Relations Tests were found very suitable for testing the intelligence of Bushmen. The overall scores on these tests yielded a correlation of .53, probably because of the common element(s) in both tests.

Visual Illusions

In addition to the Bushmen, samples of Native mine labourers and White University graduates and undergraduates were tested with the Müller-Lyer figure, Horizontal-Vertical Illusion (2 forms), Sander Parallelogram, a perspective illusion, Poggendorff figure. In tests 1 and 3 the pigmented samples were less influenced by illusion than the White sample. These findings corroborated those established by Rivers in 1901 on the Murray Islanders and Todas. The White group was

vloed, terwyl geen verskille opgemerk is in die waarneming van die perspektiewe sinsbedrog nie. By toets 1, 2 en 3 was die Boesmans se resultate tussen dié van die ander 2 groepe geleë. Weens die moeilikheid van toepassing is toetsing met die Poggendorff-figuur gestaak. Twee verdere studies behoort hierdie reeks op te volg; een op 'n Boesman-monstergroep en die ander op inheemse groepe op verskillende opvoedingspeile.

Vertolking van Prentemateriaal

'n Stel van 5 prente is ontwerp om te bepaal of proefpersone hulle as twee- of as drie-dimensionele prente vertolk. 'n Groep Naturelle bestaande uit ongeletterde mynwerkers, geletterde mynwerkers, ambagsmanne, mynkerke, voorgraadse studente en gegradueerdes, almal afkomstig van Suidelike-, Midde- en Oos-Afrika is willekeurig uitgesoek en ook 'n groep blanke laerskoolleerlinge.

Die ongeletterde en geletterde naturelle en die naturelle-ambagsmanne het die prente twee-dimensioneel vertolk, terwyl 40% van die klerklike groep met skoolopleiding van Vorm 3 en hoër drie-dimensionele vertolkings gegee het. Van die baie klein groep van voorgraadse naturelle studente en gegradueerdes het bykans 40% een of meer van die prente tweedimensioneel vertolk. Van die blanke laerskoolgroep het 12½% van Graad 1 drie-dimensionele vertolkings gegee. By hierdie groep het drie-dimensionele vertolking met die opvoedkundige vlak verbeter en 'n direkte verhouding tot intelligensiepeil geopenbaar. Verdere werk duur voort in verband met oorvleuelende werke, plekbeplanning en gesigspunt.

Groepsverskille

Soos onder die opskrif Toegepaste Eksperimentele Psigologie gemeld, is drie monstergroepe met 'n mosaiekttoets getoets. Verskillende kultuurgroepe het verskillende patrone gelewer, wat oor die algemeen by die ongeletterdes minder ordelik was. Verskille in opvoedkundige peil skyn een van die kulturele faktore te wees waaraan die verskille toegeskryf kan word.

Indiwiduele Verskille

'n Studie van indiwiduele persoonlikheidsverskille onder die inboorlingbevolking is met behulp van 'n woordassosiasietoets („Aufzähl“) en die 7-vierkantetoets onderneem. Die monstergroep het uit ongeletterde naturellemynwerkers bestaan, sommige van wie op grond van 'n sosiale interaksietoets (leierlose groepetoets) vir toesighoudende diens gekeur is.

Gebruiklike projekietoetsprosedures kon nie met veel sukses op hierdie groep toegepas word nie as gevolg van die agterstand deur twee-dimensionele vertolking meegebring, die probleme van toetstoepassing en die verkryging van rapport via tolke. Onder hierdie

less influenced than the others on test 2, while no differences were found in the perception of the perspective illusion. On tests 1, 2, 3 the result of the Bushmen fell between those of the other groups. Testing on the Poggendorff figure was abandoned because of difficulty of administration. Two additional studies should follow: one on a Bushman sample and the other on autochthonous samples of varying degrees of education.

Interpretation of Pictorial Material

A set of 5 pictures was designed to test whether subjects interpreted them as two-dimensional or three-dimensional pictures. Samples were Black illiterate mine labourers, literate mine labourers, artisans, mine clerks, undergraduates and graduates, and White primary school pupils. The first five samples came from Southern, Central and East Africa.

Illiterate, literate and artisan samples interpreted the pictures two-dimensionally, while 40% of the clerical sample of Form 3 and higher educational level gave three-dimensional interpretations. Of the very small sample of Black graduates and undergraduates almost 40% interpreted one or more of the pictures two-dimensionally. In the White primary school sample 12½% at the Grade 1 educational level gave three-dimensional interpretations. In this sample three-dimensional interpretation improved with educational level and appeared to be related directly to intelligence level. Further work is proceeding on overlapping cues, location and viewpoint.

Group Differences

As mentioned under Applied Experimental Psychology three samples were tested on a mosaic test. Different cultural samples produced different patterns, which were on the average less orderly for the illiterates. Educational differences appeared to be one cultural factor accounting for the difference.

Individual Difference

A study of individual personality differences among the autochthonous population was undertaken by means of a word association test („Aufzähl“) and the 7-Squares Test. The sample was composed of illiterate mine workers, some of whom had been selected for supervisory duties on a social interaction test (leaderless group test).

Conventional projective testing procedures did not prove very successful with these illiterates, because of the handicap of two-dimensional interpretation, of the difficulties of test administration and of establishing rapport through interpreters. However, under these

omstandighede het die 7-vierkante-toets egter weens die gemak van toepassing van nut geblyk te wees. Hierdie toets het alreeds tussen kultuurgroepe onderskei; die toekoms sal moet leer of dit tussen individue kan onderskei.

Verdere vraagstukke wat navorsing vereis is die verhouding tussen resultate by projektiewe persoonlikheidstoets vercry en persoonlikheidsbepalings op grond van die sosiale interaksiesituasie, die vasstelling van die bestaan al dan nie van individuele persoonlikheidsverskille in die tradisionele milieu van streng eise wat maatskaplike gelykvormigheid betref en die invloed van verstedeliking en opvoedkundige peil op die persoonlikheid.

TOEGEPASTE SOSIALE SIELKUNDE

Finansiële Aansporingskemas

Ontleding van gegewens vercry deur vraelyste deur die pos aan Suid-Afrikaanse sekondêre nywerhede te sirkuleer het aangetoon dat aansporingslone merendeels op arbeiders en in 'n geringer mate op ambagsmanne van toepassing is. Verdere bevindings is as volg:—

Aansporingskemas is gebruik in bedrywe ongeag die aantal werknemers; die meeste vervaardigers is nie van voorneme om hulle skemas uit te brei na ander departemente of werkerskategorieë nie; by die meeste vervaardigers was aansporingskemas vir 4 jaar of minder in swang; die meeste vervaardigers pas 'n individuele bonussisteen toe, terwyl die groepbonus volgende op die lys staan, hoewel sommige nyweraars albei toepas; diegene wat verantwoordelik is vir die ontwikkeling van aansporingskemas het oor die algemeen nie oor spesiale opleiding of ondervinding beskik nie; die merendeel van die nyweraars het hulle werknemers geraadpleeg vóór die instelling van aansporingslone en die meeste werknemers was heeltemaal inskiklik toe hulle geraadpleeg is.

Die meeste vervaardigers het dit onnodig gevind om hulle finansiële aansporingskemas na invoering daarvan te wysig. Dié wat wel hulle skemas gewysig het, het die volgende redes aangevoer:—

Om werknemers tevrede te stel en te behou; weens veranderings in die tipe produk of aard van werk; omdat die oorspronklike waardebeplanning vir 'n taak of te hoog of te laag gestel is; weens veranderings in die massaproduksiemetodes of in individuele taakuitvoering.

Van die bedrywe wat die vraelys beantwoord het, het 74% geen voorneme gehad om aansporingslone in te voer nie, 4% was voornemens om die gebruik daarvan af te skaf, terwyl 7% voornemens was om hulle in te voer en 15% het reeds daarvan gebruik gemaak.

conditions the 7-Squares proved useful because of its ease of administration. This test has differentiated among cultural groups; it remains to be seen whether it will differentiate individually.

Further questions to be investigated are the relationship between personality projective test results and personality assessments based on the social interaction situation, the determination whether individual personality differences exist in the autochthonous population under its traditional setting of rigid social conformity demands, and the influence of urbanization and educational level on personality.

APPLIED SOCIAL PSYCHOLOGY

Financial Incentive Schemes

An analysis of data on financial incentive schemes obtained by means of a postal survey from South African secondary industry indicated that incentive payment applied mostly to operatives and to a lesser extent to artisans. Further findings were that:—

Incentive schemes were used in establishments regardless of the number of staff employed; most producers had no intention of extending their incentive schemes to other departments or categories of workers; in the majority of producing establishments incentive schemes had been in operation for four years or less; the majority of producers applied an individual bonus system, with a group bonus system next in order of popularity, although some producers applied both systems; those responsible for the development of incentive schemes were generally not specially trained or experienced men in this field; the majority of producers had consulted their employees prior to introducing incentives; the majority of employees had been completely co-operative when so consulted.

Most of the producers found it unnecessary to amend their financial incentive schemes after their introduction. Those producers who had amended their schemes did so for the following reasons:—

To satisfy and retain employees; because of changes in the type of product or the nature of the work; because of original rate setting being either too high or too low; because of changes in the assembly line production methods or in an individual work operation.

Of the industries responding to the questionnaire 74% had no intention of introducing financial schemes, 4% intended discontinuing their use, while 7% intended introducing them and 15% were using them already.

Werkhoudings en Persoonlikheidsamestelling

'n Poging is aangewend om die mate te bepaal waartoe persoonlikheidsamestelling werkhoudings oor die algemeen en werkstevredenheid in die besonder sou beïnvloed. Oor die algemeen is by vorige navorsingswerk aanvaar dat werkhoudings die gevolg was van werksomgewing, en dat die bestuur dus uitsluitlik verantwoordelik was vir die verkryging van werkstevredenheid onder die werkers. Die studie van die Instituut het berus op die aanname dat daar mense mag wees wat vatbaar is vir ontevredenheid en swak moraal, *ongeag van werksomstandighede*.

Die proefstudie het 'n groot aantal persone aangedui wat „onsekerheidsangs” besit, ongeag hul werksomstandighede. Sulke persone mag besonder geneig wees om bedreig te voel en om ongunstig op geringe prikkels wat uit die werk voortspruit, te reageer. 'n Belangrike bevinding aangaande aansporingslone is dat sulke skemas gemaklik produksie kan belemmer, of 'n bron van sterk ontevredenheid kan uitmaak, wanneer die werkers nie die werking van die skemas begryp nie of hulle in een of ander opsig as onregverdig beskou.

Opleidingsprogram vir Personeelbeamptes

Twee kursusse is saamgestel vir die opleiding van die pas-aangestelde Personeelbeamptes van die Johannesburgse Stadsraad. Die Onderhoudopleidingskursus is beplan om alle leerlinge in staat te stel om aan werklike onderhoudsituasies deel te neem soortgelyk aan dié wat hulle moontlik tydens hulle daaglikse werk sal teekom. Die grondidee van die rolspeeltegniek is dat elke leerling om die beurt as leier van, en deelnemer aan die onderhoud optree, en daarna die kritiek van die res van die groep aanhoor aangaande sy optrede tydens die onderhoud.

Die Opleidingskursus in Menslike Verhoudings is ontwerp om leerlinge 'n beter insig in sekere aspekte van die werksituasie te gee, soos die invloed van menslike verhoudings op die doeltreffendheid van 'n werks-groep, die oorsake en hantering van spannings en botsings tussen persone en groepe.

Nywerheidshof: Aansporingslone

Hulp is verleen by die opstel van 'n memorandum aan die Sekretaris van die Nywerheidshof van die Departement van Arbeid in verband met aansporingslone in Suid-Afrika.

DEMOGRAFIE

Boek oor Demografiese Opnames

Die finale verslag van die opnames in Kaapstad, Durban, Port-Elizabeth, Germiston en Vereeniging sal in boekvorm verskyn.

Work Attitudes and Personality Dimensions

An attempt was made to determine the extent to which personality structure might influence work attitudes in general and job satisfaction in particular. Previous research had in the main assumed that work attitudes were the result of the work environment, and that, therefore, management was entirely responsible for ensuring the job satisfaction of workers. The study conducted by the Institute was based on the assumption that there may be individuals who are prone to dissatisfaction and poor morale, *irrespective of the conditions under which they work*.

The pilot study identified many individuals as possessing “anxious-insecurity”, no matter under what conditions they worked. Such persons may be particularly prone to feel threatened, and to react unfavourably to minor irritations arising from their work. An important finding relating to incentives was that such schemes can easily act as a “disincentive” to production, or become a strong dissatisfaction, if workers do not understand how the schemes work, or regard them as being unfair in some way or another.

Training Programme for Establishment Officers

Two courses were drawn up for training the newly appointed Establishment Officers of the Johannesburg City Council. The Interview Training Course was planned to enable all trainees to participate in actual interview situations such as they are likely to encounter in their daily task. The basic idea underlying this role-playing technique is that each trainee acts once as interviewer and once as interviewee and then hears criticism from the remainder of the group regarding the way in which the interview was conducted.

The Human Relations Training Course was designed to make trainees more perceptive of certain aspects of the work situation, such as the influence of human interrelationships on the efficiency of a work group, the causes of interpersonal and intergroup tension and conflict, and the handling of such tension and conflict.

Industrial Tribunal: Wage Incentives

Assistance was given in the preparation of a memorandum to the Secretary of the Industrial Tribunal of the Department of Labour on the subject of wage incentive schemes in South African Industries.

DEMOGRAPHY

Book on Demographic Surveys

A final version of the surveys conducted in Cape Town, Durban, Port Elizabeth, Germiston and Vereeniging will appear in book form.

Behuisingsbehoefes van Blankes

'n Studie is gemaak van huisgesinne waar die inkomste van die man minder as £70 per maand was (insluitende bydraes van werkende kinders en Ioseerders en kosgangers, maar uitsluitende enige verdienste van die huisvrou), dit wil sê huisgesinne wat binne die bestek val van skemas deur die Nasionale Behuisingskantoor gefinansier. Die vermoë van die blanke bevolking om huishuur te betaal is bereken in terme van 'n minimum bestaansgrens, en die huisgesinne van die laagste sosio-ekonomiese status is in die drie grootste stede van die Unie (Johannesburg, Kaapstad, Durban) bestudeer.

'n Finale verslag oor die ontleding word voorberei.

Mannekragopname

Die verwerking van gegewens het voortgeduur. Vir 'n voorlopige verslag is 'n ontleding voorberei van 'n toevallige, gestratifiseerde monster van 1,600 eerste vraelyste, 'n ooreenstemmende monster van 1,600 tweede vraelyste en tellings behaal op uitgesoekte toetse van die Algemene Siftings- en Klassifiseringstoetsbatterij. Die monsters is getrek en 'n verslag word ogestel.

Tydens 1959 sal 'n derde opvolgvraelys aan 2,500 manskappe wat militêre opleiding ondergaan ter beantwoording voorgelê word. Dit sal 'n studie moontlik maak van veranderinge wat by die manskappe ten opsigte van aspirasies en prestasie ingetree het sedert die eerste vraelys vier jaar gelede aan hul voorgelê is.

Behuisingsbehoefes van die Kleurlingbevolking

Hierdie opname is onderneem ten behoeve van die Nasionale Bounavorsingsinstituut namens die Nasionale Behuisingskantoor en is daarop gerig om behuisingsbehoefes van die Kleurlingbevolking vas te stel ten opsigte van woonhuistipes, vermoë om huishuur te betaal, lewensgewoontes en voorkeurhoudings insake behuising. Die veldwerk is beplan om die kleiner stedelike gebied van die winterreënvalgebied te dek wat tydens die sensus van 1951 'n Kleurling- of Maleierinwonertal van meer as 2,000 gehad het. 'n Personeellid van die Instituut het die dorpe besoek om die probleme aan die veldwerk verbonde te bepaal (Somerset-Wes, Stellenbosch, die Strand, Paarl, Wellington en Ceres).

Algemeen

'n Voorlopige opname van die behuisingsbehoefes van Indiërs in Durban is gemaak, en hulp is aan 'n Regeringskommissie verleen by die opstel van vraelyste in verband met ingenieursopleiding. 'n Probleem wat nog navorsing vereis, is die klassifisering van gebiede en dorpe in die Unie op 'n stedelik-plattelandse basis.

European Housing Requirements

A study was made of households where the income of the male head (including contributions by working children and boarders and lodgers, but excluding any salary earned by wife) was less than £70 per month, that is households falling within the schemes financed by the National Housing Office. The rent paying ability of the White population in terms of a poverty datum line was estimated, and a study of the lowest socio-economic status households in the three largest cities of the Union (Johannesburg, Cape Town, Durban) was made.

A final report on the analysis is being prepared.

Manpower Survey

The raw data processing continued. An analysis was prepared for an interim report, based on a random stratified sample of 1,600 first questionnaires, a corresponding sample of 1,600 second questionnaires and scores for selected tests from the General Screening and Classificatory Test Battery. These samples were drawn and a report is being prepared.

During 1959 a third follow-up questionnaire will be administered to 2,500 men undergoing military training. This will enable a study to be made of changes in the aspirations and achievements which have taken place in the men since the first questionnaire was administered four years ago.

Coloured Housing Requirements

This survey, undertaken on behalf of the National Building Research Institute for the National Housing Office, aims at revealing the housing requirements of the Coloureds, in terms of types of dwellings, rent paying ability, living habits and housing preferences. Field work was planned for the smaller towns of the winter rainfall area, which had at the time of the 1951 census a Coloured or Malay population exceeding 2,000. A member of the Institute staff visited the towns chosen (Somerset West, Stellenbosch, Strand, Paarl, Wellington and Ceres) to assess field work problems.

General

A preliminary survey of Indian housing requirements in Durban was made and assistance was given to a Government Commission in drafting their questionnaires on the training of engineers. A problem awaiting study is that of classifying areas and towns in South Africa on a rural-urban basis. Arrangements were

Met die Departement Aardrykskunde van die Natalse Universiteit (Durbantak) is reëlings getref om insae te verkry van die gegewens aldaar beskikbaar aangaande 'n stedelike hierargie.

SOSIALE ETNOPSIGOLOGIE

Navorsing oor Bantoeikinderontwikkeling

Hierdie lengtestudie is gemoeid met die uitwerking van kulturele en voedingstoestande op liggaamlike en intellektuele ontwikkeling. Dit vereis die konstruksie van ontwikkelingskole vir suiglinge en die meting van prestasie op hierdie skale in verhouding tot voeding, sosio-ekonomiese faktore, intelligensie van ouers, skoolonderrig en verstedeliking, sowel as kindgrootmaakpraktyke.

Werk in verband met die opstel van suiglingsskale en die opleiding van personeel vir die toepassing daarvan is voortgesit. Die reaksieskedule vir die ouderdomsgroep 7-12 maande is opgestel, en maatstawwe vir die aanteken van items vir die skale 0-12 maande is bepaal. Die radikale verandering van die toetsprosedure het 'n groot verbetering in die babas se reaksies teenoor die hele toetsituasie teweeggebring. Toetsing ter verkryging van normatiewe gegewens is voltooi vir 164 suiglinge in die groep 7-12 maande.

Geen vordering is gemaak met die voedingsaspekte van die studie nie. Daar is besluit om 'n gekontroleerde proef uit te voer deur die dieët van die helfte van die swanger vroue tydens die laaste drie maande van swangerskap aan te vul. Hierdie benadering is op die uitkakeling van die insameling van voedingsdata gerig aangesien die geselekteerde moeders voldoende hoë-graadse proteïene sou ontvang om enige tekortkominge aan te vul. Sommige voedingsdeskundiges het dit betwyfel dat die voeding van moeders gedurende die 3-trimester enige uitwerking op die *intellektuele* peil van kinders kon hê. Die volle ontplooiing van die navorsing (veral die voedingsopname) is deur die tekort aan personeel aan bande gelê. 'n Voorlopige opname word nou in die vooruitsig gestel om vas te stel op watter wyse die lengtestudie beperk moet word om dit binne die perke van beskikbare personeel te bring.

Opname van Naturelletrekarbeiders

'n Studie van die werksmotivering van naturelletrekarbeiders is voltooi. In die stedelike gebiede is onderhoude met 'n groot monstergroep naturelle-mans, wat vir beperkte tye op kontrak aangestel is, gevoer om die rede vir hulle bepaalde trekpatroon en werkkeuse te bepaal. 'n Opvolgstudie is in die stamgebiede van herkoms uitgevoer na aanleiding van die gegewens deur die stedelike studie opgelewer. Sodoende kon 'n beeld verkry word van die sosio-ekonomiese

made with the Geography Department of the University of Natal (Durban branch) to have access to data collected in a study on urban hierarchy.

SOCIAL ETHNO-PSYCHOLOGY

Developmental Studies of Bantu Children

This longitudinal study concerns the effect of cultural and nutritional conditions on physical and mental development. It involves the construction of infant development scales and the measurement of performance on these scales relative to nutrition, socio-economic factors, parental intelligence, education and urbanisation, as well as child rearing practices.

Work continued on the construction of infant scales and the training of staff in the administration of these scales. The response schedule for the 7-12 age group was drawn up, and the criteria for recording items on the 0-12 months scales were laid down. A great improvement in the response of the babies to the test situation as a whole was noted as a result of radical alteration in the test procedure. Testing for normative data was completed for 164 infants in the 7-12 months age group.

No progress was made with the nutritional aspect of the study. A decision was made to conduct a controlled experiment by feeding half of the pregnant women during the third trimester. This approach aimed at dispensing with the collection of nutritional data, as the selected mothers would be fed sufficient high-grade protein to make good any deficiencies. Some nutritionists queried whether feeding mothers during the third trimester would have any influence on the *mental* development of the infant. Staff limitations prevented the full development of the project, more particularly the dietary survey. It is now intended to conduct a preliminary survey to determine in which way the longitudinal study may be limited in order to bring it within the staff resources available to the Institute.

Migratory Native Labour

A study of the work motivation of migratory Native labour was completed. In urban areas a large sample of men employed on contract for limited periods was interviewed to find the reason for their particular migratory pattern and for their choice of employment. The information obtained in this urban survey was followed up in the tribal areas from which these migrants were drawn. A picture of the socio-economic and cultural circumstances determining migration was

en kulturele determinante van trekarbeiders. Een van die vernaamste bevindings was dat die motivering van trekarbeiders steeds sterk gerig is op die kleinboerlewe in 'n stamverband, en dat werk buite hierdie sfeer slegs 'n tussenbedryf uitmaak, wat geensins die basiese motivering om 'n tradisionele leefwyse te bestendig, verander nie.

Diensversuim en Personeelwisseling by Blanke Werkers

Hierdie navorsing van die menslike faktore wat produktiwiteit as gevolg van diensversuim en personeelwisseling beïnvloed geskied in medewerking met die Raad vir Tegniese Samewerking in Afrika besuide die Sahara. Die doel is om 'n groot verskeidenheid faktore te bestudeer, wat die gedrag van natuurlike-arbeiders in die industrie raak. Bestuursbeleid en die vertolking daarvan in die werksituasie is bestudeer. Die houding en optrede van eerstelinietoesighouers, wat daagliks in kontak met natuurlikewerkers kom, is veral belangrik. Vanaf begin 1959 is aantekeninge in 12 nywerhede gehou, wat 'n monstergroep van 6,000 omvat, van wie met 1,200 onderhoude gevoer sal word om inligting te bekom aangaande hulle sosio-ekonomiese agtergrond, aspirasies en mate van industrialisering en verstedeliking.

Die gedeelte van die opname wat deur die Unie behartig sal word, is beperk tot bouwerk en konstruksie en sekondêre nywerhede, insluitende vervaardigers van glas, tekstiel, metaalhouers, chemikalieë, motorvoertuie en tabakprodukte. Sowel kus- as binnelandse bedrywe word gedek, en 'n uitgebreide reeks ambagte word geraak. Benewens die insameling van statistiese gegewens, sal inligting ingewin word aangaande demografiese, sosiologiese en sielkundige faktore wat waarskynlik bedryfsmobiliteit en diensversuim beïnvloed. Die inligting word van bestaande aantekeninge verkry, asook deur middel van individuele onderhoude, groepbesprekings en sielkundige toetse.

PSIGOFISIOLOGIE

Een van die vernaamste doelstellings van die Instituut op hierdie studiegebied is om die aard van temperament, veral die basiese neurofisiologie daarvan, te verklaar. In die verlede is hierdie werk veral deur kruiskorrelasie-metodes verrig; maar hierdie metodes vorm slegs leidrade by wyse van afleiding ten opsigte van die meganismes wat temperamentsverskille bepaal. Tydens die afgelope jaar het die klem op die hoofsaaklik kliniese studie van individuele geval eerder as op die korrelasie-ontledings van tellings verkry van groot aantalle proefpersone in 'n verskeidenheid van toetse. Hierdie verandering in metodologie is veral te sien in die navorsing op die gebied van die psigotonaboeters.

obtained. One of the principal findings was that this type of labour remains strongly motivated towards peasant life in a tribal context and that work away from this sphere is merely an interlude, which does not alter the basic motivation to continue a traditional way of life.

Absenteeism and Labour Turnover among White Operatives

This study concerning the human factors affecting productivity in relation to absenteeism and labour turnover is being conducted as a joint project of the Council for Technical Co-operation for Africa South of the Sahara. The aim is to investigate a wide range of factors which may influence the industrial behaviour of the Native labour force. Managerial policy and its interpretation in the actual work situation were assessed. Especially important are the attitudes and behaviour of first line supervisors who are in constant contact with Native workers. Recordkeeping began in 12 industries from the beginning of 1959, covering a sample of 6,000 men, of whom 1,200 will be interviewed for information concerning their socio-economic background, aspirations and degree of industrialization and urbanization.

The Union's part of the survey is limited to building and construction enterprises and to secondary industries, including manufacturers of glass, textiles, metal containers, chemicals, motor vehicles and tobacco products. Both coastal and inland establishments are covered, and an extensive range of skills is involved. In addition to statistical records, information will be collected on the demographic, sociological and psychological factors likely to influence occupational mobility and absence behaviour. The information will be collected from existing records and by means of individual interviews, group discussions and psychological tests.

PSYCHOPHYSIOLOGY

One of the main endeavours of the Institute in this field has been the elucidation of the nature of temperament, particularly its basic neurophysiology. In the past this work has been done mainly by cross-correlational methods; but such correlational methods give only inferential clues as to the mechanisms underlying differences in temperament. During the past year emphasis was placed on the clinical study of individuals rather than on correlational analyses of scores obtained from large numbers of subjects on a variety of tests. This change in methodology is seen most clearly in the studies dealing with the psychotomimetica.

Psigotonabootsende Verdowingsmiddels

Navorsing om die fisiologiese en sielkundige uitwerking van middels soos lysergiensuur-diëtielamied (LSD 25) en meskaliane te bepaal, is hervat en 4 proewe is uitgevoer wat elk drie dae in beslag geneem het, waartydens die volgende veranderlikes bestudeer is: elektroënkefalogram, drumpels van skynbare beweging, reaksies teenoor ligstimulering, drumpels vir tweeflits-samesmelting, kondisionering van reaksies op ligstimulering, syfer-span (Wechsler-Bellevue), 7-vierkanttoets, Wartegg-toets, bloedchemie, bloeddruk, polsslag, psigiatriese reaksies, en verbale prestasie en subjektiewe reaksies; laasgenoemdes is deurgaans op magnetiese band geregistreer. Al bogenoemde waarnemings is op die dag vóór toediening van die middel gedoen en weereens op die „eksperimentele” dag. Op die derde dag het die proefpersoon 'n beskrywing van sy ondervindings gelees, en is hy noukeurig uitgevra. Die aanwesige psigiater was prof. L. A. Hurst van die Witwatersrandse Universiteit, terwyl dr. J. Harington van die Pneumokoniosenavorsingslaboratorium die biochemiese ondersoek behartig het.

Die gegewens verkry dra by tot die studie van die elektriese aktiwiteit van die brein in verband met die organisasie en funksies van geestesprosesse, met bepaalde verwysing na die rol van die temperamentveranderlike van Primêre-Sekondêre Funksie. Dit skyn asof die Sekondêre Funksie bemiddel word deur die nie-spesifieke, diffuse netwerksisteem van die breinstam en thalamus, terwyl die Primêre Funksie ontstaan as gevolg van inkomende impulse wat via die spesifieke sisteem direk op die korteks geprojekteer word. Dit skyn dat middels soos lysergiensuur en meskaliane hierdie twee sisteme sodanig reguleer dat 'n aansienlike vermindering in die modulerende invloed van Sekondêre Funksie teweeggebring word, waardeur die organisme dan aan die genade van onbeteuelde Primêre Funksie oorgelewer word. Die proewe is ontwerp om te bepaal of die hipotese in sy huidige vorm voldoende is (wat waarskynlik nie die geval is nie), en om vas te stel hoe die twee sisteme deur die psigotonaboosers geaffekteer word.

Apparaat om Visuele Reaksie te Bepaal

Hierdie apparaat, wat met die hulp van die Sentrale Werkwinkel ontwerp is, bied 6 visuele patrone in toevallige volgorde aan die proefpersoon, van wie verwag word om 'n ooreenstemmende sleutel af te druk. Elke stimulus bly op die skerm totdat die gepaste reaksie plaasvind. Die reaksietyd en die korrekte en inkorrekte reaksies word outomaties aangeteken.

Die hipotese is gestel dat 'n reeksdiskriminasietoets van hierdie aard meer lig sou werp op die verhouding tussen alfaritmie en die waarnemingsnelheid en gedrag. Voorlopige ontleding van gegewens van 30 proefpersone

Psychotomimetic Drugs

Research into the physiological and psychological effects of drugs such as lysergic acid diethylamide (LSD-25) and mescaline was resumed and 4 experiments were carried out, each lasting 3 days, during which the following variables were studied: Electroencephalogram, apparent movement thresholds, responses to single light flashes, two-flash fusion thresholds, conditioning of responses to photic stimulation, digit-span (Wechsler-Bellevue), 7-Squares Test, Wartegg Test, blood chemistry, blood pressure, pulse rate, psychiatric reaction, and verbal output and subjective reactions, which were recorded continuously on magnetic tape. All the above observations were made on the day prior to the ingestion of the drug and again on the “experimental” day. On the third day the subject read his account of his experiences and was carefully cross-questioned and interviewed. Prof. L. A. Hurst of the Witwatersrand University was the psychiatrist in attendance, while Dr. J. Harington of the Pneumoconiosis Research Laboratory conducted the biochemical investigations.

The data obtained contribute to the study of the electrical activity of the brain in relation to mental processes and the organisation of mind, with particular reference to the role of the temperament variable Primary-Secondary Function. Secondary Function appears to be mediated by the nonspecific, diffuse reticular system of the brain stem and thalamus, whereas Primary Function arises as a result of signals arriving via the specific system projecting directly on the cortex. It is suggested that drugs such as lysergic acid and mescaline affect these two systems in such a way as to reduce markedly the modulating influence of Secondary Function, rendering the organism at the mercy of unrestrained Primary Function. The experiments were designed to test whether the hypothesis is adequate as it stands—which it probably is not—and to establish how the two systems are affected.

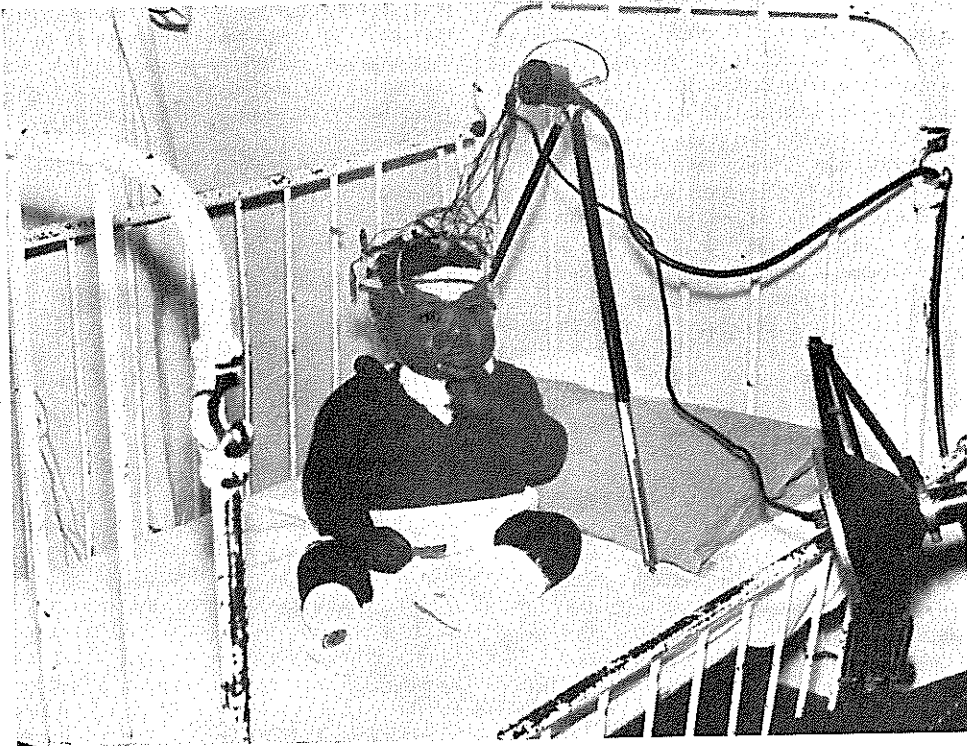
Visual Reaction Apparatus

This apparatus, which was designed with the aid of the Central Workshops, presents 6 visual patterns in random order to the subject, who is required to press a corresponding key. Each stimulus remains on the screen until the appropriate response has been made. Reaction time and the correct and incorrect responses are registered automatically.

It was hypothesised that a serial discrimination task of this kind would throw further light on the relationship between alpha rhythm and speed of perception and behaviour. However, preliminary analysis of data

het egter geen beduidende korrelasie tussen prestasie by hierdie toets en alfafrekwenste aangedui nie. Verdere ontleding van die gegewens word uitgevoer en 'n voorlopige verslag word voorberei.

from 30 subjects failed to reveal a significant relationship between performance on this test and alpha frequency. Further analysis is in progress and a preliminary report is in preparation.



Tweejarige pasient met korrelvoet ondergaan EEG-ondersoek in vergelyking met Kwasiorkor-pasient

Patient aged two years with club feet undergoing EEG examination for comparison with Kwashiorkor patient

Breintritmes en Kinderontwikkeling

'n Nuwe projek, in medewerking met die Kleuterskoolopleidingsentrum van die Witwatersrandse Tegniese Kollege beoog die vasstelling van die verwantskap tussen reeksveranderinge in die elektroënkefalogramme van kinders van 3-5 jaar oud met hulle intellektuele en psigomotoriese ontwikkeling. Vier elektroënkefalogramme sal jaarliks vir 1-2 jaar van elk van 'n monstergroep kinders opgeneem word. Hierdie metings sal vergelyk word met tellings behaal by eenvoudige motoriese en waarnemingstoetse van die Gesell-tipe, intelligensietoetse, opeenvolgende aanpassingsbeoordelings, en waardebepalings aangaande aanpassingspeil in die Kleuterskool. Agt-en-vyftig elektroënkefalogramme is tot dusver geregistreer.

Brain Rhythms and Child Development

A new project, in collaboration with the Nursery School Training Centre of the Witwatersrand Technical College, aims to relate serial changes in the electroencephalograms of 3-5 year old children with mental and psychomotor development. A sample of children will undergo 4 electroencephalograms per year for 1-2 years. These measures will be compared with scores of simple motor and perceptual tests of the Gesell type, intelligence test scores, serial adaptation ratings and assessment of level of adjustment at the Nursery School. Fifty-eight electroencephalograms have been recorded.

Narkose, Suurstofgebrek, Doodgaan en die Elektroënkefalograaf

Die Instituut is versoek om behulpsaam te wees met die ontwikkeling van 'n waarskuwingstegniek, met die gebruik van die elektroënkefalogram, vir die oophart-operasie, in medewerking met die Baragwanath-hospitaal en die Mediese Skool van die Witwatersrandse Universiteit. Aangesien die gewone middels vir beoordeling van die pasiënt se toestand (polsslag en respirasiespoed) tydens die operasie afwesig is, is die elektroënkefalogram een van die weinige oorblywende kriteria van lewe, en is dit bekend as indikator van die graad van narkose en van suurstoftoevoer.

Tien sodanige operasies is op honde uitgevoer (waar van 3 gevrek het) terwyl elektroënkefalogramme en gelyktydige elektrokardiogramme geregistreer is. Hierdie proewe het belangrike inligting verskaf aangaande die kenmerke van die elektroënkefalogram op die laer punt van die serebralewaaksameheidskontinuum.

Alfaritme en Snelheid van Oogbewegings

Die verslag wat in 1958 gepubliseer is, het die volgende resultate aan die lig gebring: Duur van skielike oogbeweging is positief gekorrelleer met fikseertyd, terwyl geen beduidende korrelasie bepaal is tussen enige elektroënkefalografiese veranderlikes en hoeksnelheid van oogbeweging of fikseertyd nie. Laasgenoemde twee het egter beduidend gekorrelleer met totale aantal en spitsaantal optellings in die Pauli-toets, terwyl tellings by die Nuwe Suid-Afrikaanse Groepsintelligensietoets beduidend gekorrelleer het met fikseertyd, maar nie met die hoeksnelheid van oogbeweging nie.

Verskillende Studies

Ander studies was toegespits op die bepaling van die verhouding tussen die elektroënkefalogram en faktore soos: skynbare beweging, wanvoeding, kinderontwikkeling, motoriese aktiwiteit, subjektiewe gewaarwording tydens flikkering, en daaglikse sielkundige en fisiologiese fluktuasies. Tydens die jaar is 188 elektroënkefalogramme geregistreer.

PSIGOMETRIE

Beroepsvoorligtingstoetsbattery vir Departement van Arbeid

Bykans 3,000 persone is getoets om gegewens te verkry vir die finale vorm van 8 toetse (wat almal verkort is) in 'n battery wat binnekort aan die 10 grootste sentra van die Unie uitgedeel sal word. Alle toetse kan binne 'n halfuur toegepas word, sodat die totale battery binne die bestek van 3-4 uur toegepas kan word. 'n Handleiding vir gebruik van die battery is voorberei, nadat batterygewigte en veelvoudige korrelasies vir sekere toetse bereken is.

Anaesthesia, Anoxia, Death and the Electroencephalograph

The Institute was asked to assist in developing a monitoring technique, using the electroencephalogram, for the heart-lung by-pass operation, in collaboration with the Baragwanath Hospital and the Medical School of the University of the Witwatersrand. As the ordinary measures for assessing the state of the patient (pulse and respiration rate) are absent during this operation, the electroencephalogram is one of the few remaining criteria of life and is known to show variations with depth of anaesthesia and level of oxygenation.

Ten such operations were performed on dogs (of which 3 died) while electroencephalograms and simultaneous electrocardiograms were recorded. These experiments provided important information on the characteristics of the electroencephalogram in the lower end of the continuum of cerebral vigilance.

Alpha Rhythm and Speed of Eye-movements

The report published in 1958 revealed the following results: Saccadic duration was positively correlated with fixation time, while no significant correlation was established between any electroencephalographic variables and saccadic speed or fixation time. However, saccadic speed and fixation correlated significantly with total number and peak number of additions on the Pauli Test, while scores on the New South African Group Intelligence Test correlated significantly with fixation time, but not with saccadic speed.

Various Studies

Other studies included the relationship between the electroencephalogram and such factors as apparent movement, malnutrition, child development, motor activity, subjective sensations during flicker, and daily psychological and physiological fluctuations. During the year 188 electroencephalograms were recorded.

PSYCHOMETRICS

Vocational Guidance Test Battery for Labour Department

Nearly 3,000 individuals were tested in order to obtain data for the final forms of 8 tests, all of which were shortened, in a battery which will soon be distributed to the 10 major centres of the Union. All tests can be administered in half-an-hour, so that the entire test battery can be administered in 3-4 hours. An instruction manual for the administration of the battery was prepared after battery weights and multiple correlations had been computed for certain tests.

Die standaardisasie en validering van die toets-battery moet nog voltooi word nadat roupuntetellings van die verskillende sentra beskikbaar word.

Standaardisasie van die Wechsler-Bellevue-toets

Werk aan hierdie projek is in verskeie dele van die land voortgesit. Daar is besluit om geen veranderings in die tydskedule vir die vorm wat die Departement van Arbeid gebruik, aan te bring nie, maar om eerder sommige van die minder onderskeidende praktiese toetse weg te laat.

Nuwe Suid-Afrikaanse Groepsintelligensietoets

Die Buro vir Opvoedkundige en Maatskaplike Navorsing wat vir die konstruksie en standaardisasie van hierdie toets verantwoordelik is, het verskille in prestasie by toets by die twee taalgroepe gevind. Volgens die mening van die Buro het dit die gebruik van onafhanklike, aparte norme geregtig. Materiaal deur die Buro verskaf is ondersoek. Dit het getoon dat daar beduidende verskille bestaan in gemiddeldes by die Nie-verbale Toets behaal, wat identies is vir albei groepe. Daar is ook beduidende verskille in dieselfde rigting gevind vir die gemiddeldes van alle kriteria. Daar is bevestig dat die gebruik van 'n enkele standaard (in dié geval die Afrikaanse een) vir albei groepe geensins die validiteitskoëffisiënte vir die Engelse groep alleen of vir die gekombineerde groep verminder nie.

Nuwe Norms vir Nie-blanke Bevolkings

Nuwe norms vir nie-blanke bevolkings is uitgewerk vir geskikte toetse van verstandelike wakkerheid, taalprestasie en rekenaarsleg. Weens die groot getalle nie-blankes wat tans in klerklike en ander verantwoordelike poste aangestel word, byvoorbeeld in munisipale departemente vir nie-blanke sake, is die konstruksie van doeltreffende keuringstegnieke en toereikende standaarde vir vergelyking, 'n saak van toenemende belang.

Blokkietoets

'n Nuwe oorspronklike toets wat na verwagting 'n meetmiddel vir waarneming in drie dimensies sal uitmaak, is op 'n monstergroep argitekte en ander persone beproef. Navorsing van hierdie toets duur voort.

Psigometriese Metodes

Spesiale waarskynlikheidsgrafiekpapier is ontwerp en gedruk. Metodes is ontwerp, wat nie alleen genormaliseerde standaardtellings gelewer het nie, maar ook uitvoerige inligting aangaande kurtose, skeefheid, omvang en gevoeligheid van tellings.

Navorsing is uitgevoer aangaande korreksie vir lukraak antwoorde op vrae met veelvuldige keuse; hierdie navorsing het gelei tot toetse vir chi-kwadraat en nomograwe wat mens in staat stel om elke prent op sy

The standardization and validation of the test battery now remains to be done when raw scores from the various centres become available.

Wechsler-Bellevue Standardization

Work on this project continued in several areas of the country. It was decided not to alter time credits for the form used by the Department of Labour, but rather to omit some of the less discriminative practical tests.

New South African Group Intelligence Test

The Bureau for Educational and Social Research, responsible for the construction and standardization of this test, found differences in the performance of the two language groups. This they considered to justify the use of independent and separate norms. Material supplied by the Bureau was examined. It showed that there were significant differences between means obtained on the Non-Verbal test, which is identical for both groups. However, significant differences in the same direction were also found for the means of all criteria. It was confirmed that the use of a single standard (in this case the Afrikaans) for both groups did not in any way reduce the validity coefficients for the English group on its own, or for the combined group.

New Norms for Non-White Populations

New norms for Non-White populations were calculated for suitable tests for mental alertness, language achievement, and computational ability. In view of the growing number of Non-Whites being employed in clerical and other positions of responsibility, for example in Non-European Affairs Departments of Municipalities, the construction of effective selection techniques, together with adequate standards of comparison, is a matter of increasing importance.

Blocks Test

A new and original test which was hoped to provide a measure of three-dimensional space perception was tried out on a sample of architects and others. Research continues on this test.

Psychometric Methods

Special probability graph paper was designed and printed. Methods were then developed which not only provided normalized standard scores, but detailed information about kurtosis, skewing, ranges and sensitivity of scores.

Research was done into correction for guessing in multiple-choice questions, resulting in chi-square tests and nomographs enabling one to deal with every item on its own merits, without the necessity of resorting

die meriete te behandel, sonder om terug te val op blote skattings, wat byna sonder uitsondering op 'n groot mate van oorkorreksie uitloop. Om die gewone snypunt-itemtoets-korrelasie van .3 te vervang, is vergelykings uitgewerk wat snypunte lewer wat die volgende in ag neem: monstergrootte, toetslengte en verlangde mate van beduidendheid.

'n Aantal kleiner psigometriese probleme voortvloeiende uit die navorsingsprogram van die Instituut is ondersoek, onder andere die volgende: werk i.v.m. die 7-vierkante-toets, die patroonvoltooiingstoets, die Vraelys vir Militêre Belangstelling, en die toetsbattery ontwerp vir die keuring van Bantoe-staatsampnare.

WISKUNDIGE STATISTIEK

Programme vir die Zebra-rekenmasjien

Na die installering van die Zebra-rekenmasjien in die Nasionale Fisiese Navorsingslaboratorium is programme vir die volgende voorberei en getoets: gemiddelde en standaardafwyking met standaardfoute, standaardtellings en F-en-t-toets; produkmomentkorrelasie van een veranderlike met een of meer ander veranderlikes en 'n matrys van interkorrelasies; eenweg- en tweeweg-ontleding van variansie en ontleding van kovariansie; 2×2 , $2 \times n$ en $m \times n$ toevaligheidstabelle; Hotelling se hoofkomponente en Thurstone se volledige sentroïde metodes van faktorontleding; die hellingsmetode vir afleiding van latente wortels; die herleiding van 'n matrys met behulp van die vierkantwortelmetode; en die betroubaarheidskoëffisiënt deur Formule 20 van Kuder-Richardson.

'n Aantal ander programme is voorberei, maar nog nie getoets nie.

Steekproefvariasie by Faktorontleding

'n Literatuurstudie van die verskillende metodes van faktorontleding is voortgesit, asook van die sogenaamde „Monte Carlo”-metodes. Om die betrokke berekening te behartig is programme voorberei vir die Sentoïde-, die Hoofkomponente- en die Rao-metode.

Teoretiese Studies in Meerdimensionale ontleding

'n Nuwe kriterium vir die uitsoek van veranderlikes vir 'n regressievergelyking is ontwikkel en in 'n verhandelings in 'n Switserse wetenskaplike tydskrif gepubliseer. Die kriterium is uitgebrei om 'n basis te voorsien waarvolgens besluit kan word of dit die moeite loon om enige veranderlikes hoegenaamd vir voorspelling te gebruik. Die verspreiding van die lengte van die vertroubaarheidsgebied vir die voorspelde veranderlike is ook verkry.

'n Verslag wat die prosedure vir berekening van die vertroubaarheidsgrense vir die oorvleueling van meerdimensionale normale bevolkings uiteensit word voor-

to rule of thumb methods which almost invariably result in a large measure of over-correction. To replace the commonly-adopted cut-off item-test correlation of .3, equations were developed which yield cut-offs that take account of size of sample, length of test and significance demanded.

Numerous minor psychometric problems arising from the research programme of the Institute were investigated. These included work on the 7-Squares Test, Pattern Completion Test, the Military Interest Questionnaire and the battery of tests designed for the selection of Bantu Civil Servants.

MATHEMATICAL STATISTICS

Programming for the Zebra Electronic Computer

Following on the introduction of the ZEBRA electronic computer at the National Physical Research Laboratory, programmes were prepared and tested for the following: mean and standard deviation with standard errors, standard scores and F and t tests; product-moment correlation of one variable with one or more other variables and a matrix of intercorrelations; one-way and two-way analysis of variance and analysis of covariance; 2×2 , $2 \times n$ and $m \times n$ contingency tables; Hotelling's principal components and Thurstone's complete centroid methods of factor analysis; the gradient method of deriving latent roots; the reduction of a matrix by the square-root method; and the coefficient of reliability by Kuder-Richardson Formula 20.

A number of other programmes were written, but not tested.

Sampling Variation in Factor Analysis

A study of the various methods of factor analysis from the literature continued, as well as one of Monte Carlo methods. To handle the computations involved, programmes were written for the Centroid, the Principal Component and the Rao methods.

Theoretical Studies in Multivariate Analysis

A new criterion for selecting variables for a regression equation was developed and presented in a paper published in a Swiss journal. The criterion was extended to provide a basis for deciding whether it is worth using any variables at all for prediction. The distribution of the length of the confidence interval for the predicted variable was also obtained.

A report describing the procedure for calculating the confidence limits for the overlap of multivariate normal populations is being prepared. A programme for

berei. 'n Program vir berekening van tabelle van Nie-sentrale F is opgestel en die tabelle is opgestel.

'n Kriterium vir die uitsoek van veranderlikes vir diskriminante-analise is bestudeer. Die verwagte waarde vir die foutief geklassifiseerde gedeelte is vir 'n enkele diskriminant verkry. Die resultate is gebaseer op werk van Rao.

'n Verslag oor die voltooide studie van diskriminante-analise met diskrete veranderlikes is gesirkuleer.

Beoordeling van Psigomotoriese Leerkrommes

Ontledings van variansie is op die parameters van die leerkrommes uitgevoer, en die resultate word beoordeel.

Statistiese Verspreidings: Berekening van Persentasiepunte

Persentasiepunte vir Nie-sentrale F is op die elektroniese rekenmasjien bereken en tabelle word vir publikasie opgestel.

Gevorderde Tegnieke en Nuwe Metodes van Skaalontleding

'n Model vir 'n Non-perfekte Grittman-skaal is geformuleer en eksperimente uitgevoer om die distribusie van „sprei” te bestudeer. Die model het geskik geblyk vir ander as skaalontledingsprobleme, byvoorbeeld vir 'n sinsbedrogproef.

Verskeie metodes vir die verkryging van latente wotels is ondersoek en 'n program vir die hellingsmetode is opgestel.

Op die myne en in die tabakbedryf is 'n reeks prosedure op die Klassifiseringsbattery toegepas om te bepaal of hierdie metode so goed soos die ander kon keur. In geen van beide gevalle het dié prosedure swakker gevaar nie, en in laasgenoemde 'n verbetering op vorige metodes getoon met 'n tydsbesparing van 50% by die toepassing. Die reeksprosedure word nou getoets by die keuring van leerlingloodse van die afgelope jare. 'n Referaat en 'n beskrywende verslag is voorberei.

Algemeen

'n Aantal probleme van wiskundige-statistiese aard voortvloeiende uit die navorsingsprogram van die Instituut is afgehandel.

computing tables of Non-central F was written and the tables prepared.

A criterion for selecting variables for discriminant analysis was studied. The expected value for the misclassified proportion was obtained for a single discriminator. The results are based on work by Rao.

A report was circulated on the completed study of discriminant analysis with discrete variables.

Evaluation of Psychomotor Learning Curves

Analyses of variance were carried out on the parameters of the learning curves and the results are being assessed.

Statistical Distributions : Computation of Percentage Points

Percentage points for Non-central F were computed on the electronic computer and tables for publication are being prepared.

Advanced Techniques and New Methods of Scale Analysis

A model for a Non-perfect Guttman scale was formulated and experiments were carried out to study the distribution of the “spread”. The model proved applicable to other than scale analysis problems, for example to data from an illusion experiment.

Various methods for obtaining latent roots were studied and a programme was written for the gradient method.

A sequential procedure was applied to the Classification Battery on the mines and in the tobacco industry to determine whether such a procedure could select as well as the usual methods. In both cases this procedure did no worse and in the latter case actually did better than existing methods, with a saving of 50% in time for administration. The sequential procedure is now being tried in the selection of pupil pilots for past years. An article and a report describing the method were prepared.

General

A number of mathematical-statistical problems arising out of the Institute research programme was dealt with.

BIBLIOTEEK

Onderafdeling Biblioteek

Tydens die jaar het die aantal uitlenings met 50% toegeneem—van 6,449 tot 11,511, waarvan 399 aan Staatsdepartemente, nywerhede en ander leners buite die Instituut. Daarbenewens is 1,004 boeke kragtens die Inter-biblioteek leenstelsel uitgeleen.

Die voorraad is met 438 boeke en 449 pamflette aangevul tot 'n totaal van 1,695 boeke en 2,583 pamflette. 590 Pamflette moet nog verwerk word. Die Institute teken in op 100 wetenskaplike tydskrifte en ontvang nog 45 op 'n uitruilbasis.

Die Biblioteek van die Instituut ontvang talle navrae van buite om leeslyste en publikasies, en raak alhoemeer by universiteits- en openbare biblioteke, sowel as by studente en nyweraars bekend vir sy versameling boeke oor bedryfsielkunde en wiskundige statistiek.

Onderafdeling Publikasies

Die twee nommers van die Tydskrif van die Instituut (Deel 7, nommer 2 en Monograafbyvoegsel nommer 2) is aan 117 intekenaars, 66 inrigtings met wie ons uitruil-ooreenkomstes het en aan 41 persone en inrigtings op ons kostelose versendlys gestuur. As gevolg van advertensies in oorsese tydskrifte is 60 eksemplare van die Monograaf op bestelling afgelewer.

'n Totaal van 3,745 herdrukke van referate deur personele wat in ons eie en ander tydskrifte verskyn het, is gedurende die afgelope jaar aan persone uit baie wêrelddele wat daarna gevra het, gestuur.

Werk aan die Militêre Register duur voort en noue kontak is met die hoofbiblioteek van die Wetenskaplike en Nywerheidsnavorsingsraad in Pretoria behou.

LIBRARY

Library Section

During the year the number of issues increased by 80%—from 6,449 to 11,511—of which 399 issues were made to Government Departments, Industries and other non-Institute borrowers. In addition 1,004 books were issued on the Inter-Library loan system.

The stock was augmented by 438 books and 449 pamphlets, to a total of 1,695 books and 2,583 pamphlets. A further 590 pamphlets await processing. The Institute subscribes to 100 journals and receives another 45 periodicals on an exchange basis.

The Library of the Institute receives many outside enquiries for reading lists and publications, and is becoming well known to university and public libraries as well as to students and industrialists for its collection of books on industrial psychology and mathematical statistics.

Publication Section

The two issues of the Journal of the Institute (Volume 7, Number 2 and Monograph Supplement Number 2) were sent to 117 subscribers, to 66 institutions with which we have an exchange arrangement and to 41 persons and institutions on the complimentary mailing list. In response to advertisements in overseas journals 60 copies of the Monograph were sold and despatched.

A total of 3,745 offprints of articles by staff members in our own and other periodicals was sent to enquirers from many parts of the world during the past year.

Work is still in progress on the Military Registry and close contact with the parent library of the Council for Scientific and Industrial Research in Pretoria was maintained.

PUBLICATIONS — PUBLIKASIES

Gereelde Publikasies

Joernaal van die N.I.P.N.—driemaal per jaar.

Periodical Publications

Journal of the N.I.P.R.—three times per year.

Published Papers and Monographs, including those not previously listed in Annual Reports

Gepubliseerde verhandelings en monografieë, met inbegrip van die wat nie voorheen in jaarverslae gemeld is nie

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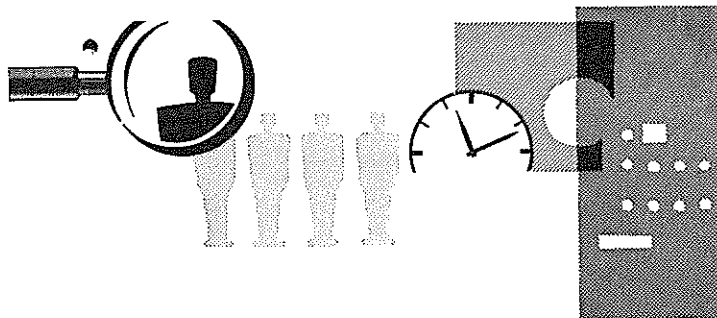
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DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

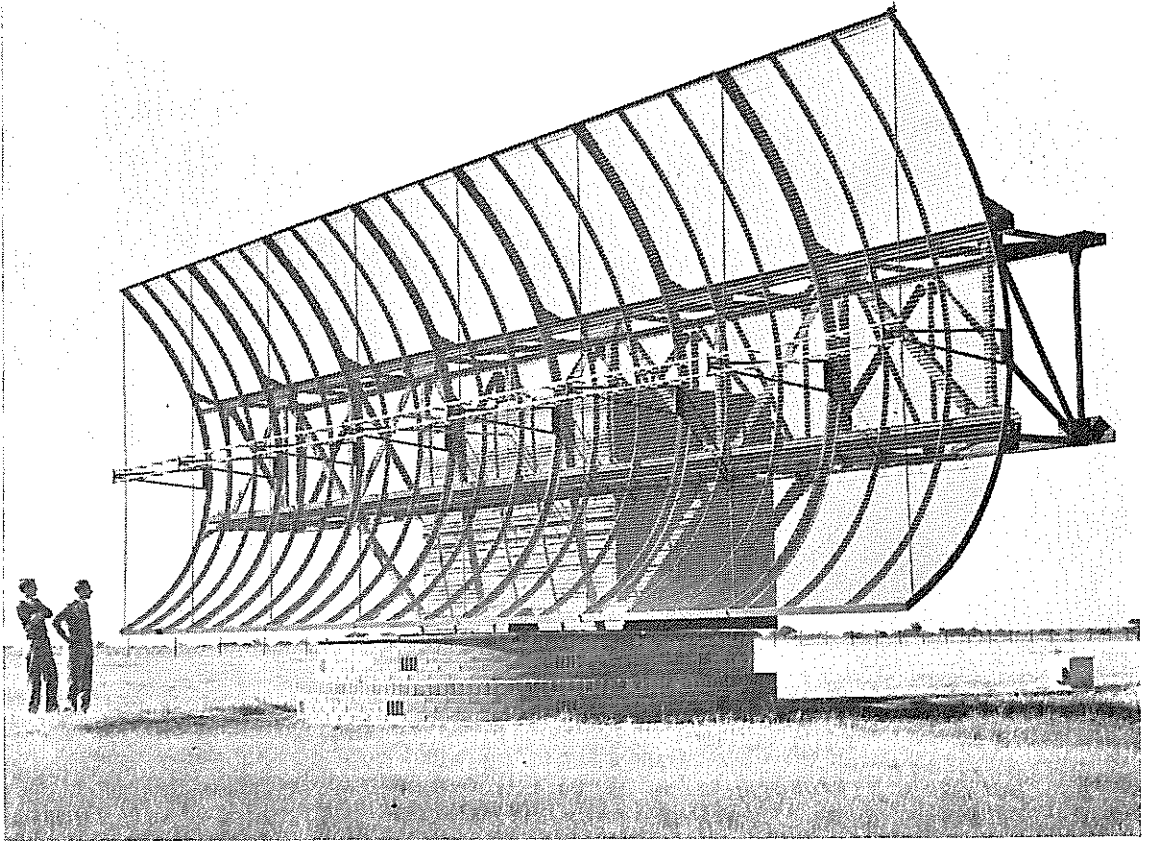
DEEL VII

NASIONALE INSTITUUT
VIR TELEKOMMUNIKASIE-
NAVORSING

PART VII

NATIONAL INSTITUTE FOR
TELECOMMUNICATIONS
RESEARCH

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. BOX 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)



'n Radar-antenne deur die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese ontwerp vir vliegtuigopspoor-toerusting wat deur die Nasionale Instituut vir Telekommunikasie-navorsing ontwikkel is

A radar antenna designed by the National Mechanical Engineering Research Institute for aircraft tracking equipment developed by the National Institute for Telecommunications Research

NASIONALE INSTITUUT VIR TELEKOMMUNIKASIE- NAVORSING

Direkteur: DR. F. J. HEWITT

Die bestudering van die voortplanting van radiogolwe in die bo- en onderlae van die atmosfeer en die uitwerking van natuurverskynsels op kommunikasie- en radarstelsels het 'n belangrike deel van die Instituut se program uitgemaak.

Werk in verband met sekere gevorderde tegnieke wat by die ontwikkeling van gespesialiseerde toerusting in die Instituut of die Suid-Afrikaanse nywerheid teëgekomp is, is voortgesit.

Heelwat aandag is gegee aan die radiovolging van die verskillende kunsmatige aardsatelliete wat deur die Verenigde State van Amerika gelanseer is. Dit het meegebring dat 'n „Prime Minitrack Station” wat deur die Verenigde State se Vlootnavorsingslaboratorium verskaf is, onderhou en bedien is. 'n Paar proewe is uitgevoer na die moontlikheid daarvan om satelliete of vuurpyle wat nie van aktiewe radiosenders voorsien is nie, deur middel van die radio op te spoor en te lokaliseer.

Die permanente gebou vir die Instituut op die terrein van die Universiteit van die Witwatersrand is voltooi en betrek. Tegelykertyd is die naam Nasionale Telekommunikasie-navorsingslaboratorium verander in Nasionale Instituut vir Telekommunikasie-navorsing.

Veldwerk is saamgetrek op die Universiteit se proefplaas by Frankenwald, by die Spoorwegopleidingskollege op Esselenpark, die Poskantoor se ontvangstasie op Derdepoort en op 'n stasie van die Suid-Afrikaanse Lugmag. Ionosferiese waarnemings is vir die Instituut in Kaapstad gedoen deur die Departement van Pos- en Telegraafwese. Waarnemings by vertikale invalshoeke in Salisbury en die bestudering van skuins pulsuitstralings tussen Johannesburg en Salisbury is moontlik gemaak deur 'n program van samewerking op navorsingsgebied met die Universiteitskollege van Rhodesië en Njassaland.

DIE VOORTPLANTING VAN RADIOGOLWE

Ionosferiese Waarnemings en Voorspellings

Die gereelde meting van ionosferiese eienskappe vir die voorspelling van radioverbindingstoestande is in Johannesburg en Kaapstad voortgesit. Die pos wat op Marioneiland in die raamwerk van die program vir die Internasionale Geofisiese Jaar ingestel is, is gesluit weens die moeilikheid om toerusting van die aard onder die strawwe omstandighede op die eiland te onderhou. Die toerusting wat aan die Universiteitskollege van

NATIONAL INSTITUTE FOR TELECOMMUNICATIONS RESEARCH

Director: DR. F. J. HEWITT

The study of the propagation of radio waves through the lower and upper atmosphere and the effect of natural phenomena on communications and radar systems constituted an important part of the programme of the Institute.

Work continued on certain advanced techniques encountered in the development of specialized equipment developed either in the Institute or by South African industry.

Considerable effort was devoted to the radio tracking of the various artificial earth satellites launched by the United States of America. This entailed the maintenance and operation of a Prime Minitrack Station supplied by the United States Naval Research Laboratory. Some experiments were conducted on the detection and location by radio of satellites or rockets not equipped with active radio transmitters.

The permanent building in the grounds of the University of the Witwatersrand for the Institute was completed and occupied. Concurrently the name of the National Telecommunications Research Laboratory was changed to the “National Institute for Telecommunications Research”.

Field work was concentrated at the University Experimental Farm at Frankenwald, at the Railway Training College at Esselen Park, the Post Office receiving station at Derdepoort and a South African Air Force Station. Ionospheric observations were made at Cape Town on behalf of the Institute by the South African Department of Posts and Telegraphs. Vertical incidence observations in Salisbury and oblique incidence pulse transmission studies between Johannesburg and Salisbury were made possible by a co-operative programme of research with the University College of Rhodesia and Nyasaland.

THE PROPAGATION OF RADIO WAVES

Ionospheric Observations and Forecasts

The regular measurements of ionospheric characteristics necessary for the forecasting of radio communications conditions continued at Johannesburg and Cape Town. The station established on Marion Island as part of the International Geophysical Year programme was closed down owing to the difficulty of maintaining equipment of this nature under the severe conditions experienced on the Island. The equipment loaned to

Rhodesië en Njasaland in Salisbury geleen is, was tot die einde van 1958 in diens, maar weens radiosteuringe op die terrein kon aantekeninge oor 'n hele jaar nie gedoen word nie.

Die opstel en uitgee van maandelikse voorspellings van die gunstige frekwensies vir verbindings in Suidelike Afrika is voortgesit.

Ionosferiese Absorpsie

Absorpsiemetings by vertikale invalshoek op frekwensies van 1.83 en 2.63 megahertz is van 0400 tot 2000 met 'n uur tussenpose op ongeveer agt dae per maand, met inbegrip van Wêrelddae, gedoen. Die ontleding van die gegewens is aan die gang. 'n Mate van teoretiese werk in verband met die heel golfbehandeling van absorpsie is gedoen. In die besonder is 'n heelgolfberekening van absorpsie by die twee betrokke frekwensies vir 'n veronderstelde ionosferiese model gedoen. 'n Verhandeling oor hierdie onderwerp is vir plasing aangeneem deur die Journal of Atmospheric and Terrestrial Physics.

Uit die berekenings blyk dit dat die meeste absorpsieer-groepsvertraging baie naby die teoretiese weerkaatsingshoogte plaasvind.

Gedeeltelike Ionosferiese Weerkaatsings

Die gedeeltelike weerkaatsings uit die onderste lae van die ionosfeer is in sameloop met die absorpsiemetings bestudeer. Die resultate is gebruik om 'n elektronedigheidsprofiel tot op 80 Km. hoogte te bereken. 'n Verhandeling oor hierdie onderwerp, waarby die waarnemings van vorige ionosferiese kruis-modulasieproewe inbegryp is, is vir plasing in die Journal of Atmospheric and Terrestrial Physics aangeneem.

Ionosferiese Winde

Waarnemings van ionosferiese winde deur middel van drie gespreide ontvangers is gelyktydig met die reeds genoemde ander gespesialiseerde ionosferiese waarnemings gedoen.

Die toevallige skommeling van dag tot dag is blykbaar groot, selfs so groot as die waarde van die snelheid, terwyl dit moeilik is om bepaalde neiging vas te stel. Die waargenome snelhede strek van 50 tot 100 meter per sekonde.

Hierdie besondere deel van die ionosfeerprogram is onderneem deur 'n navorsingstudent van die Universiteit van die Witwatersrand wat aan die Instituut verbonde was.

Waarnemings onder Skuins Invalshoek

'n Pulstransmissieverbinding by 10.74 megaherts is tussen Johannesburg en Salisbury ingestel in samewerking met die Universiteitskollege van Rhodesië en Njasaland, wat die waarnemings in Salisbury onderneem het. Metings van amplitude- en relatiewe vertraging van die pulse wat in Salisbury ontvang is, is op

the University College of Rhodesia and Nyasaland at Salisbury was operated until the end of 1958, though difficulties experienced with radio interference on the site prevented a full year's records being obtained.

The preparation and issue of monthly forecasts of optimum frequencies for use over circuits in Southern Africa continued.

Ionosferiese Absorpsie

Absorption measurements at vertical incidence on frequencies of 1.83 Mc/sec and 2.63 Mc/sec were made on approximately eight days per month including World Days at hourly intervals from 0400 to 2000. Analysis of the data is in progress. Some theoretical work on the full wave treatment of absorption was done. In particular a full wave calculation of absorption at the two frequencies in question was made for an assumed ionospheric model. A paper on this subject has been accepted for publication by the Journal of Atmospheric and Terrestrial Physics.

The calculations show that most of the absorption and group delay occurs very close to the theoretical height of reflection.

Partial Ionosferiese Refleksies

The partial reflections from lower regions of the ionosphere have been studied concurrently with the absorption measurements. The results were used to calculate an electron density profile up to a height of about 80 Km. A paper on this subject, including the results of previous ionospheric cross modulation experiments, was accepted for publication by the Journal of Atmospheric and Terrestrial Physics.

Ionosferiese Winde

Observations of ionospheric winds using three spaced receivers were made concurrently with the other specialised ionospheric observations previously mentioned.

The random day to day variation appears to be large, of the order of the velocity itself, and the establishing of definite trends is difficult. The velocities observed range up to between 50 and 100 metres per second.

This particular part of the ionosphere programme was undertaken by a research student of the University of the Witwatersrand who was attached to the Institute.

Oblique Incidence Observations

A pulse transmission circuit on 10.74 Mc/sec was established between Johannesburg and Salisbury in co-operation with the University College of Rhodesia and Nyasaland, which undertook the observations in Salisbury. Measurements of amplitude and relative delay of the pulses received in Salisbury were made on

alle dae gedoen waarop absorpsiemetings in Johannesburg gedoen is. Die waarnemings word nou bestudeer.

Radioruispeile

Met die hulp van die Poskantoor is 'n allegolf-ruisregistreerder wat deur die Central Radio Propagation Laboratory van die Verenigde State se National Bureau of Standards verskaf is, gedurende die jaar in werking gehou. Die waarnemings is ontleed en bevat die so nodige inligting oor radioruispeile in Suid-Afrika op die hoëfrekwensieband.

Die Southern Africa Air Transport Council het geldelik tot hierdie werk bygedra.

BESTUDERING VAN NATUURVERSKYNSELS

Radareggo's uit Weerlig

Gedurende die somer is 'n beperkte reeks waarnemings van radareggo's uit die weerlig gedoen, waarby 'n nuwe opnametegniek toegepas is. Deur middel van straalsterktemodulasie is die hoeveelheid film vir onafgebroke opname by hoë informasietoever binne redelike perke gehou, waardeur die noodsaaklikheid van 'n snellerinrigting verval het. Die probleem, veral die in verband met die naspeel van hierdie soort opname, is nog nie ten volle opgelos nie.

Radareggo's uit Donderstorms

Die aanvanklike doel van hierdie projek was om die betreklike sterkte, die voorkomsfrekwensie en die omvang van stormeggo's op soekradartoestelle met hoë prestasie op die grond op verskeie golflengtes vas te stel met die oog op bepaling van die uitwerking van die weergesteldheid op radardekking onder Suid-Afrikaanse omstandighede.

'n Opnametoestel is ontwerp en saam met radaruitrusting van bekende prestasie gebruik op golflengtes van 10 en 50 cm. Gedurende sekere ure is fotografiese opnames van die gegewens elke vyf minute in beeldskermvorm gemaak. Daar is besondere aandag gegee aan die verhouding inset/lewing van die ontvangers en aan die opstel van die katodestraalbuise, sodat betroubare gegewens omtrent die seinsterkte afgelei kon word uit die sterkte van die opgenome seine.

Werk in verband met die tweede doel, naamlik 'n uitvoerige studie van die werklike aard van die radar-terugslae uit donderstorms, is nog nie ter hand geneem nie.

Hierdie program word volgens kontrak met die Weermag uitgevoer.

all days on which absorption measurements were made in Johannesburg. The results are now being studied.

Radio Noise Levels

With the assistance of the South African Post Office the operation of an all wave noise recorder supplied by the Central Radio Propagation Laboratory of the United States National Bureau of Standards was continued during the year. The results have been analysed and provide much needed information on radio noise levels in South Africa in the high frequency band.

The Southern Africa Air Transport Council contributed to the cost of this work.

STUDIES OF NATURAL PHENOMENA

Radar Echoes from Lightning

During the summer season a limited series of observations of radar echoes from lightning were made using a new recording technique. By using intensity modulation the amount of film required for continuous recording at a high information rate was restricted to reasonable quantities and thus the need for any form of trigger system was obviated. The problems encountered, particularly in the play-back of this type of record, have yet to be completely solved.

Radar Echoes from Thunderstorms

The initial objective of this project was to determine the relative intensity, frequency of occurrence and extent of storm echoes on high performance ground based search radar sets at various wavelengths with a view to assessing the effect of weather conditions on radar coverage under South African conditions.

A recording system was developed and operated in association with radar equipment of known performance operating on wavelengths of 10 and 50 cms. During selected hours of operation photographic records of the information in PPI form were taken at five minute intervals. Special attention was paid to the input/output relationship of the receivers and to the setting up facilities for the cathode ray tubes so that reliable signal intensity information would be obtained from the intensity of the recorded signals.

The second objective, namely a detailed study of the actual nature of the radar returns from thunderstorms, has not as yet commenced.

This programme is being carried out under a contract with the Union Defence Force.

GEVORDERDE RADIOTEGNIEKE

Kristalbeheer van Veranderbare Frekwensie

Die ontvanger wat kragtens lisensie in die Verenigde Koninkryk vervaardig word, is nou wêreldberoemd en word deur baie handelondernemings gebruik.

Die Tellurometer-metode van Afstandmeting

Die vervaardiging van die instrument vir geodetiese opmetings deur Tellurometer (Pty.) Ltd., met medewerking van die Wetenskaplike en Nywerheidsnavorsingsraad, het gedurende die hele verslagtermyn voortgegaan. Die instrument is nou in algemene gebruik oor die hele wêreld. Die maatskappy volg 'n aktiewe uitbreidingsbeleid, waartoe die Instituut 'n sekere mate van gespesialiseerde tegniese hulp verleen.

Plekbepaling

Nog voor die verslagtermyn is 'n ondersoek na die probleme in verband met die bepaling van die opstelingsplek van mobiele landmagte te velde ten behoeve van die Weermag op tou gesit. Daarna is 'n proef- en 'n gebruikstoestel ontwerp om in die praktyk getoets te word.

In die begin van hierdie werk het die Army Engineer Research and Development Laboratories van die Verenigde State 'n soortgelyke probleem aan Tellurometer (Pty.) Ltd. voorgestel. Met die toestemming van die Weermag word die werk nou gedoen met geldelike steun van Tellurometer (Pty.) Ltd., wat op sy beurt 'n ontwikkelingskontrak met die genoemde Laboratorium van die Verenigde State aangegaan het.

Toepassing van Kristalbuise

Nuwe tegnieke betrokke by die gebruik van kristalbuise is bestudeer en kristalbuis-stroombane is ontwikkel in alle gevalle waar kristalbuise op 'n bepaalde probleem van toepassing was. Veral is die mobiele ontvanger wat vir die plekbepalingstoerusting nodig was, volledig met kristalbuise uitgebou, selfs met 'n alternatiewe metervertoning waardeur die katodestraalbuis uitgeskakel word. Hierdie ontvanger is 'n dubbelkanaal tipe van gespesialiseerde aard. Besonder interessante probleme het opgeduik by die toepassing van automatiese versterkersreëling (AVR), en die uitwerking daarvan op die middelfrekwensie van die twee gevoeligheidskanale. Eweneens is die metervertoning wat vir faseaanduiding ontwerp is, in staat om oor 'n groot bereik van insetseinamplitude te werk. Besondere aandag is gegee aan die gedrag by ongunstige verhoudings van sein tot ruis. Die stroombaan is ingewik-

ADVANCED RADIO TECHNIQUES

Variable Frequency Crystal Control

The receiver manufactured under licence in the United Kingdom is now world famous and is used by the armed services of a number of different countries and by many commercial organisations.

The Tellurometer System of Distance Measurement

Production of the instrument for geodetic survey purposes by Tellurometer (Pty.) Ltd. in association with the Council for Scientific and Industrial Research, continued throughout the period under review. The instrument is now in general use throughout the world. The Company is pursuing an active development programme to which the Institute provides certain specialised technical assistance.

Position Fixing

Prior to the period under review an investigation into the problems of determining the position of mobile military ground forces in the field was commenced on behalf of the Union Defence Force. Subsequently an experimental system was devised and a practical design commenced with a view to testing its possibilities.

At an early stage in this work the United States Army Engineer Research and Development Laboratories posed a somewhat similar problem to Tellurometer (Pty.) Ltd. With the consent of the Union Defence Force the work is now being carried out with the financial support of Tellurometer (Pty.) Ltd., who in turn have negotiated a development contract with the United States Engineer Research and Development Laboratories.

Transistor Applications

The new techniques associated with the introduction of transistors were studied and transistor circuitry has been developed wherever the application of transistors to a particular problem is appropriate. In particular, the mobile receiver required for the position fixing equipment was developed in a fully transistorised form, even to the extent of an alternative meter presentation eliminating the cathode ray tube. This receiver is a twin channel receiver of a specialized nature and particularly interesting problems arose in the application of automatic gain control and its effects on the centre frequency of the two response channels. Similarly, the meter presentation developed for phase indication is capable of operating from a very wide range of input signal amplitude, and special attention has been given to the performance at poor signal/noise ratios. The circuitry is complicated but requires only 10% of the

keld, maar dit het slegs 10% van die krag nodig wat vir die katodestraalbuis-verhitter alleen vereis word, en dit is makliker om te bedien.

Ondervinding is opgedoen met die toepassing van kristalbuis by hoër frekwensies met die ontwerp van 'n tussenfrekwensiestrook by 33 Mh., met AVR. Dit is 'n vyftrapsversterker wat Amerikaanse tetrode-kristalbuis gebruik met 'n alfa-afsnijding in die buurt van 200 Mh. Die totale wins is 80 db. met 'n bandbreedte van 3 Mh., en 'n ruisfaktor van 9.5 db.

'n Laboratorium instrument vir die meting van α , die gewone-emitter kortsluitstroomwins, is gebou. Daarmee kan by 1 Kh. onder verskillende waardes van emitter stroom gemeet word.

Verskeie kragomsetters wat kristalbuis i.p.v. vibrators gebruik, is ontwerp en gebou vir bepaalde doeleindes.

Integrasie in Pulsradarstelsels

By pulsstelsels met konstante herhalingstempo kan die minimum waarneembaarheid van seine verbeter word deur opeenvolgende pulse en ruis op die regte wyse toe te voeg. Die verbeterde prestasie geskied ten koste van die tempo waarmee inligting uit die stelsel verkry kan word, maar die tempo is gewoonlik hoër as wat noodsaaklik is.

'n Terugkoppelende integreertoestel van die aard is in die Instituut gebou met gebruikmaking van 'n kwik-vertragslyn, waardeur seine en ruis van een radar-pulsreeks tot die ander opgegaar kan word. Die praktiese toepassing daarvan op radarstelsels word ondersoek.

'n Goeie bediener met 'n korrek ingestelde beeldskermvertoning is 'n redelik doeltreffende integreerder. Geen aanmerklike verbetering in seinsigbaarheid kan onder hierdie omstandighede verwag word nie. By sekere ander soorte vertonings of in die geval van betreklik ongeskoolde bedieners, gebrekkige instelling van die vertoning of swak verligting behoort daar egter heelwat verbetering moontlik te wees.

Parametriese Versterkers

Parametriese versterking, meer bepaald versterking deur middel van 'n tydsveranderlike reaktiewe element, is 'n dramatiese ontwikkeling wat moontlik gemaak is deur onlangse vordering op die gebied van die fisika van soliede stowwe in die buiteland. Omdat die wesenlike element in hierdie versterker 'n byne volmaakte kondensator is, is versterking moontlik wat nagenoeg ruisvry is.

Die uiterste grens van gevoeligheid by verbindingstelsels bo 100 megahertz word tot nog toe gestel deur die ruis wat in die radiofrekwensieversterkers of die omsetters van die stelsel ontstaan.

Hierdie probleem is in die buiteland enigermate opgelos deur die Maser, 'n baie ingewikkelde molekulêre versterker wat by uiters lae temperatuur moet werk.

power required for the CRT heater alone and is simpler to operate.

Experience in transistor applications at higher frequencies was gained in the development of an IF strip, with AGC, operating at 33 Mc/sec. This is a five stage amplifier using American tetrode transistors with an alpha cut off in the region of 200 Mc/sec. The overall gain is 80 db with a bandwidth of 30 Mc/sec and a noise factor of 9.5 db.

A laboratory instrument for the measurement of α , the common emitter short circuit current gain, was developed. It enables α to be measured at 1 Kc/sec under various conditions of emitter current.

Various power convertors using transistors instead of vibrators have been designed and built for specific purposes.

Integration in Pulse Radar Systems

In pulse systems of constant repetition rate the minimum perceptible signal may be improved by adding successive pulses and noise in the appropriate manner. The improvement in performance is achieved at a reduction of the rate at which information may be obtained from the system, but this usually is excessive.

A regenerative integrating device of this nature was developed in the Institute using a mercury delay line which makes possible the storage of signals and noise from one radar pulse train to the next. Its application to practical radar systems is being investigated.

A good operator with a correctly adjusted PPI display is a reasonably efficient integrator, and no appreciable improvement in signal visibility is to be expected under these conditions. For certain other types of displays or for the case of relatively unskilled operators, maladjustment of the display or unfavourable lighting conditions, a considerable improvement should be realised.

Parametric Amplifiers

Parametric amplification, or more specifically, amplification by means of a time varying reactive element, is a dramatic development which has been made practicable by recent advances overseas in solid state physics. Because the essential element in this amplifier is an almost perfect condenser, virtually noise free amplification is made possible.

The ultimate limit of sensitivity in communications systems above 100 Mc/sec has been set to date by the noise generated in the radio frequency amplifiers or convertors used in the system.

Some solution to this problem was found overseas in the Maser, a very complex and involved molecular amplifier which required to operate at extremely low temperatures.

In vergelyking met die Maser is die parametrisie versterker 'n baie eenvoudige toestel wat binne wye frekwensiegrense kan werk. Sy ruis-eienskappe kom naamlik byna ooreen met die grense wat gestel word deur die ruimtetemperature vir kommunikasiedoeleindes. Die verbetering van die gevoeligheid van ontvangers is van groot belang vir die Instituut. Spesiale studie word dus gewy aan parametrisie versterkers en hulle eenskappe. Die werk word in die eerste plek tot die desimeterstreek beperk. 'n Senior beampte van die Instituut het 'n kort besoek aan die Verenigde State van Amerika gebring om 'n detailstudie uit te voer voordat die praktiese program aan die gang gesit is.

Radartoerusting

'n Reeks veldwaarnemings is gedoen met 'n laboratoriumprototipe van 'n radartoestel wat volgens kontrak met die Departement van Verdediging gebou is om die absolute prestasie van die uitrusting vas te stel. Die senderkrag- en ontvangerruisfaktor kan met aanmerklike juistheid in die laboratorium bepaal word, maar die antennewins kan nie so maklik gemeet word nie, terwyl daar heelwat twyfel bestaan omtrent die minimum bespeurbaarheid van die sein in tipiese bedryfsomstandighede. Ter oplossing van hierdie onbekende faktore is die totale prestasie van die uitrusting gemeet op 'n trefplaat waarvan die grootte en vorm presies bekend is en waarvan die eggo-eienskappe bereken kan word. Met die doel is sferes wat van papierdeeg gemaak en met geleidende materiaal bedek is, aan vry ballonne gehang. Waarnemings is toe gedoen ten opsigte van die radar-uitrusting.

Toerusting wat in die land vervaardig is, word nog steeds getoets. Sekere veranderings is aangebring, terwyl 'n aantal ondergeskikte items ontwikkel is om die onderhoud te vereenvoudig en die betroubaarheid te verhoog.

RUIMTENVORSING

Ruimtenavorsing in Suid-Afrika

Deur sy geografiese ligging kan Suid-Afrika 'n belangrike rol speel in die waarneming van kunsmatige aardsatelliete en in ruimteondersoek.

Gedurende die Internasionale Geofisiese Jaar het die Instituut die verantwoordelikheid aanvaar om 'n Minitrack-pos in te rig en te onderhou. Die Minitrack-pos is 'n akkurate stelsel, wat deur die Verenigde State se Vlootnavorsingslaboratoriums ontwikkel is, om satelliete van die Verenigde State, wat op ongeveer 108 megahertz uitsend, te volg. Die toekomstige ontwikkeling van soortgelyke werksaamhede in Suid-Afrika, word nou oorweeg, ten opsigte van verbetering

By comparison with the Maser, the parametric amplifier is an extremely simple device which can operate over a wide range of frequencies, its noise properties corresponding almost to the limit set by space temperatures for communications purposes. The problem of improved sensitivity of receivers is of vital concern to this Institute and a special study is being made of parametric amplifiers and their properties. In the first instance, work is being restricted to the decimetric region. A senior officer of the Institute visited the United States of America for a short period to study developments in detail before the practical programme commenced.

Radar Equipment

A series of field observations were made on a laboratory prototype radar set developed under a contract with the S.A. Department of Defence, for the purpose of establishing the absolute performance of the equipment. The transmitter power and receiver noise factor can be determined in the laboratory with considerable accuracy, but the aerial gain is less easy to measure and considerable doubt exists as to the minimum detectable signal under typical operating conditions. In an attempt to resolve these unknown factors the overall performance of the equipment was measured on a target of accurately known size and shape whose echoing properties could be calculated. For this purpose, spheres constructed of paper mache and covered with conducting material were suspended from free balloons and observations were carried out on the radar equipment.

The testing of locally manufactured equipment continued and certain modifications were introduced. Certain minor items of equipment were developed to simplify maintenance and improve reliability.

SPACE RESEARCH

Space Research in South Africa

Due to its geographical situation South Africa can play an important part in the observation of artificial earth satellites and space probes.

During the International Geophysical Year the Institute accepted responsibility for the installation and maintenance of a Minitrack Station, the precision system developed by the United States Naval Research Laboratories for tracking United States satellites transmitting on approximately 108 Mc/sec. The future development of activities of this nature in South Africa is now under consideration in relation both to improvements and extensions of the satellite tracking

sowel as uitbreiding van satellietvolging en ten opsigte van toerusting vir die volg van diepruimteondersoeke. Vir hierdie laaste doel is Suid-Afrika ten opsigte van die Verenigde State gerieflik geleë deurdat dit een van die drie hoofposte om die aarde kan uitmaak waarvandaan deurlopende waarnemings van 'n ruimteondersoek moontlik sou wees. Dit is ook gerieflik geleë vir die waarneming van 'n deurgeesatelliet om 'n kommunikasieskakel tussen die Verenigde State en Europe tot stand te bring.

Op uitnodiging van COSPAR (Committee on Space Research, 'n komitee ingestel deur die International Council of Scientific Unions om internasionale samewerking op die gebied van ruimtenavorsing te bevorder) het die Direkteur Suid-Afrika op die tweede vergadering van die Komitee in Maart 1959 in 's-Gravenhage verteenwoordig.

Die Minitrack-pos op Esselenpark

Die Minitrack-pos op Esselenpark is sedert April 1958 in werking en het hom baie betroubaar en stabiel betoon. Nooit het 'n storing in die toerusting van watter aard ook al die pos vir langer as 'n uur of twee buite werking gestel nie. By vyf geleenthede is die pos met behulp van die Suid-Afrikaanse Lugmag gekalibreer. Uit die resultate blyk dat daar min verandering in die elektriese of meganiese konstantes van die stelsel plaasgevind het.

Die pos het daarin geslaag om al die satelliete en ruimtevaartuie van die Verenigde State wat op 108 megehartz uitsend, te volg. 'n Opsomming van die waarnemings word hieronder gegee:

Tydperk: 15 April 1958 tot 31 Maart 1959

| Satelliet | Werkdae | Aantal velle gegewens | Voorspelde oorgange |
|-------------------|---------|-----------------------|---------------------|
| Alfa 1958 | 37 | 105 | 143 |
| Beta 1958 | 350 | 780 | 1,341 |
| Gamma 1958 . . | 61 | 119 | 207 |
| Epsilon 1958 . . | 70 | 142 | 154 |
| Zeta 1958 | 24 | 57 | 68 |
| Alfa 1959 | 28 | 110 | 112 |

'n Mens moet bedink dat „oorgange” dikwels voorspel word wat buite die presiese dekkingstreek van die stasie is. Bowendien is geen waarneming van Alfa 1958 moontlik nie, tensy dit in direkte sonlig is, aangesien sy radiosender sonkrag gebruik.

facilities and to equipment suitable for the tracking of deep space probes. For this latter purpose South Africa is conveniently situated in relation to the United States of America in that it would constitute one of three major stations situated around the world from which continuous observations of a space probe would be possible. It is also conveniently situated for the observation of any relay satellite to provide a communications link between the United States of America and Europe.

At the invitation of COSPAR (Committee on Space Research—a committee established by the International Council of Scientific Unions to further international co-operation in space research) the Director represented South Africa at the second meeting of the Committee in The Hague in March 1959.

The Minitrack Station Esselen Park

The Minitrack Station at Esselen Park has been in operation since April 1958 and has proved itself to be extremely reliable and stable. On no occasion has equipment trouble of any form rendered the station out of action for more than one or two hours. On five occasions the station has been calibrated with the assistance of the South African Air Force, and the results show that little change has taken place in the electrical or mechanical constants of the system.

The station has succeeded in tracking all U.S. satellites and space vehicles transmitting on 108 Mc/sec and a summary of the observations is given below:

Period: 15th April 1958 to 31st March 1959

| Satellite | Operational Days | Number of Data Sheets | Predicted Passes |
|-------------------|------------------|-----------------------|------------------|
| 1958 Alpha . . | 37 | 105 | 143 |
| 1958 Beta | 350 | 780 | 1,341 |
| 1958 Gamma . . | 61 | 119 | 207 |
| 1958 Epsilon . . | 70 | 142 | 154 |
| 1958 Zeta | 24 | 57 | 68 |
| 1959 Alpha . . | 28 | 110 | 112 |

It should be pointed out that “passes” are frequently predicted which are outside the accurate coverage region of the station and in addition no observations are possible on 1958 Beta unless it is in direct sunlight as its radio transmitter is solar-powered.

'n Beperkte hoeveelheid telemetrie is op versoek van die Verenigde State se owerhede in verband met sekere satelliete gedoen.

Die huidige pos is slegs ingerig vir die volg van satelliete wat hoofsaaklik ekwatoriale bane loop. By sulke satelliete speel dit 'n besonder belangrike rol onmiddellik na lansering, deurdat 'n nuwe satelliet omtrent 40 minute na lansering binne die waarnemingsveld van die pos kom. Gevolglik is inligting uit Esselenpark die eerste aanduiding van die welslae of mislukking van die onderneming.

Onlangs is die verbinding tussen Esselenpark en die kontrolesentrum in Washington geweldig verbeter deur die instelling van 'n voltydse direkte teledrukkerverbinding. Die aanmerklike koste hiervan word deur die Verenigde State gedra. Die voordele daarvan is veral opmerklik by lansering, hoewel die eintlike waarde sal lê by wetenskaplike proewe wat nog nie onderneem is nie en wat onmiddellike deurstuur van inligting vereis.

Stil Satelliete en Vuurpyle

'n Reeks eksperimente is uitgevoer in 'n poging om die versterking van eggo-eienskappe, deur satelliete of vuurpyle op 'n betreklik geringe hoogte, wat deur sekere waarnemers van die Verenigde State gerapporteer is, waar te neem. Die eksperimente is met behulp van uitsendings uit die Suid-Afrikaanse Uitsaaikorporasie se stasie op Paradys uitgevoer op frekwensies van 9 tot 25 megahertz. Spesiale uitsendings is ook deur die Poskantoor van Olifantsfontein af en deur die Weermag uit Kaapstad gereël.

Die waarnemings het slegs bestaan uit die registreer van die peil van outomatiese versterkingsreëling van 'n ontvanger wat op die betrokke stasie ingestem is, wat by voorkeur in die oorspronggebied vir normale voortplantingsmaniere moet wees. Die eerste uitkomst van die waarnemings van Spoetnik III se vuurpyl, wat op 185 Km. hoogte in sy baan geloop het, was skouspelagtig. Op drie agtereenvolgende dae is om 0630 S.A.S.T. groot ladings van outomatiese versterkingsreëling wat tot 8 minute geduur het, op die voorspelde oorgangstyd waargeneem. Weens die presisie van die baan is die proewe op die drie daaropvolgende dae op die vroeër oorgang uitgevoer en is 'n bietjie moeilikheid ondervind met 'n steurende uitsending. Op die eerste twee dae het groot, vinnige uitswaai van die outomatiese versterkingsreëling se peil op die voorspelde tyd plaasgevind, maar op die laaste dag het die verskynsel 30 minute voor die verwagte oorgangstyd gekom. Dit is nog nie vasgestel of die vuurpyl werklik van sy program afgewyk het nie, hoewel dit moontlik is, aangesien versplyting op hande was en die gedrag van die projektiel dus nie so maklik voorspelbaar sou wees nie.

A limited amount of telemetry has been recorded on certain satellites at the request of the United States authorities.

The present station is equipped only for tracking satellites in primarily equatorial orbits. For such satellites it plays a particularly important role immediately after launching in that a new satellite passes within range of the station approximately 40 minutes after launching, and thus information from Esselen Park is the first intimation of the success or otherwise of the operation.

Recently communications between Esselen Park and the Washington Control Centre have been vastly improved by the provision of a full-time direct teleprinter circuit. Costs in this connection, which are considerable, are borne by the United States authorities. Its advantages are particularly marked during launching, though its real value will be in scientific experiments not yet commenced where immediate passage of information is essential.

Silent Satellites and Rockets

A series of experiments were carried out in an attempt to observe the enhanced echoing properties of satellites or rockets at relatively low altitudes that have been reported by certain United States observers. The experiments were carried out at Esselen Park with the assistance of transmissions from the South African Broadcasting Corporation station at Paradys on frequencies ranging from 9 to 25 Mc/sec. Special transmissions were also arranged by the Post Office from Olifantsfontein and by the Union Defence Force from Cape Town.

The observations consisted only in recording the AVC level of a receiver tuned to the station in question, which should preferably be in the skip region for normal modes of propagation. The initial results on the rocket Sputnik III, orbiting at a height of 185 Km were spectacular. On three successive days at about 0630 S.A.S.T. large AVC charges lasting up to 8 minutes were observed at the predicted time of transit. Owing to the precision of the orbit the experiments on the three succeeding days were carried out on the earlier transit and some trouble was experienced with an interfering transmission. On the first two days large and rapid excursions of the AVC level occurred at the predicted time but on the last day the effect occurred 30 minutes before the expected time of transit. It has not yet been established whether or not the rocket had in fact departed from its expected schedule, though this is possible in view of the fact that burn up was imminent and thus the behaviour was not easily predictable.

Minder oortuigende resultate is ten opsigte van Spoetnik III verkry. Dit het op ongeveer 225 Km oor Suid-Afrika gegaan. Puls waarnemings gelyktydig met 'n pulsuitsending op 20 megahertz, wat deur die Postkantoor van Olifantsfontein af gereël is, het geen resultate opgelewer nie, maar die puls lengte van 1 millisekonde het 'n minimum afstand van omtrent 1000 myl vasgestel.

Die lang duur van die eggo's, d.w.s. ontrent 8 minute, is nog glad nie verklaar nie. Dit kom waarskynlik voor, soos die eerste waarnemers van die Verenigde State trouens vermoed het, dat die versterkte eggo-eienskappe toegeskryf moet word aan die ionisasie wat die voorwerp by hoë snelheid in die boonste atmosfeer voortbring.

Die proef word bemoeilik deur die gebrek aan 'n sterk transmissie binne die oorspringstreek en die afwesigheid van steurende langsafstandsiene wat op normale wyse voortgeplant word ten tyde van die oorgang van 'n satelliet op 'n hoogte wat klein genoeg is om hierdie uitwerking moontlik te maak. 'n Posing is ook aangewend om die totale ruis en interferensie te registreer by 'n frekwensie wat ruim hoër is as die kritieke frekwensie by vertikale invalshoek, maar geen resultate is behaal nie.

Hierdie waarnemings sal by voorkomende geleentheid voortgesit word.

Less convincing results were obtained on the satellite Sputnik III passing over South Africa at approximately 225 Km. Simultaneous pulse observations with a pulse transmission on 20 Mc/sec arranged by the Post Office from Olifantsfontein yielded no results, but the pulse length of 1 millisecond set a minimum range of about 1000 miles.

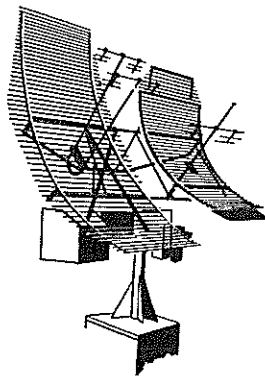
The explanation of the long duration echoes, that is some eight minutes, is by no means clear. It seems probable, as was suggested by the original United States observers, that the enhanced echoing properties are due to ionization produced by the object moving at high speed in the upper atmosphere.

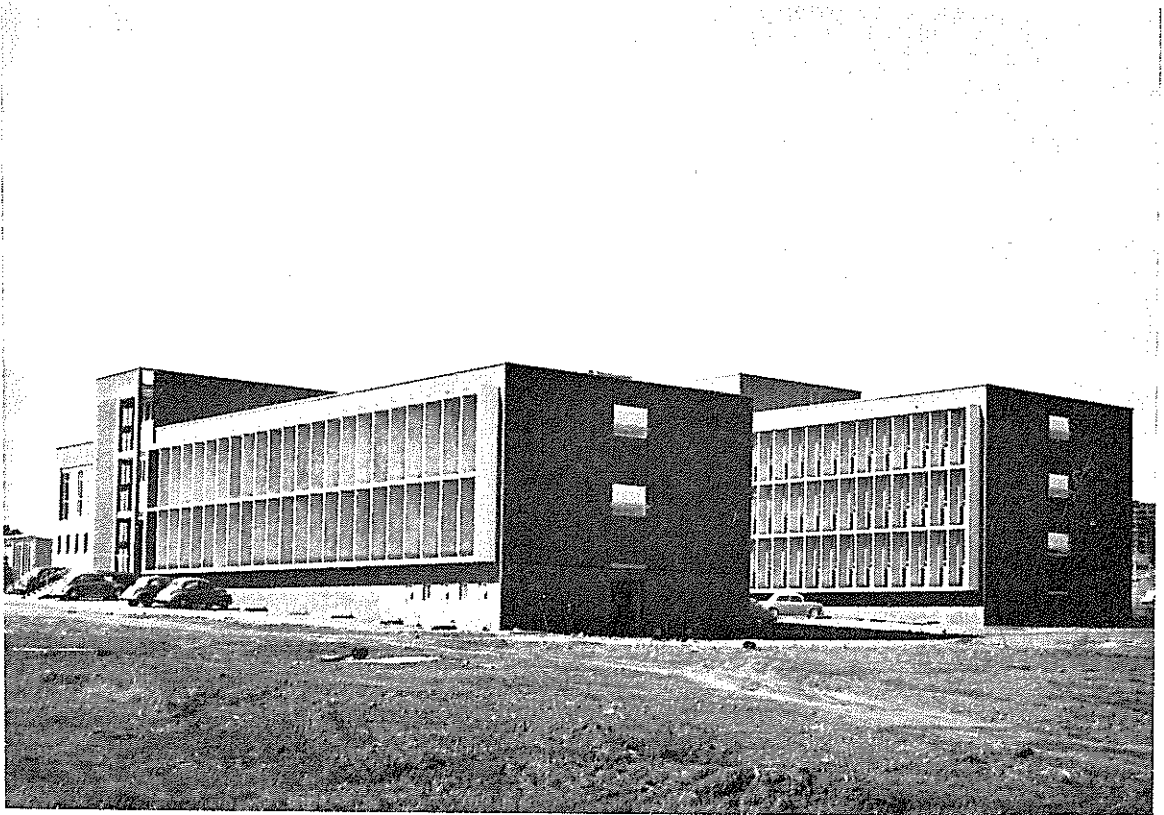
The experiment is rendered difficult by the need for a high power transmission within the skip region and the absence of long range interfering signals by normal propagation modes at the time of transit of a satellite at a sufficiently low altitude to produce these effects. An attempt was also made to record the total noise and interference at a frequency well above the vertical incidence critical frequency but no results were obtained.

The observations will be continued whenever possible.

PUBLICATIONS — PUBLIKASIES

WADLEY, T. L., Electronic Principles of the Tellurometer. *Transactions of the South African Institute of Electrical Engineers*, part 49, no. 5, May 1958, pp. 143-172.





*Nuwe gebou van die N.V.N.I. kort na voltooiing in
Maart 1959*

*New building of the N.N.R.I. shortly after completion
in March 1959*

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL VIII

NASIONALE VOEDING
NAVORSINGSINSTITUUT

PART VIII

NATIONAL NUTRITION
RESEARCH INSTITUTE

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. BOX 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)

NASIONALE VOEDING-NAVORSINGSINSTITUUT

Direkteur: F. W. QUASS

VELDSTUDIES

Cholesterolkonsentrasies in Kinders

'n Totaal van 1150 kinders se bloed is ontleed vir cholesterolkonsentrasie, asook vir hemoglobien, proteïen (totaal en gedifferensieer), karoteen, timol-turbiditeit, alkaliese fosfatase, anorganiese fosfor, amilase en vitamien C. Hierdie kinders is gekies uit verskillende groepe van die bevolking, naamlik die geëde stedelike blanke en die landelike en stedelike Bantoe. Die hoofdoel van die opname was om die serum-cholesterolkonsentrasies van die verskillende ouderdoms- en rassegroepe, asook van die twee geslagte, te vergelyk.

Wanneer die gemiddelde serum-cholesterolwaardes van die blanke kinders (Pretoria-Oos) met dié van die Bantoe kinders (Grootfontein, Koffykraal en Atteridgeville) vergelyk word, sal gemerk word dat daar op 'n vroeë ouderdom (onder 10 jaar), reeds belangrike verskille aangetoon kan word. Dit geld ook vir die betrokke waardes tussen die Bantoe kinders in die meer „primatiewe” landelike stante, Koffykraal en Grootfontein, en die Bantoe kinders in die „verwesterde” stedelike lokasie, Atteridgeville (Sien Tabel 1). Uit hierdie tabel blyk dit ook duidelik dat in die Afrikaanse skole (vergeelyk Pretoria-Oos- en Afrikaanse Hoër Seun- en Meisieskole, Pretoria) vir die ouderdomsgroep 5 tot 16 jaar wat uitgetoets is, die blanke seuns se gemiddelde serum-cholesterolwaardes deurgaans laer is as dié van die blanke meisies. Die Engelse skool (Pretoria Boys High School) se gemiddelde serum-cholesterolwaardes is hoër as dié van die Afrikaanse Hoër Seunskool en dit sal vergelyk word met die gemiddelde waardes verkry van die Pretoria Girls High School sodra laasgenoemde syfers beskikbaar is.

Die samestelling van die bevolking van Suid-Afrika is heterogeen en oorsese normale waardes is meermale nie van toepassing op die Unie se bevolkingsgroepe nie. 'n Leemte bestaan dus vir „normale” biochemiese waardes soos blyk uit die voorafgaande bespreking van die cholesterolwaardes vir die verskillende Suid-Afrikaanse bevolkingsgroepe, gekondisioneer onder verskillende fisiologiese en nutrasionele invloede. Hier word gedink aan invloede—om maar 'n paar te noem—soos (i) ras, (ii) ouderdom, (iii) geslag, (iv) spannings-toestande soos puberteit of oormatige groei, (v) voedingstoestande, (vi) aktiwiteit, en (vii) 'n kombinasie van twee of meer van hierdie faktore. Die bloedmonsters van die bogenoemde opname word dus ook gebruik om ander „normale” biochemiese waardes onder Suid-Afrikaanse toestande vas te stel.

NATIONAL NUTRITION RESEARCH INSTITUTE

Director: F. W. QUASS

FIELD STUDIES

Cholesterol Concentrations in Children

The blood of a total of 1,150 children was analysed for cholesterol concentration as well as for haemoglobin, protein (total and differentiated), carotene, thymol turbidity, alkaline phosphatase, inorganic phosphorus, amylase and vitamin C. These children were selected from different population groups, i.e. well-to-do urban Europeans and from rural and urban Bantu. The main object of the survey was to compare the serum-cholesterol concentrations of the various age and racial groups, as well as that of the two sexes.

On comparison of the average serumcholesterol values of European children (Pretoria-Oos) with those of Bantu children (Grootfontein, Koffykraal and Atteridgeville), it will be seen that important differences show up at an early age (under ten years). This is true also for the relative values in respect of Bantu children in the more “primitive” rural villages, Koffykraal and Grootfontein and in the “westernized” urban location of Atteridgeville (see Table 1). This table also clearly shows that in the Afrikaans schools (cf. Pretoria-Oos, Afrikaanse Hoër Seuns- and Meisieskool, Pretoria) the average serumcholesterol values in the age group 5 to 16 years is generally lower for European boys than for European girls. The average serumcholesterol values for the English school (Pretoria Boys' High School) is higher than for the Afrikaans Hoër Seunskool, and this will be compared with the average values obtained at the Pretoria Girls' High School as soon as the latter figures are available.

The composition of South Africa's population is heterogeneous and overseas normal values frequently do not apply to the Union's population groups. “Normal” biochemical values are therefore lacking, as may be seen from the preceding discussion of the cholesterol values for various South African groups conditioned under different physiological and nutritional conditions. The conditions considered here—to mention but a few—include (i) race, (ii) age, (iii) sex, (iv) conditions of tension, such as puberty or excessive growth, (v) conditions of nutrition, (vi) activity, and (vii) a combination of two or more of these factors. The blood samples obtained for the above survey are therefore also used to determine other “normal” biochemical values under South African conditions.

Voedingstatusopnames en Veldvoedingsproewe

Daar is 'n begin gemaak met 'n uitgebreide studie van die invloed van byvoegings tot die dieet op die voedingstatus van Bantoe kinders (5 tot 8 jaar) in twee stante, Grootfontein en Koffykraal, in Wes-Transvaal. Nadat 'n volledige voedingstatusopname (kliniese

Nutrition Status Surveys and Field Nutrition Tests

A start was made with an extensive study of the influence of supplements to the diet on the nutritional status of Bantu children (5 to 8 years) in two villages, Grootfontein and Koffykraal, in the Western Transvaal. After a complete survey of the nutritional status

TABEL 1 / TABLE 1

Serum-Cholesterolkonsentrasies by Kinders / Serum-Cholesterol Concentrations in Children

| | Gemiddeld (mg. %) Average (mg. %) | Persentasie gevalle onder 200 mg. % Percentage cases under 200 mg. % | Ouderdom (jare) Age (years) | Getal in groep Number in group |
|------------------------------|---|--|-----------------------------------|-----------------------------------|
| GROOTFONTEIN: | | | | |
| Seuns/Boys | 152 ± 28 | 97 | 5—9 | 37 |
| Dogters/Girls | 155 ± 36 | 93 | 5—10 | 68 |
| KOFFYKRAAL: | | | | |
| Seuns/Boys | 146 ± 37 | 91 | 5—9 | 43 |
| Dogters/Girls | 153 ± 42 | 93 | 5—9 | 55 |
| ATTERIDGEVILLE: | | | | |
| Seuns/Boys | 178 ± 29 | 80 | 5—8 | 65 |
| Dogters/Girls | 180 ± 32 | 77 | 5—8 | 102 |
| PRETORIA-OOS-SKOOL: | | | | |
| Seuns/Boys | 207 ± 41 | 46 | 5—11 | 98 |
| Dogters/Girls | 215 ± 47 | 22 | 6—11 | 79 |
| AFRIKAANSE HOËRSKOOL: | | | | |
| Seuns/Boys | 202 ± 35 | 49 | 12—18 | 165 |
| AFRIKAANSE HOËRSKOOL: | | | | |
| Meisies/Girls | 242 ± 44 | 12 | 12—17 | 182 |
| BOYS' HIGH: | | | | |
| Seuns/Boys | 240 ± 37 | 12 | 12—18 | 242 |

evaluering, biochemiese en hematologiese bepalinge op die bloed, röntgenologie van die handwortelbeentjies, somatometrie en parasitologiese ondersoek van die stoelgange) uitgevoer is, is die kinders in vier statisties vergelykbare groepe verdeel. Drie van hierdie groepe het die volgende byvoegings tot hul dieet in die vorm

(clinical evaluation, biochemical and haematological blood analysis, X-ray examinations of the carpal bones, somatometry and a parasitological investigation of the faeces) the children were divided into four statistically comparable groups. Three of these groups received the following supplements to their diets in the form of

van beskuitjies ontvang, terwyl die vierde groep—met geen aanvullende voedsel—as kontrole gedien het:

1. Vismeelblom-, grondbonemeel- en voedselgisverrykte beskuitjie (500 kalorieë).
2. Beskuitjie verryk met afgeroomde melk (500 kalorieë).
3. Onverrykte beskuitjie (500 kalorieë).

Hierdie voedsel is daaglik, insluitende op naweek- en vakansiedae, aan die kinders uitgedeel. Om die samestelling van die beskuitjies te kontroleer, is gereelde analises vir proteïen, vet en ander voedingstowwe uitgevoer. Vir die nodige kontrole is gereelde besoeke aan die twee stante minstens elke veertien dae afgelê. Die kinders is aan die einde van elke maand geweeg en hul lengte gemeet.

Na verloop van ses maande is volledige voedingstatusopnames weer by albei stante uitgevoer. Op hierdie stadium het dit geblyk dat die getal proefpersone in Grootfontein aansienlik gedaal het en daar is dus, op aanbeveling van die statistikus, besluit om die voedingsproewe by hierdie stat te staak. In Koffykraal het die getalle egter besonder konstant gebly, die voedseluitdelings is gereeld bygewoon en die ondersoek by hierdie stat word dus voortgesit vir tenminste 'n verdere ses maande. 'n Voedingstatusopname sal binnekort weer by laasgenoemde stat uitgevoer word.

KWASHIORKOR

Die Effek van Vette op Serumlipiede

Die effek van verskillende soorte vette in die dieet op die serumlipiede-inhoud van herstelde kwashiorkor-pasiënte is bestudeer. Dertig pasiënte het vanaf opname in die hospitaal tot drie weke na opname identiese behandeling ontvang. Gedurende hierdie drie weke het hul dieet uit afgeroomde melkpoeier bestaan. Daarna is hul verdeel in vyf groepe bestaande uit ses pasiënte elk en is die vyf groepe op vyf verskillende diëte geplaas vir 'n tydperk van ses weke. Die vyf diëte het dieselfde aantal kalorieë per pond liggaamsgewig aan die pasiënte voorsien; dit is bewerkstellig deur die koolhidraatinhoud van die verskillende diëte te varieer. Die vyf diëte het bestaan uit:

1. Sproeigedroogde volroommelkpoeier;
2. Sproeigedroogde „sojamelk”;
3. Afgeroomde melkpoeier;
4. Afgeroomde melkpoeier plus soja-olie; en
5. Algemene kindersaaldiëet.

Bloed van die pasiënte is vanaf opname tot nege weke na opname weeklik gekollekteer en die volgende bepalinge is uitgevoer:—serumproteïene, totale lipiede, cholesterol, fosfolipiede, jodiumgetal van die lipiede, kalsium en fosfor.

biscuits, while the fourth group—which received no supplementary food—served as a control group:

1. Biscuit enriched with fish flour, peanut meal and food yeast (500 calories);
2. Biscuit enriched with skim milk (500 calories);
3. Unenriched biscuit (500 calories).

This food was issued to the children daily, including week-ends and holidays. In order to control the composition of the biscuits, they were analysed at regular intervals for protein, fat and other nutrients. Regular, fortnightly visits were paid to the two villages to exercise the necessary supervision. The weight and length measurements of the children were taken monthly.

After six months, comprehensive nutritional status surveys were again carried out at both villages. At this stage the number of subjects at Grootfontein showed a considerable decrease and, on the advice of the statistician, it was decided to discontinue the tests at this village. In Koffykraal, however, the numbers remained remarkably constant, the food issues were attended regularly; and the investigation at this village is therefore being continued for at least another six months. A nutritional status survey will be conducted again at this village in the near future.

KWASHIORKOR

The Effect of Fats on the Serum Lipids

The effect of various types of fat in the diet on the serum lipid content of recovered kwashiorkor patients was studied. Thirty patients received identical treatment from the time of admittance to the hospital till three weeks after admittance. During these three weeks their diet consisted of skim milk powder. Thereafter they were divided into five groups of six patients each, and these five groups were placed on five different diets for a period of six weeks. The five diets each provided the patients with an equal number of calories per lb. body weight, this being accomplished by varying the carbohydrate content of the various diets. The five diets consisted of:

1. Spray-dried full cream milk powder;
2. Spray-dried “soya milk”;
3. Skim milk powder;
4. Skim milk powder plus soya oil; and
5. Common children's ward diet.

Blood was collected from the patients weekly for nine weeks from the time of admittance, and the following determinations were conducted: serum protein, total lipids, cholesterol, phospholipids, iodine number of the lipids, calcium and phosphorus.

Die volgende gevolgtrekkings is na statistiese ontleding van die resultate gemaak:—

1. Geen verskil is waargeneem wat betref die effek van die vyf diëte op die serumproteïenkonsentrasies van die pasiënte nie.

2. Wanneer dierlike en vaste vette in die dieet vervang is deur plantaardige olie, is daar aanduidings dat laasgenoemde diëte 'n groter serumlipiedverlagende effek het as wanneer die dieet dierlike en vaste vet bevat. Volgens die toegepaste statistiese ontledings was hierdie lipiedverlagende effek egter nie betekenisvol nie.

3. Wanneer vet in die dieet deur koolhidrate vervang is, het dit 'n soortgelyke serumlipiedverlagende effek as plantolie op die pasiënte gehad. Hierdie effek was egter ook nie betekenisvol nie.

4. Die jodiumgetal van die serumlipiede het direk gevarieer met die graad van versadiging van vet in die dieet.

5. Wanneer geen vet in die dieet ingesluit is nie, het dit 'n verlagende effek op die jodiumgetal van die serumlipiede gehad.

Die Witbloedselle in Kwashiorkor

Verskeie navorsingsprojekte is reeds uitgevoer oor patologiese veranderinge in die organe en weefsels van kwashiorkorpatiënte. Daar is egter nog geen werk gedoen oor die intrasellulêre veranderinge in die witbloedselle van hierdie pasiënte nie. Daar is dus 'n ondersoek geloods met die doel om meer inligting in te win oor hierdie aspek van die patologie van kwashiorkor. In hierdie ondersoek is daar hoofsaaklik gebruik gemaak van die nuwere histochemiese tegnieke.

Histochemiese bepalinge van die volgende intrasellulêre bestanddele van die witbloedselle is uitgevoer:— lipiede, ribonukleïensuur, desoksiribonukleïensuur, glikogeen, mukoproteïen, peroksidase en alkaliese fosfatase. Hierdie bepalinge is uitgevoer op smere van die perifere bloed van twintig Bantoe-kwashiorkorpatiënte by opname in die hospitaal en met weeklikse tussenposes daarna. Bloedsmere van tien gesonde Bantoe-kinders van dieselfde ouderdomsgroep het as kontrole gedien en vir vergelykingsdoeleindes is smere van agt gesonde volwasse blankes ook ondersoek.

Die resultate kan soos volg opgesom word: in die geval van 50 persent van die pasiënte het die lipiede-inhoud van die witbloedselle gestyg gedurende die eerste veertien dae van behandeling en daarna het 'n geringe daling plaasgevind. In die res van die pasiënte het die lipiede-inhoud van die witbloedselle gedaal gedurende die eerste veertien dae van behandeling. In eersgenoemde groep pasiënte bestaan daar dus die interessante moontlikheid (wat nog verder nagevors moet word) dat die witbloedselle gedurende die eerste veertien dae van behandeling mag dien as draers van die lipiede wat gedurende dieselfde periode vanuit die lewer vrygestel word.

The following conclusions were drawn after a statistical analysis of the results had been made:

1. No differences were observed in the effects of the five diets on the serum-protein concentrations of the patients.

2. When vegetable oils were substituted for animal and solid fats in the diets there were indications that the latter diets caused a greater reduction in the serum lipid levels than when the diets contained animal and solid fats. Applied statistical analyses, however, showed that this lipid reduction effect was not significant.

3. When the fat in the diet was replaced by carbohydrates, a similar reducing effect on the serum lipids was observed. This effect was also not considered significant.

4. The iodine number of the serum lipids varied directly with the degree of saturation of the fats in the diet.

5. When no fat was included in the diet, it had a lowering effect on the iodine number of the serum lipids.

The White Blood Cells

Various research projects have been conducted on the pathological changes in the organs and tissues of kwashiorkor patients. No work has as yet been done, however, on the intracellular changes in the white blood cells (leucocytes) of these patients. An investigation has therefore been instituted with a view to obtaining more information on this aspect of kwashiorkor pathology. In this investigation the latest histochemical techniques have for the most part been applied.

Histochemical determinations of the following intracellular substances of the leucocytes have been carried out: lipids, ribonucleic acid, glycogen, mucoprotein, peroxidase and alkaline phosphatase. These determinations were carried out on smears of the peripheral blood of twenty Bantu kwashiorkor patients on admittance to hospital and thereafter at weekly intervals. Blood smears of ten healthy Bantu children of the same age group served as a control and, for purposes of comparison, smears of eight healthy adult Europeans were also examined.

The results may be summarized as follows: in the case of 50 per cent of the patients the lipid content of the white blood cells rose during the first fourteen days of treatment and thereafter there was a slight fall. In the remainder of the patients the lipids content of these cells fell during the first fourteen days of treatment. In the former group of patients an interesting possibility is therefore manifested (and this will require further investigation) i.e. that the white blood cells may serve, during the first fortnight of treatment, as carriers of the lipids which are released from the liver during the same period.

In die geval van alkaliese fosfatase is gevind dat die aktiwiteit van hierdie ensiem aan die begin van behandeling hoog was. Daarna het 'n daling gedurende behandeling plaasgevind, maar in die vyfde week van behandeling het die aktiwiteit weer gestyg. Hierdie patroon van intrasellulêre alkaliese fosfatase-aktiwiteit van die witbloedsel stem ooreen met dié wat gevind is vir die aktiwiteit van dieselfde ensiem in die serum van hierdie gevalle. In individuele gevalle van kwashiorkor was daar egter op geen stadium gedurende behandeling enige kwantitatiewe korrelasie tussen die aktiwiteit van alkaliese fosfatase in die serum en die aktiwiteit van dieselfde ensiem in die witbloedselle nie. Dit skyn dus asof die intrasellulêre alkaliese aktiwiteit in individuele pasiënte gereguleer word deur 'n faktor of faktore wat verskillend is van die faktor(e) wat die aktiwiteit van dieselfde ensiem in die serum reguleer.

In the case of alkaline phosphatase it was found that the activity of this enzyme was high at the commencement of treatment. Thereafter, during treatments, there was a decrease, but in the fifth week of treatment this activity once more increased. This pattern of intracellular alkaline phosphatase activity of the white blood cell corresponds to what was discovered in respect of the activity of the same enzyme in the serum of these cases. At no stage of treatment in individual cases of kwashiorkor, however, was any quantitative correlation found between the alkaline phosphatase activity in the serum and the activity of the same enzyme in the white blood cells. It would therefore appear that the intracellular alkaline phosphatase activity in individual patients is regulated by a factor or factors which differ from the factor(s) which regulate the activity of the same enzyme in the serum.



Drie herstellende gevalle van kwashiorkor word gevoed. Behandeling van die gevalle geskied onder toesig van die N.V.N.I.

Three convalescent cases of kwashiorkor receiving their feeds. Treatment of these cases is supervised by the N.N.R.I.

Die peroksidase-aktiwiteit van die witbloedselle was deurgaans hoër in kwashiorkorpasiënte as in normale kontroles. In die geval van glikogeen, mukoproteïen en nukleïensure is daar geen verskille gevind in dieselfde pasiënt op verskillende stadia van behandeling nie. Daar was ook geen verskille tussen pasiënte en normale kontroles wat betref die laasgenoemde drie bestanddele nie.

The peroxidase activity of the white blood cells was generally higher in kwashiorkor patients than in normal control cases. In the case of glycogen, mucoprotein and nucleic acids no differences were found in the same patient at different stages of treatment. Nor were there any difference, as far as the last-mentioned three substances are concerned, between patients and normal control cases.

Vismeelblom aan Kwashiorkorpatiënte

'n Ondersoek van die uitwerking van Suid-Afrikaanse en Amerikaanse vismeelblomsupplemente by mieliemeel op herstelde gevalle van kwashiorkor is gedurende die afgelope jaar geloods. Patiënte met kwashiorkor is eers op gebruikelike roetine-wyse met afgeroomde melk en die gewone hospitaaldiët behandel totdat die kliniese toestand so goed was dat hulle, indien nodig, uit die hospitaal ontslaan kon word. Op hierdie stadium is die pasiënte dan op een van drie verskillende voedings geplaas. Die eerste groep van 15 gevalle is behandel met 'n voeding wat bestaan het uit mieliemeel, suiker en 'n mineralemengsel waarby 'n supplement van 30 gram Suid-Afrikaanse vismeelblom (10 persent van die totale droë voeding) gevoeg is. 'n Tweede groep van 11 pasiënte is op identiese wyse behandel behalwe dat die Suid-Afrikaanse vismeelblom deur 'n Amerikaanse produk vervang is. In 'n derde groep van 10 kontrole-gevalle is die vismeelblomsupplement deur 'n kaseïen-supplement vervang. Hierdie gevalle het 25 gram kaseïen daagliks ontvang. Die stikstof-inname van die drie groepe was ongeveer dieselfde. Daar is gepoog om die pasiënte van die verskillende groepe vir periodes van minstens ses weke met bogenoemde diëte te behandel.

In 10 van die 15 gevalle wat die Suid-Afrikaanse vismeelblom ontvang het, moes die eksperiment voor die einde van die toetsperiode gestaak word vanweë 'n algemene agteruitgang van die pasiënte se gesondheidstoestand en eetlusverlies, braking, lusteloosheid en vinnige daling van die gewig en/of serumproteïene.

Van die 11 gevalle wat die Amerikaanse vismeelblom ontvang het, kon 4 ook nie vir die hele toetsperiode op die voeding gehou word nie. Die ander 7 gevalle het 'n gewigstoename vertoon en het hulle serumalbumieninhoud gehandhaaf.

Al 10 die kontrole-gevalle wat kaseïensupplemente ontvang het, het goed gereageer en kon tydens die hele toetsperiode op die voeding gehou word. Die liggaamsgewig het in 9 van die 10 gevalle steeds toegeneem, terwyl die serumalbumieninhoud deur al 10 gevalle gehandhaaf is.

Een-en-veertig stikstofbalansstudies is vir periodes van drie dae op die pasiënte van die verskillende groepe uitgevoer. Die gemiddelde absorpsie van stikstof in die kontrolegroep was 86 persent van die inname, terwyl die gemiddelde absorpsie van stikstof in die groepe wat Suid-Afrikaanse- en Amerikaanse vismeelblomsupplemente ontvang het, 63 en 67 persent onderskeidelik was.

Dit is dus duidelik dat die pasiënte wat mieliemeelvoedings met 'n supplement van kaseïen ontvang het, beter gevaar het as dié wat die vismeelblomsupplemente ontvang het.

Fish Flour to Kwashiorkor Patients

During the past year an investigation was launched to determine the effect of South African and American fish flour supplements to mealie meal, on cases who had recovered from kwashiorkor. Kwashiorkor patients were first treated in the usual routine manner with skim milk and the ordinary hospital diet until the clinical condition was so good that they could, if necessary, be discharged from hospital. At this stage the patients were placed on one of three different diets. The first group of 15 cases was treated with a diet consisting of mealie meal, sugar and a mineral mixture to which a supplement of 30 grams of South African fish flour (10 per cent of the total dry food) had been added. A second group of 11 patients were treated in exactly the same way except that the South African fish flour was replaced by an American product. In a third group of 10 control cases, the fish flour supplement was replaced by a casein supplement. These cases received 25 grams of casein daily. The nitrogen intake of the three groups was approximately the same. Efforts were made to treat the patients of each of the various groups for periods of at least six weeks, with the above diets.

In 10 of the 15 cases receiving South African fish flour, the experiment had to be discontinued before the end of the test period, because of a general deterioration of the health of the patients, loss of appetite, vomiting, listlessness and a rapid loss of weight and/or serum protein.

Of the 11 cases who had received the American fish flour, 4 could also not be kept on the diet for the whole test period. The other 7 cases showed an increase in weight and maintained their serum albumin content.

All 10 control cases who had received casein supplements, reacted well and could be kept on the diet through the whole test period. The body weight increased steadily in 9 out of the 10 cases, while the serum albumin content was maintained in every one of the 10 cases.

Forty-one nitrogen balance studies were conducted for periods of three days on the patients of the various groups. The average nitrogen absorption of the control group was 86 per cent of the intake, while the average nitrogen absorption of the groups receiving South African and American fish flour supplements was 63 and 67 per cent respectively.

Clearly, therefore, the patients who received the casein supplement showed a more favourable response than those who received fish flour supplements.

PROTEÏENWAARDEBEPALING

Metodiek

Op gronde van waarnemings van die responsie van eksperimentele rotte, ten opsigte van hul groei en stikstofretensie, is vasgestel dat proteïenwaardes wat op groeimethodes gebaseer is [sien Osborne, Mendel en Ferry, *J. Biol. Chem.* (1919) Vol. 37, p. 223] onderhewig is aan 'n groter mate van variasie van proefdier tot proefdier as in die geval van proteïenwaardes wat gebaseer is op stikstofretensiemetodes (sien Mitchell, „Proteins and Amino Acids in Nutrition”, Redakteur M. Sahyun (1948), Reinhold Publ. Corp. p. 46). Uit die resultate verkry in 'n reeks van 34 eksperimente (met 326 rotte) het geblyk dat die variasiekoëffisiënt in die geval van die groeimethode 2.87 maal groter is as dié verkry met behulp van 'n stikstofretensiemethode.

Verder het geblyk dat die respons van jong rotte ten opsigte van beide bogenoemde kriteria (groei en stikstofretensie), onder die kondisies wat destyds in die proefdierkamers van die Instituut in die Impalagebou, Pretoria, geheers het, onderhewig was aan noemenswaardige seisoensinvloede: sowel die verkreë „P.E.R.”-waardes (dit is die gewigstoename in gram per gram proteïeninname) as die „biologiese waardes” (dit is die gewig bruikbare proteïen per 100 gram geabsorbeerde proteïen, bepaal volgens die stikstofretensiemethode van Mitchell) was gedurende wintermaande laer as gedurende somermaande. Seisoensveranderinge het blykbaar geen noemenswaardige uitwerking op die verteringsvermoë van die proefdiere onder die betrokke eksperimentele kondisies gehad nie. 'n Opsomming van die resultate wat in verband met die bogenoemde werk ten opsigte van eierproteïen versamel is, kan uit Tabel 2 verkry word.

Deur die toepassing van geskikte korreksiemetodes kan die effek van seisoensfaktore op die biologiese waardes van proteïene (soos bepaal deur die Nasionale Voedingnavorsingsinstituut) egter op 'n doeltreffende wyse uitgeskakel word, om sodoende die resultate wat gedurende verskillende seisoene verkry is, vergelykbaar te maak.

Die Stikstofbalans in die Rot

In verband met die ondersoekwerk oor die basiese aspekte van proteïenmetabolisme is gevind dat die stikstofbalans by sowel jong as volwasse rotte liniër

PROTEIN EVALUATION

Methodology

From observations made of the response of experimental rats with regard to growth and nitrogen retention, it was established that protein values based on growth methods [see Osborne, Mendel and Ferry, *J. Biol. Chem.* (1919) 37,223] are subject to greater variation within experimental groups than is the case with protein values based on nitrogen retention methods [see Mitchell, „Proteins and Amino Acids in Nutrition”, Edited by M. Sahyun (1948) Reinhold Publ. Corp. p. 46]. From the results obtained in a series of 34 experiments (with 326 rats) it appeared that the coefficient of variation in the case of the growth method was 2.87 times greater than that obtained when the nitrogen retention method was used.

It was also found that the response of young rats as regards both the criteria mentioned above (growth and nitrogen retention) was subject to important seasonal influences under the conditions which prevailed in the Institute's experimental rat rooms. Both the “P.E.R.” values obtained (i.e. weight increase in grams per gram of protein intake) and the “biological values” (i.e. the weight of utilizable protein per 100 grams absorbed protein, determined by Mitchell's nitrogen retention method) were lower during the winter months than during the summer months. Seasonal changes evidently had no notable effect on the digestion of the protein by the test animals under the experimental conditions employed. Table 2 contains a general summary of the results obtained on egg protein in connection with the findings discussed above.

By means of the appropriate correction methods, however, the effect of seasonal factors on the biological values of proteins (as determined by the National Nutrition Research Institute) can be effectively eliminated thus rendering the results obtained during different seasons comparable.

Nitrogen Balance in the Rat

In connection with the investigation of the basic aspects of protein metabolism it was found that the nitrogen balance in young as well as in adult rats

toeneem met 'n toename in proteïeninnome totdat 'n stadium bereik word waar die weefsels met proteïen versadig raak. Nadat weefselversadiging bereik is, vind daar 'n afplating in die stikstofbalanskurwe plaas, wat aandui dat sodra 'n bepaalde optimum stikstofbalans bereik is, verdere verryking van die dieet met

increases in a linear fashion with increase in protein intake until a stage is reached where the tissues become saturated with protein. After tissue saturation is reached, the nitrogen balance curve levels off. This indicates that when a specific optimum nitrogen balance is reached, further enrichment of the diet with protein

TABEL 2 / TABLE 2

Gegewens Versamel oor 'n Periode van Twee Jaar om die Seisoensinvloede op die Respons van Eksperimentele Rotte met Betrekking tot „P.E.R.”, Verteerbaarheid en Biologiese Waarde van Eierproteïen te Illustreer
Data Collected over a Period of Two Years to Illustrate the Seasonal Influence on the Response of Experimental Rats in Respect of P.E.R., Digestibility, and Biological Value of Egg Protein

| Periode/Period | Verteerbaarheid/Digestibility, % | | | | | | Biologiese waarde/Biological Value, % | | | | | |
|--|----------------------------------|--|----------------------|--|--|--------------------------------------|---|--|----------------------|--|--|--|
| | Jan. Feb. Jan. Feb. | Maart April Mar. Apr. | Mei Junie May June | Julie Aug. July Aug. | Sept. Okt. Sept. Oct. | Nov. Des. Nov. Dec. | Jan. Feb. Jan. Feb. | Maart April Mar. Apr. | Mei Junie May June | Julie Aug. July Aug. | Sept. Okt. Sept. Oct. | Nov. Des. Nov. Dec. |
| Gemiddeldes verkry in individuele eksperimente/Averages obtained in individual experiments | 95.6 95.9 99.9 97.5 | 94.9 94.4 92.4 93.4 98.1 97.0 96.5 95.9 | 94.4 95.5 96.3 | 95.0 95.3 98.5 98.1 97.4 97.2 97.4 | 95.7 95.5 99.2 98.4 96.7 97.4 | 96.6 96.8 96.6 94.8 95.9 | 97.0 92.8 95.3 94.1 | 91.7 93.6 90.7 91.7 93.7 91.3 92.4 | 89.4 85.2 95.0 | 92.4 89.5 88.9 91.3 94.0 93.3 92.4 | 91.2 91.7 93.5 95.4 92.4 93.3 | 94.6 95.1 94.1 94.8 97.5 97.2 |
| Gemiddelde van Periode/Average for Period | 97.2 | 95.3 | 95.4 | 97.0 | 97.2 | 96.1 | 94.8 | 92.4 | 89.9 | 91.7 | 93.0 | 95.6 |
| Gemiddelde Verteerbaarheid vir Jaar/Average Digestibility for Year=96% | | | | | | | Gemiddelde Biologiese Waarde vir Jaar/Average Biological Value for Year=93% | | | | | |
| Gemiddelde „P.E.R.” vir Periode/Average „P.E.R.” for Period | 3.28 | 2.97 | 2.66 | 3.04 | 3.08 | 3.51 | | | | | | |

proteïen nie enige spesifieke doel kan dien nie. Ook is gevind dat by inname van 'n laagwaardige proteïen, soos dié van grondbonemeelproteïen, die stikstofbalanskurwe op 'n laer vlak afplat as by die toediening van 'n hoogwaardige proteïen soos ontvette hoendereierproteïen.

Volgens resultate wat aan die Instituut verkry is, kan die verband tussen stikstofinnome en stikstofbalans by jong rotte op 'n gemengde dieet bevattende ontvette

can serve no specific purpose. It was also found that with the intake of a low quality protein, such as peanut flour protein, the nitrogen balance curve levels off at a lower level than when a high quality protein such as defatted whole egg is administered.

According to results obtained in the Institute, the relationship between nitrogen intake and nitrogen balance in young rats on a mixed diet containing

hoendereier as die enigste bron van proteïen met die volgende vergelyking weergegee word:—

$$Y = \begin{cases} -148.3 + 0.88 X & \text{vir } 0 \leq X < 600 \\ \frac{616.8 - 144.3 \cdot 10^3}{X} & \text{vir } 600 \leq X < 1602, \end{cases}$$

en dié by jong rotte op dieselfde gemengde dieet bevatende *grondbonemeel* as die enigste bron van proteïen deur die vergelyking soos volg:—

$$Y = \begin{cases} -155.1 + 0.55 X & \text{vir } 0 \leq X < 700 \\ \frac{469.8 - 166.2 \cdot 10^3}{X} & \text{vir } 700 \leq X < 1450, \end{cases}$$

waar Y = stikstofbalans in milligram/kilogram liggaamsgewig³, en

X = stikstofabsorpsie in milligram/kilogram liggaamsgewig³.

Uit die voorafgaande blyk dus dat daar in die geval van laagwaardige proteïene faktore in werking tree wat proteïen-assimilasie sodanig onderdruk dat laagwaardige proteïene op alle vlakke van inname minderwaardig bly teenoor hoogwaardige proteïene. Hierdie faktore kan in alle waarskynlikheid in verband gebring word met die verskynsel van aminosuurwanbalans wat tans deur verskillende ondersoekers in ander lande bestudeer word.

SUID-AFRIKAANSE VISMEELBLOM

Assimileerbare Proteïeninhoud

Om die assimileerbare proteïeninhoud van Suid-Afrikaanse vismeelblom met dié van ander proteïendraende stowwe te kan vergelyk, is 'n reeks proteïenwaardebepalings met behulp van groeiende rotte uitgevoer.

Die resultate het onder andere weereens bevestig dat, met die uitsondering van sojaboonproteïen, die proteïene van dierlike oorsprong soos dié in hoendereiers, melkpoeier, biltong, vismeelblom, kaas, beesvleis en bloedplasmapoeier noemenswaardig beter is ten opsigte van kwaliteit as die proteïene in botterbone, grondbonemeel, mieliepap en brood.

Twee monsters Suid-Afrikaanse melkpoeier wat ondersoek is, was relatief swak ten opsigte van proteïenkwaliteit en daar word oorweeg om verdere kwaliteitstudies op plaaslik vervaardigde melkpoeiers van stapel te stuur.

Die proteïenkwaliteit van kommersieel vervaardigde biltong vergelyk baie gunstig met dié van gekookte vleis.

Vismeelblom beklee 'n gunstige posisie in vergelyking met ander proteïendraende stowwe ten opsigte van proteïenkwaliteit en -inhoud, maar volgens die resultate van toetse met plaaslik vervaardigde vismeelblom en monsters wat uit Amerika verkry is, blyk die plaaslike produk minder verteerbaar te wees as die Amerikaanse produk.

defatted whole egg as the sole source of protein, can be given in the following equation:—

$$Y = \begin{cases} -148.3 + 0.88 X & \text{for } 0 \leq X < 600 \\ \frac{616.8 - 144.3 \cdot 10^3}{X} & \text{for } 600 \leq X < 1602, \end{cases}$$

and in young rats on the same mixed diet containing *peanut flour* as the sole source of protein, by the following equation:—

$$Y = \begin{cases} -155.1 + 0.55 X & \text{for } 0 \leq X < 700 \\ \frac{469.8 - 166.2 \cdot 10^3}{X} & \text{for } 700 \leq X < 1450 \end{cases}$$

where Y = nitrogen balance in milligrams/kilograms body weight³ and

X = nitrogen absorption in milligrams/kilograms body weight³.

From the above it would appear that in the case of low quality proteins there are factors which operate to suppress protein assimilation to such an extent that low quality proteins remain inferior to high quality proteins at all levels of intake. These factors may very probably be associated with the phenomenon of amino acid imbalance, which is at present being investigated by various workers in other countries.

SOUTH AFRICAN FISH FLOUR

Assimilable Protein Content

With the object of comparing the assimilable protein content of South African fish flour with that of other protein materials a series of protein evaluations was carried out with the aid of growing rats.

The results have once more borne out the fact that with the exception of soya protein, animal proteins such as egg, milk powder, biltong, fish flour, cheese, beef and blood plasma proteins are notably better in quality than the proteins present in butter beans, groundnut flour, maize porridge and bread.

Two samples of locally manufactured milk powder were relatively poor with regard to protein quality and further quality studies of locally manufactured milk powders are being considered.

The protein quality of commercially manufactured biltong compares very favourably with that of boiled meat.

Fish flour occupies a favourable position in comparison with other protein containing substances with respect to its protein quality and content, but according to tests on locally manufactured fish flour and samples obtained from America, the local product has been shown to be less digestible than the American product.

Die Fisiologiese Besikbaarheid van die Minerale

Uit die resultate van ondersoeke op rotte aangaande die fisiologiese bruikbaarheid van die minerale in Suid-Afrikaanse vismeelblom het geblyk dat die minerale teenwoordig in die vismeelblom tot 'n hoë mate bruikbaar is maar dat die mineraalmengsel in die vismeelblom in die geheel nie as volwaardig beskou kan word nie; om normale groei te verkry by rotte wat slegs vismeelblomminerale ontvang het, moes 'n hoeveelheid standaard mineraalmengsel—bestaande uit 'n kombinasie van al die benodigde minerale—by die rantsoen van die rotte gevoeg word.

Toksiteitstudies

Geen toksiteit kon tot dusver by plaaslik vervaardigde vismeelblom aangewys word nie. Die studies wat tot dusver uitgevoer is, handel oor die responsie van proefrotte ten opsigte van vismeelblom-inname tot en met die tagtigste dag na geboorte van die eerste generasie proefdiere. Hierdie studies moet egter nog na waarnemings op ander diersoorte uitgebrei word.

Vitamienvernietiging

'n Ondersoek oor die moontlike vernietiging van vitamien A in brood deur bygevoegde vismeelblom is afgehandel. Die resultate wat verkry is, dui daarop dat binne die perke van die eksperimentele fout, daar nie bewyse is dat vismeelblom in die hoeveelhede wat dit by brood gevoeg word, aanleiding kan gee tot die vernietiging van vitamien A nie.

Gefermenteerde Vismeele vir Verrykingsdoeleindes

In die bereiding van vismeelblom word ru-vismeele gekstraheer met 'n oplosmiddel soos alkohol. In die proses word nie net die lipiede verwyder nie maar gaan daar ook ander nutriënte, onder andere van die B-vitamiene, verlore.

Navorsing is gedoen om vas te stel of dit moontlik sou wees om deur 'n versuringsproses 'n verlaging van die trimetielamieninhoud en die peroksiedgetal van ru-vismeele te verkry om sodoende 'n produk te berei waarin al die nutriënte teenwoordig in die ru-vismeele behoue sal bly, en wat geskik sal wees vir toevoeging tot brood as verrykingsmateriaal.

'n Proses is ontwikkel waarin ru-vismeele by 'n versuurde koringmeel-, of hawermeel-, of verkieslik, 'n versuurde hawermeel-kaseienpap gevoeg word. Die vismeel word vermeng met dié versuurde graanprodukte in die onderskeidelike verhouding van 80 tot 20 gewigstele (laasgenoemde op droë basis bereken) en dan vir 'n kort tydjie onder lae druk (byvoorbeeld by 5 lb. vir 15 minute) geoutoklaveer. Hierna word die produk met behulp van 'n roldroër gedroog.

Hoewel verskeie melksuurvormende bakterieë geskik is vir hierdie versuringsproses, is 'n kultuur van *Lactobacillus delbrückii* hoofsaaklik in die bestudering van

Physiological Availability of the Minerals

Results of investigations on rats in connection with the physiological availability of the minerals in South African fish flour have shown that the minerals present in the fish flour are available for utilization to a considerable extent, but that on the whole the mineral mixture in the fish flour cannot be regarded as complete, in order to obtain normal growth in rats which have received fish flour minerals only, a certain amount of standard mineral mixture—consisting of a combination of all the necessary minerals—had to be added to the rations of the rats.

Toxicity Studies

Up to the present no toxicity could be detected in locally manufactured fish flour. The studies carried out to date deal with the response of rats consuming fish flour up to the eightieth day after the birth of the first generation of experimental animals. These studies have, however, still to be extended to include observations on other types of animals.

Vitamin Destruction

An investigation of the possibility of vitamin A in bread being destroyed by the incorporation of a fish flour was concluded. The results obtained indicate that, within the limits of experimental error, there is no evidence that fish flour, in the quantities added to bread, could lead to the destruction of vitamin A.

Fermented Fish Flour for Enrichment Purposes

In the preparation of fish flour, crude fish meal is extracted with a solvent such as alcohol. The lipids are not removed in the process but other nutrients, some of the vitamin B, for instance, are lost.

Research was conducted to determine whether it would be possible, by means of an acidifying process, to obtain a reduction of the trimethylamine content and of the peroxide number of crude fish meal in order to prepare a product in which all the nutrients in crude fish meal would be preserved and which would be suitable as an enrichment additive to bread.

A process was developed in which crude fish meal was added to an acidified wheat meal, oat meal or preferably an acidified oat meal-casein porridge. The fish meal is mixed with these acidified cereal products in the respective proportions of 80 to 20 parts by weight (the latter calculated on dry weight basis) and then autoclaved for a short period under low pressure (e.g. at 5 lbs. for 15 minutes). After this the product is dried by means of a roller drier.

Although various lactic acid forming bacteria are suitable for this acidifying process, a culture of *Lactobacillus delbrückii* was the one mainly used for the study

die besonderhede van die fermentasieproses gebruik. Daar is vasgestel dat die kwaliteit van die kultuur belangriker is as die verkryging van 'n hoë suurgraad. 'n Lang fermentasietyd is ook nie nodig nie: selfs met 'n kort versuringstyd van slegs ses uur by 'n rH-waarde van 21 is goeie resultate bereik. Die beste resultate is egter bereik met 'n versuringstyd van 10 tot 12 uur by 'n rH waarde van 14 tot 19.

Chemiese ontleding van die produkte het getoon dat in vergelyking met dié van vismeel, 'n daling van 73 persent in die trimetielamieninhoud en 89 persent in die peroksiedgetal verkry kan word. Hierdie produk het 'n goeie goedhouvermoë.

Tydens die drogingsproses vind 'n verlies van suur plaas. Daar is vasgestel dat monsters met 'n hoë suurinhoud tot 50 persent van die titreerbare suur gedurende die drogingsproses verloor. Die verlies by monsters met lae suurgehalte is egter gering. Die rede hiervoor is nog nie ondersoek nie.

Om die aanneemlikheid van die eksperimentele produkte vas te stel, is bakproewe gereeld uitgevoer met byvoeging in bruinbrood van hoeveelhede ekwivalent aan 'n toevoeging van 4 persent vismeelblom (berekend op basis van proteïene). Daar is vasgestel dat dit nodig is om die effek van die toevoeging van die suur vismeelprodukt te neutraliseer deur toevoeging van byvoorbeeld natriumkarbonaat om te verhoed dat die pH van die brood onder 5.4 daal.

Hoewel byvoeging van die produk 'n effense afwykende reuk en smaak gee en ook ten opsigte van die kleur, volume en tekstuur van die brood, 'n nadeliger uitwerking as die toevoeging van gewone vismeelblom by brood het, is tog gevind dat bruinbrood met 'n toevoeging ekwivalent aan 4 persent vismeelblom nog aanneemlik is.

Verdere ondersoek van hierdie proses word gesamentlik voortgesit aan die Visnywerheidsnavorsingsinstituut te Kaapstad, waar hierdie fermentasieproses vir hierdie doel ook al bestudeer is. 'n Amptenaar van die Instituut is na die V.N.I. gesekeundeer om met die voortsetting van die gesamentlike projek behulpsaam te wees.

BROOD

Proteïenverryking

'n Aansienlike hoeveelheid werk is gedoen om die effek van die byvoeging van verskillende stowwe by koringmeel (dit is verryking) op die assimileerbare proteïeninhoud van die brood te ondersoek. Die resultate wat verkry is met aanvulling van verskillende

of the particulars of the fermentation process. It has been ascertained that the quality of the culture is more important than the achievement of a high degree of acidity. Nor is a long fermentation period necessary: good results have been obtained with an acidifying period of as little as six hours with an rH value of 21. The best results however, were obtained with an acidifying period of up to 12 hours at an rH value of 14 to 19.

Chemical analysis of the products showed that in comparison with that of fish meal, a reduction of 73 per cent can be obtained in the trimethyl-amine content and 89 per cent in the peroxide number. This product keeps excellently

Loss of acidity occurs during the drying period. It has been determined that samples with a high acid content lose up to 50 per cent of the titratable acid. The loss in samples of low acidity, however, is negligible. The reasons for this have not been investigated.

Baking tests to determine the acceptability of the experimental products were conducted regularly by the addition of such quantities to brown bread as were equivalent to 4 per cent fish flour (calculated on a protein basis). It was determined that neutralization of the effect of the addition of the acid fish meal product by the addition of, for instance, sodium carbonate, was necessary to prevent the pH of the bread falling below 5.4.

Although the addition of the product imparts a slight off-flavour and taste and has a more detrimental effect on the colour, volume and texture of the bread than the addition of ordinary fish flour, it was found that brown bread with a supplement equivalent to 4 per cent of fish flour is still acceptable.

Further investigation of this product is being continued in collaboration with the Fishing Industry Research Institute at Cape Town, where this fermentation process for this purpose has also been studied. An officer of the Institute has been seconded to the F.I.R.I. to assist in the continuation of the joint project.

BREAD

Protein Enrichment

A considerable amount of work has been done to investigate the effect of the addition of various substances to wheat flour (i.e. enrichment) on the assimilable protein content of the bread. The results obtained with various supplements such as skim milk

hoeveelhede afgeroomde melkpoeier, geoutoklaveerde, ontvette sojameel, ontvette grondbonemeel, L-lisien, en Suid-Afrikaanse vismeelblom word in Tabel 3 weer-gegee.

Daarbenewens is vasgestel dat die effek van verryking van brood volgens die grondbonemeel-melkpoeierresep van die Departement van Voeding maar 'n geringe bydrae lower tot die assimileerbare proteïeninhoud van

powder, autoclaved, defatted soya flour, defatted peanut flour, L-lysin and South African fish flour are given in Table 3.

It has further been determined that the enrichment of bread according to the Department of Nutrition's peanut flour and milk powder recipe makes but a small

TABEL 3 / TABLE 3

Die Relatiewe Geskiktheid van Sekere Byvoegingsmateriale vir die Voorsiening van Ekstra Assimileerbare Proteïen in Brood van Meel van 90% Uitmaling gemaak (soos Bepaal in N-Balansproewe met Rotte)

The Relative Suitability of Certain Additive Materials for Providing Extra Assimilable Protein in Bread made of 90% Extraction Meal (as Determined in Balance Tests with Rats)

| Byvoegingsmateriaal Supplement Material | Aantal dele gevoeg by 100 dele koringmeel van 90% uitmaling Number of parts added to 100 parts of wheat meal, 90% extraction | Bygevoegde N as % van totale N in mengsel volgens ontleiding N Supplement as % of total N in mixture according to analysis | Toename in assimileerbare proteïeninhoud (in g.) per pond brood (voginhoud—40%) Increase in assimilable protein content (in g.) per lb. of bread (moisture content—40%) |
|--|---|---|--|
| AFGEROOMDE MELK-POEIER (Kommersieel rollerge-droog)/ SKIM MILK POWDER (Commercially roller-dried) | 4 | 6.3 | 2.35 |
| | 8 | 12.3 | 4.34 |
| | 12 | 17.2 | 6.08 |
| SOJAMEEL (geoutoklaveer; geëkstraheer met eter)/ SOYA MEAL (autoclaved; extracted with ether) | 2 | 3.2 | 1.14 |
| | 4 | 6.9 | 2.46 |
| | 8 | 12.6 | 4.49 |
| | 12 | 21.0 | 7.51 |
| L-LISIEN HCl (Du Pont) L-LYSINE HCl (Du Pont) | 0.1 | 0.7 | 1.85 |
| | 0.2 | 1.6 | 2.66 |
| | 0.4 | 2.7 | 2.68 |
| | 0.8 | 5.0 | 2.71 |
| | 1.6 | 10.9 | 2.80 |
| GRONDBONEMEEL (Kommersieel)/ PEANUT MEAL (Commercial) | 4 | 9.4 | 1.63 |
| | 8 | 17.0 | 2.95 |
| | 12 | 22.4 | 3.91 |
| VISMEELBLOM/ FISH FLOUR | 1 | 5.0 | 3.24 |
| | 2 | 8.9 | 5.79 |
| | 4 | 14.0 | 9.11 |

die brood, te wete ongeveer 3.8 tot 4.1 gram assimileerbare proteïen per twee-pond brood, terwyl hierdie gewig onverrykte brood (90 persent uitmalingsgraad) op sigself ongeveer 31 gram assimileerbare proteïen bevat. Laasgenoemde hoeveelheid assimileerbare proteïen is voldoende vir die daaglikse behoefte van 'n volwasse persoon van 65 kilogram liggamsgewig volgens die standaarde van die Voedsel- en Landbou-organisasie.

Aminosuursamestelling

Gedurende die afgelope jaar is die werk op die kwantitatiewe bepaling van aminosure in voedsels voortgesit. Aandag is veral gegee aan die bepaling van die basiese aminosure in brood.

'n Nuwe ionuitruilingshars, Amberlite CG-120, tipe II, wat in sommige opsigte beter is as die hars wat vroeër in gebruik was, is gebruik en eksperimentele gewens is ingevorder wat die noukeurigheid van die nuwe wysiging van die metode van Moore en Stein, soos dit op brood toegepas is, bewys het.

Die nuwe tegniek is gebruik met die doel om die moontlike uitwerking van verskeie drogingstegnieke op die basiese aminosure (in besonder lisien) van broodmonsters te bestudeer. Die ondersoek het ontstaan as gevolg van 'n bedenking dat lisienbeskadiging tot 'n aansienlike mate mag plaasvind wanneer broodmonsters gedroog word op die manier wat deur die Instituut toegepas is, te wete vir 18 uur in 'n lugsirkulasie-oond by 'n temperatuur van 48°C, voordat hulle biologies vir proteïenkwiteit, deur die gewysigde Thomas-Mitchell-metode, getoets is.

Onverrykte bruinbrood en bruinbrood wat met die huidige verrykingsmengsel van die Departement van Voeding verryk is, is óf gevriesdroog óf vir 18 uur in 'n lugsirkulasie-oond by 48°C gedroog. Daar kon geen bewyse van enige noemenswaardige vernietiging van lisien, arginien of histidien gevind word in monsters onverrykte en verrykte brood wat in die lugsirkulasie-oond by 48°C gedroog is nie. Die geringe verskille in die ooreenkomstige aminosuursamestelling wat tussen gevriesdroogde en oondgedroogde brood waargeneem is, het ook binne die perke van die toelaatbare eksperimentele foute van die metode geval.

MIELIEMEEL

Bereiding van Klaargaar Verrykte Mieliepappoer

'n Proses wat aan die Universiteit van Stellenbosch en die Westelike Provinsie Vrugtenavorsingstasie vir die bereiding van klaargaar mieliepappoer ontwikkel is, is nader bestudeer, veral met die oog op die toepassing daarvan in die bereiding van 'n klaargaar verrykte

contribution to the assimilable protein content of the bread, viz. 3.8 to 4.1 grams assimilable protein per 2 lb. loaf, whereas the same weight of unenriched bread (90 per cent extraction rate) contains approximately 31 grams of assimilable protein. The latter amount of assimilable protein is sufficient for the daily needs of an adult of 65 kilograms body weight by the Food and Agricultural Organization standards.

Amino Acid Composition

During the past year the work on the quantitative determination of amino acids in food was continued. Special attention was given to the determination of the basic amino acids in bread.

A new ion exchange resin, Amberlite CG-120, type II, was used, which is better in some ways than the resin formerly used, and experimental data were collected which proved the accuracy of the new modification of Moore and Stein's method as applied to bread.

The new technique was used with a view to studying the possible effects of various drying techniques on the basic amino acid (and particularly lysine) content of bread samples. The investigation was started as a result of a suspicion that lysine damage might take place on a considerable scale when bread samples were dried in the manner practised at the Institute, i.e. for 18 hours in an air circulation oven at a temperature of 48°C, before being tested biologically for protein quality according to the modified Thomas-Mitchell method.

Unenriched brown bread, and brown bread enriched with the present enrichment mixture of the Department of Nutrition were analysed after either freeze-drying or drying for 18 hours in air circulation oven at 48°C. No evidence of any notable destruction of lysine, arginine or histidine could be found in samples of unenriched and enriched bread dried in the air circulation oven at 48°C. The slight differences observed between the corresponding concentrations of amino acids in freeze-dried and oven-dried bread, fell within the permissible limits of experimental error of the method.

MEALIE MEAL

Preparation of Pre-cooked Enriched Mealie Meal

A process developed at the University of Stellenbosch and the Western Province Fruit Research Station for the preparation of pre-cooked mealie meal was studied, particularly with a view to its application in the preparation of a pre-cooked enriched mealie meal in which

mieliepappoeier waarby byvoorbeeld afgeroomde melk en/of vismeelblom geïnkorporeer is, asook vir die bereiding van 'n gedroogde gesuurde mieliepap.

Die drogingstegniek is ondersoek met klein enkel- en dubbel-roldroërs. Daar is gevind dat wanneer die enkel-roldroër gebruik word slegs mieliemeel-waterdispersies wat hoogstens 10 persent droëstof bevat, gedroog kan word. By hoër konsentrasies is die materiaal nie egalig deur die roller opgeneem nie, met die gevolg dat onegale droging en daarby skroeiing van die produk voorgekom het. Meer sukses is met die dubbel-roldroër verkry: beter verspreiding en gevolglike beter droging is verkry en mieliemeel-melk-mengsels kon met soveel as 50 persent droëstof behandel word.

Die onverrykte en met melk verrykte produkte wat verkry is, is maklik benaatbaar en kan maklik vir gebruik voorberei word deur dit slegs in warm water te roer. Die reuk en smaak van die produkte was baie goed en het dieselfde kleur as die oorspronklike materiaal gehad.

In die proewe vir die bereiding van 'n klaargaar suur mieliepappoeier is 'n suurpap berei, verskillende hoeveelhede rou mieliemeel daarby ingemeng en die mengsels in die dubbel-roldroër gedroog. Die droëstofinhoud van die mengsels het van 35 tot 43 persent en die suurinhoud, bereken op 'n vogvrye basis, van 2.6 tot 3.2 persent gewissel. Die reuk, kleur en smaak van die produkte wat so verkry is, is heeltemal bevredigend.

In die organoleptiese beoordeling van die produkte wat met beide bogenoemde proewe verkry is, is egter vasgestel dat die produk meesal nie „gaar” genoeg—vir veral die Bantoe—was nie. In die algemeen was die suur mieliepappoeiers in dié opsig beter as dié wat nie aangesuur is nie. Daar is egter gevind dat dit moeilik is om objektief vas te stel wanneer so 'n produk gaar genoeg is, en die Instituut is tans besig om metodes te ondersoek om die graad van „gaarheid” van dié produkte deur fisiese meting of chemiese ontleding te bepaal.

Op versoek van die Departement van Voeding is ook 'n reeks grootskaalse eksperimente by 'n melkfabriek uitgevoer om die toepassing van hierdie proses in die praktyk uit te toets. In hierdie proewe is afgeroomde melk en mieliemeel gemeng en die suspensie wat ongeveer 20 persent droëstof bevat het, op 'n grootskaalse roldroër gedroog. 'n Spesiale toestel moes gebruik word om hierdie moeilik vloeibare suspensie egalig oor die rollers te versprei. Daar is gevind dat waar die suspensie 25 gewigsdele afgeroomde melk en 20 gewigsdele mieliemeel bevat het, dit baie geneig was om te skroei tydens droging terwyl die produk ook nog steeds nie „gaar” was nie. Verdere proewe met 'n verhouding van afgeroomde melk en mieliemeel van $12\frac{1}{2}$ en 20 gewigsdele respektiewelik het die skroeiing verminder. Voorafweking van die mieliemeel vir twee uur in warm water of in suur afgeroomde melk het 'n beter gedroogde

skim milk and/or fish flour, for instance, is incorporated and also for the preparation of a dried, fermented mealie porridge.

The drying technique was investigated with small single and double drum driers. It was found that when the single drum drier was used, only mealie meal water dispersion containing not more than 10 per cent of dry matter could be dried. At higher concentrations, the material was not taken up evenly by the drums, thus giving rise to uneven drying, accompanied by scorching of the product. More success was obtained with the double drum drier: this gave better distribution and therefore better drying and mealie meal mixes could be treated with as much as 50 per cent dry matter.

The unenriched products and products enriched with milk, which were obtained, are readily wettable and are easily prepared for use by merely stirring in hot water. The odour and flavour of the products were excellent and showed the same colour as the original material.

In the tests for the preparation of a pre-cooked sour mealie porridge powder, a sour porridge was prepared, various quantities of uncooked mealie meal were mixed into it and the mix was dried in the double drum drier. The dry material content of the mixes varied from 35 to 43 per cent and the acid content, calculated on a moisture free basis, from 2.6 to 3.2 per cent. The odour, colour and flavour of the products obtained by this method were quite satisfactory.

Organoleptic tests with the products obtained in both the above tests showed, however, that particularly for the Bantu the product was still undercooked in most cases. On the whole the sour mealie porridge powders proved to be more satisfactory than those which had not been acidulated. It was found, however, that it is difficult to determine objectively *when* such products are sufficiently done and the Institute is now investigating methods to determine by physical measurement or chemical analysis the degree to which these products are “cooked”.

At the request of the Department of Nutrition a series of large-scale experiments have been carried out at a milk factory to test the application of this process in practice. In these tests skim milk and mealie meal were mixed and the suspension, containing about 20 per cent of dry material, was dried in a large-scale drum drier. A special device was necessary to spread this suspension, which flowed with difficulty evenly over the rollers. It was found that where the suspension contained 25 parts by weight of skim milk to 20 parts by weight of mealie meal, it tended to scorch during drying, even when the product was not yet “cooked”. Further tests (with a ratio of $12\frac{1}{2}$ to 20 of skim milk and mealie meal respectively) reduced scorching. Pre-soaking of the mealie meal for two hours in hot water

en „gaarder” produk gelewer sonder dat enige skroeiing plaasgevind het. Hierdie ondersoek word nog voortgesit.

Mikrobiologiese Ondersoek

Verryking van mielie-meel met proteïenryke stowwe het probleme opgelewer, onder andere die ontwikkeling van 'n bitter smaak by opberging van die verrykte produk. Hierdie verskynsel is ondersoek en daar is vasgestel dat dit aan sekere mikro-organismes teenwoordig in die mielie-meel te wyte kan wees. 'n Studie van die mikroflora van mielie-meel is onderneem en verskeie ondersoeke in dié verband is gedurende die afgelope jaar uitgevoer. Die metodes soos toegepas in die Instituut word met dié van ander laboratoria vergelyk en verskillende monsters word ook gesamentlik met 'n ander nasionale laboratorium ondersoek.

Tydens 'n oorsese studiebesoek het 'n amptenaar van die Instituut wat met hierdie studie belas is, spesiale aandag gewy aan die jongste metodes vir ondersoeke van hierdie aard, asook aan die mikrobiologiese vereistes wat aan produkte, bedoel vir menslike gebruik, gestel moet word.

Verkleuring deur Grondbonemeel

Vroeëre ondervinding het getoon dat ontvette grondbonemeel nie gebruik kan word vir die verryking van mielie-meel nie: wanneer die verrykte produk in ysterpotte gekook word, vind 'n kleurreaksie plaas wat die pap 'n baie onaantreklike voorkoms gee. ('n Soortgelyke verkleuring kom soms ook voor by verrykte brood te wyte aan 'n verkleuring van die deeg wat ook grondbonemeel bevat, terwyl dit in die staal rysbakke lê). 'n Ondersoek is onderneem om vas te stel of hierdie tegniese probleem oorbrug kan word.

Dit is bekend dat die huid van grondbone tanniene bevat en die gedagte was dat hierdie tannien of tannienagtige stowwe vir die kleurreaksie verantwoordelik is. Proewe het ook getoon dat wanneer grondbonemeel berei van die grondbonevariëteit wat 'n wit huid in plaas van die meer algemeen bekende rooi huid het, in mielie-meel gebruik word, die verkleurings nie voorkom nie. Wanneer hierdie tipe grondbonemeel egter onvermeng in 'n ysterpot gekook word, kom die verkleuring wel voor.

Ondersoek is dus gedoen om vas te stel wat die minimum konsentrasie tannien in mielie-meel is waarby hierdie kleurreaksie plaasvind. 'n Analitiese metode wat berus op die oksidasie van tanniene en tannienagtige stowwe deur kaliumpermanganaat, waarby indigokarmyn as regulator gebruik word, is aanvanklik toegepas maar is onbetroubaar gevind. Verskeie ander metodes is uitgetoets en ook onbevredigend gevind. Tans word 'n poging aangewend om 'n ultraviolet-spektrofotometriese metode vir die bepaling van tannien in grondbone aan te pas.

or sour skim milk produced a better product which was cooked and which dried with no scorching whatsoever. This investigation is being continued.

Microbiological Investigation

Enrichment of mealie meal with substances rich in protein brought new problems, including the development of a bitter taste on storage of the product. This phenomenon was examined and it was ascertained that this could be attributed to certain micro-organisms present in the mealie meal. A study was made of the microflora of mealie meal and several investigations in this connection were conducted during the past year. The methods applied in the Institute are being compared with those of other laboratories and various samples are also being investigated in collaboration with another national laboratory.

During an overseas study tour an officer of the Institute, who is in charge of this study, paid special attention to the latest methods of investigation of this nature, as well as to the microbiological requirements to be met by products for human consumption.

Discolouration by Peanut Meal

Earlier experience showed that defatted peanut meal could not be used for the enrichment of mealie meal. When the enriched product is cooked in iron pots, a colour reaction takes place which imparts a most unattractive appearance to the porridge. (A similar reaction sometimes occurs in enriched bread owing to discoloration of the dough, which also contains peanut meal, while it is lying in the steel fermentation troughs). An investigation was conducted to determine whether this technical problem could be solved.

It is known that the skins of peanuts contain tannin and it was thought that this tannin or tannic substances are the cause of the colour reaction. Tests showed, moreover, that when peanut meal prepared from the peanut variety having white, instead of the more common red, skins was used in mealie meal, no discoloration took place. When this type of peanut meal is cooked by itself in an iron pot, however, discoloration does occur.

An investigation was therefore made to determine the minimum tannin concentration at which this colour reaction occurred. An analytic method, based on the oxidation of tannin and tannic substances by potassium permanganate and using indigo carmine as a regulator was at first applied, but it was found to be unreliable. Various other methods were tested and found equally unreliable. At the moment an endeavour is being made to adapt an ultraviolet spectrophotometric method for the determination of tannin in peanuts.

Vir dié ondersoek was dit ook nodig om 'n objektiewe metode te vind om die kleurreaksie in die mieliepap te meet. Goeie resultate is verkry deur gebruik van 'n tristimulusmeter op 'n wyse wat ooreenkom met dié wat in die tekstielnywerheid toegepas word.

VOEDSELONTLEDING

Gedurende hierdie jaar is altesaam 538 voedsel- en ander monsters ontleed. Van hierdie getal is 153 vir die Departement van Voeding, 14 vir buiteliggame, 31 vir die Gevangenisprojek en 340 vir die verskillende Afdelings van die Instituut ontleed. Die monsters het ingesluit broodverrykingsmengsels en -bestanddele, graan- en boonprodukte, vismeelblom, vismeel, rou vis, melkprodukte, rotfaeces, -uriene en -femurs, gekookte voedsels en ook een monster blare van die amadumbe, 'n plant wat in sekere dele van Natal groei en deur die Bantoe as voedsel gebruik word. Hierdie monster was eenaardig vir sover die as daarvan 'n ongewone donkergroen kleur gehad het wat die gedagte laat ontstaan het dat dit 'n besondere mineraalsamestelling mag hê. Hierdie aspek word verder ondersoek.

Behalwe die gewone vog-, as-, vet-, vesel- en proteïenbepalings is op sommige van die monsters ook kalsium, yster, magnesium, fosfor, tiamien, riboflavin, niasien, askorbiensuur, karoteen, vitamien A, trimetielamien, trimetielamienoksied, asook die antitriptiese aktiwiteit van verskillende sojaboonvariëteite, bepaal.

Die bestaande metodes moes dikwels gewysig word om aan te pas by die tipe monster wat ontleed moes word. Die bepaling van magnesium in vismeelblom, rotranstsoene en rotfaeces (laasgenoemde in verband met 'n proef oor mineraalmetabolisme) het byvoorbeeld probleme opgelewer veral weens die hoë kalsiuminhoud van hierdie monsters. Dit was dus nodig om die kalsium eers met behulp van die hars Dowex 50 te verwyder voordat die magnesium volgens die titaangeelmetode bepaal kon word. Hoewel sommige navorsers die gebruik van 'n kompenserende kalsiumoplossing aanbeveel, is nie veel sukses daarmee behaal nie en is derhalwe voorkeur daaraan gegee om die meeste van die kalsium te verwyder. In verskeie titaangeelmetodes word polivinylalkohol as stabilisator vir die kleur voorgeskryf maar ondersoek het getoon dat gelatien 'n effens beter stabilisator is. Die titaangeelmetode is wel 'n gerieflike en vinnige metode vir magnesium maar is onderhewig aan sekere nadele: die kleur is nie heeltemal stabiel nie en die kleur-intensiteit moet derhalwe binne 'n uur nadat dit ontwikkel is, bepaal word.

Heelwat aandag is ook gegee aan metodes vir die bepaling van die B-vitamiene, veral niasien. Nuwe metodes of verbeterings van bestaande metodes word so gereeld moontlik op die proef gestel en die metodes deur die Instituut in gebruik, word dan ook gewysig in gevalle waar dit noodsaaklik is.

This investigation also required an objective method of measuring the colour reaction in the mealie porridge. Good results have been achieved by the use of a tristimulusmeter in a manner similar to that applied in the textile industry.

FOOD ANALYSIS

During the year a total of 538 food and other samples were analysed. Of this number 153 were for the Department of Nutrition, 14 for outside organizations, 31 for the Prison Project and 340 for the various Divisions of the Institute. The samples included bread enrichment mixtures and ingredients, cereal and leguminous products, fish flour, fish meal, raw fish, milk products, rat faeces, urine and femurs, cooked foods and also a sample of amadumbe leaves, a plant growing in certain parts of Natal and used as food by the Bantu. This sample was peculiar in that its ash was of an unusual dark green colour, which gave rise to the idea that it might have a peculiar mineral composition. This aspect is being further investigated.

In addition to the usual moisture, ash, fat, fibre and protein determinations, the calcium, iron, magnesium, phosphorus, thiamine, riboflavin, niacin, ascorbic acid, carotene, vitamin A, trimethylamine, trimethylamine oxide were determined on some of the samples, as well as the antitryptic activity of various soya bean varieties.

The existing methods frequently had to be modified to suit the type of sample to be analysed. For instance, the determination of magnesium in fish flour, rat rations and rat faeces (the latter in connection with a test on mineral metabolism) presented problems due particularly to the high calcium content of these samples. It was necessary, therefore, first to eliminate the calcium by means of the resin Dowex 50 before the magnesium could be determined by the titan yellow method. Although some research workers recommend the use of a compensating calcium solution, it was found better to remove as much of the calcium as possible, as not much success was attained by the use of such a compensating solution. In several titan yellow methods polyvinyl alcohol is prescribed as the colour stabilizer, but investigations have shown that gelatine is slightly better. The titan yellow method certainly offers a convenient and rapid method for magnesium, but certain disadvantages are attached to its use. The colour is not quite stable and the colour intensity must therefore be determined within one hour after it has developed.

Methods for the determination of vitamin B, thiamine, riboflavin and particularly niacin, have received considerable attention. New methods or improvements on existing methods are tested as regularly as possible and the methods in use in the Institute are then modified in cases where this is necessary.

Vir die evaluering van die betrokke chemiese metodes is niasien volgens 'n mikrobiologiese metode in 15 monsters bepaal.

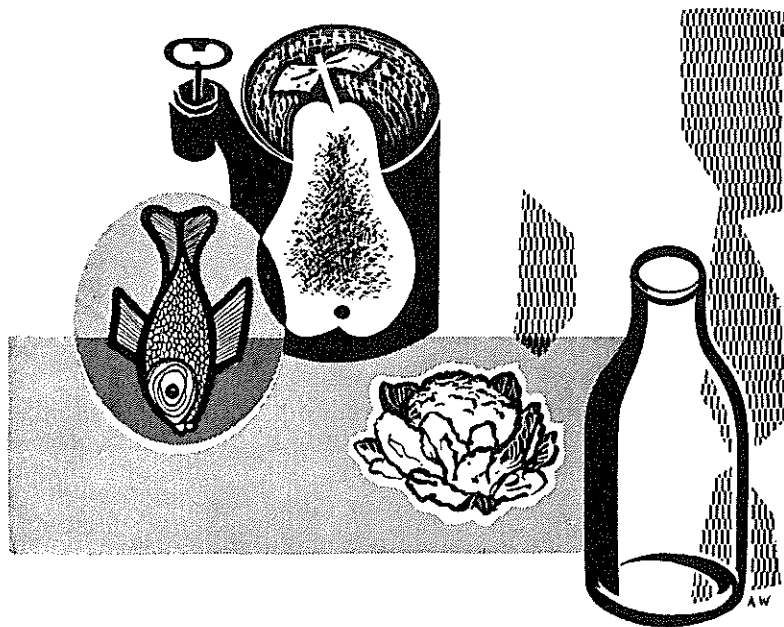
Mikrobiologiese ondersoek van 77 monsters, waaronder monsters afgeroomde melkpoeier, verrykingsmengsel en bakkersgis, is ten behoeve van die Departement van Voeding uitgevoer.

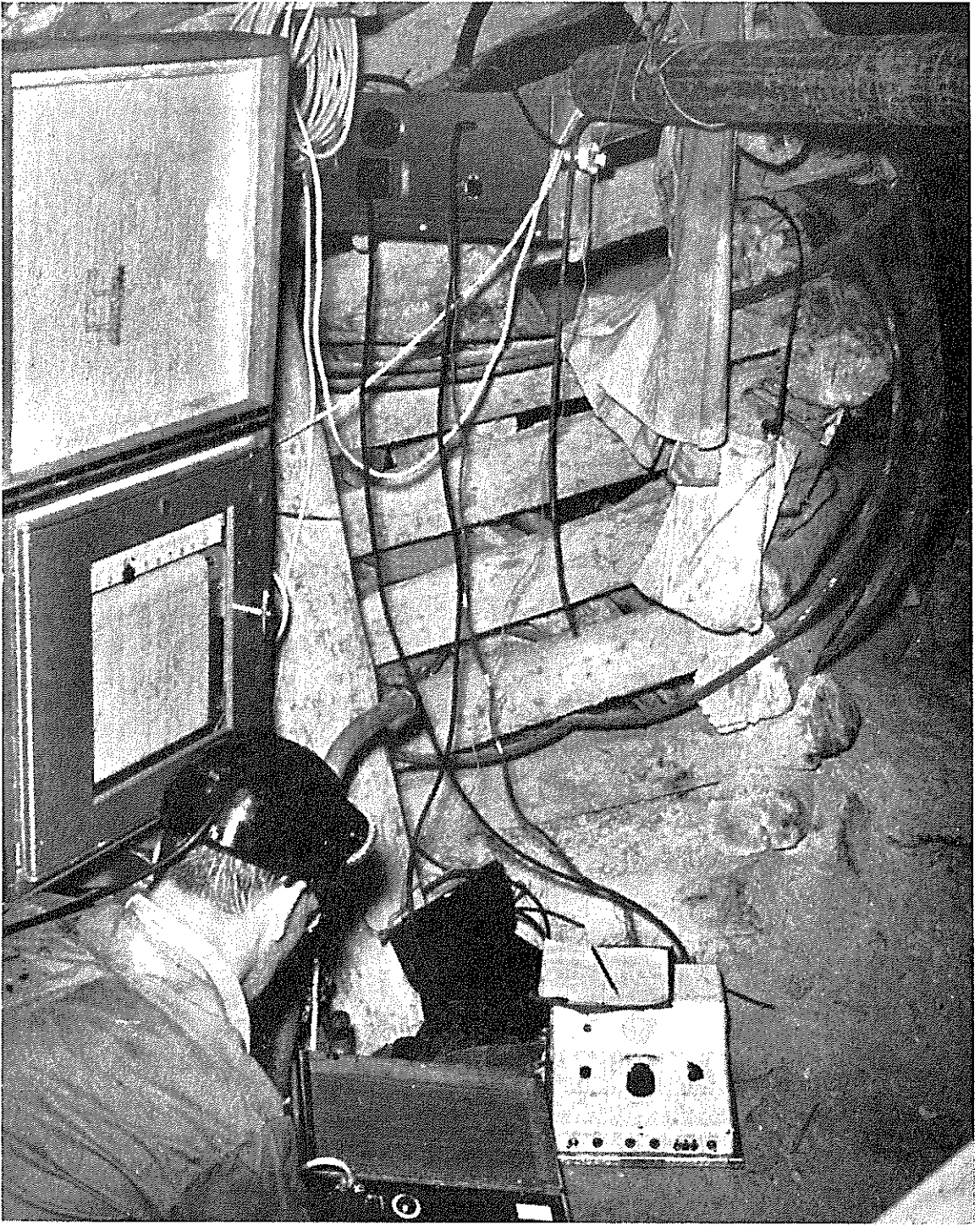
For the evaluation of the chemical methods concerned, the niacin content of 15 samples was also determined by means of a microbiological method.

Microbiological examinations of 77 samples, including samples of skim milk powder, enrichment mixtures and bakers' yeast, were carried out on behalf of the Department of Nutrition.

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'n Wetenskaplike lees instrumente wat spanningsverandering by 'n vorderende werksfront in diep mynbou afmeet

A scientist taking readings from instruments measuring changes in stress ahead of an advancing face in a deep mine

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL IX

NASIONALE NAVORSINGS-
INSTITUUT VIR MEGANIESE
INGENIEURSWESE

PART IX

NATIONAL MECHANICAL
ENGINEERING RESEARCH
INSTITUTE

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
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1.

NASIONALE NAVORSINGSINSTITUUT VIR MEGANIESE INGENIEURSWESE

Direkteur: DR. W. L. GRANT

Die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese stel hom ten doel om eerstens fundamentele navorsingswerk te onderneem in rigtings wat binne afsienbare tyd van groot belang vir die vervaardigende nywerhede kan word, en tweedens, om dringende probleme op te los wat van 'n toegepaste aard is en waarmee nywerhede, organisasies en firmas te kampe het. Vir hierdie tweeledige doelstelling word die laboratoria van die Instituut dan ook toegegerus om die maksimum diens te lewer vir die Nywerheid. Aandag word veral toegespits op die daarstelling van geriewe waarmee dringende probleme aangepak kan word. Dat hierdie 'n gesonde standpunt is, blyk uit die feit dat meer navrae oor en aanvrae om navorsingswerk ontvang is as wat behartig kon word, ten spyte daarvan dat die personeel sowel as die geriewe vinnig uitgebrei het gedurende die finansiële jaar.

Van die meer belangrike projekte waarmee gedurende die jaar 'n aanvang gemaak is, is: die ondersoek oor die beskikbaarheid en geskiktheid van Suid-Afrikaanse sand en gietvormmateriale vir gieterydoeleindes; 'n basiese ondersoek in verband met vergruising en verpoëring van bros grondstowwe; navorsing aangaande metodes om vaste liggame te verwyder uit ondergrondse mynwater wat uitgepomp moet word; en navorsing op 'n dinamies soortgelyke model van 'n vertikale mynskag om die stabiliteit van tougeleide vervoermiddels, te bepaal.

Namens die Nasionale Advieskomitee vir Lugvaartkundige Navorsing is 'n aanvang gemaak met 'n ondersoek na vliegtoestande oor verskillende roetes in die Unie. Hiermee is die S.A. Lugmag en die Weerburo behulpsaam.

Die belangrikste langtermyn-navorsingsprojekte behels o.a. navorsing oor vermoedheid van materiale en strukture, werk oor rotsstortings en stratabewegings in diep mynbou, die ontwikkeling van instrumente vir hitte-oordragings- en voglobelingsdoeleindes, ontwikkeling van verbrandingstoerusting en tegnieke vir steenkoolgasturbines, ondersoek na mynskagweerstand en hidrouliese navorsing op verslikkingsprobleme in hawens. By hierdie hoofprojekte moet nog heelwat ander navorsingsprojekte, roetinetoetse, teoretiese en eksperimentele ontledings en navrae gevoeg word.

NATIONAL MECHANICAL ENGINEERING RESEARCH INSTITUTE

Director: DR. W. L. GRANT

The aims of the National Mechanical Engineering Research Institute are, firstly, to undertake research work of a fundamental nature on general problems the solution of which will benefit the country as a whole, and secondly, to solve problems of an applied nature with which industry, organizations and firms are faced and which need immediate solution. To fulfil these aims, the laboratories of the Institute are being equipped to be of maximum benefit to industry, particular attention being given to establishing facilities for the solution of those problems which require urgent attention. The soundness of this policy is proved by the fact that more enquiries and requests for research work were received than could be handled, even though the staff and the facilities had both increased during the financial year.

Among the more important projects started during the year were an investigation into the availability and suitability of South African sands and moulding materials for foundry purposes, a fundamental study into the comminution and grinding of brittle materials, an investigation into the methods of separating solid particles from mine water which has to be pumped from underground, and a study of the stability of rope-guided conveyors by making use of a dynamically similar model of a vertical mine shaft. An investigation was started into flight conditions over different routes in the Union on behalf of the National Advisory Committee for Aeronautical Research and in collaboration with the South African Air Force and the Weather Bureau.

The most important long term research projects in progress include work on the fatigue of materials and structures, research into rockbursts and strata movement in deep level mining, development of instruments for heat transfer and humidity measurements, development of combustion equipment and techniques for coal-fired gas turbines, mine shaft resistance investigations, and hydraulic studies into siltation problems of harbours. Apart from these major projects, a considerable number of other research work, routine services, theoretical and experimental analyses and enquiries were dealt with.

Die toename in die Instituut se werk wat gelewer is ten behoeve van liggame buite die W.N.N.R., word weerspieël in die verskil tussen die finansiële jaar 1957/58 se inkomste van £36,600 en 1958/59 se £43,000. Teen die einde van die finansiële jaar het die Instituut se personeel bestaan uit 42 gegradueerde wetenskaplikes, 46 wetenskaplike assistente en 'n administratiewe personeel van 10.

METALLURGIE

'n Groot gedeelte van die metallurgiese laboratorium se werksaamheid het weer, soos in die verlede, bestaan uit navorsing regstreeks ten behoeve van die Nywerheid of om ondersoek wat in ander laboratoria gedoen word, aan te vul. Hierdie ondersoek het ingesluit makro- en mikrohardheid en trektoetse, hittebehandeling van materiale en onderdele en metallografiese ondersoek. Omtrent 60 tegniese navrae van uiteenlopende bronne het ook aandag geniet.

'n Gietsandkontrakbeurs is in die lewe geroep deur „The Institute of British Foundrymen” (Suid-Afrikaanse Tak) namens 39 firmas wat ook bydra. Daarmee het 'n gesamentlike poging ontstaan tot stelselmatige navorsing in verband met die beskikbaarheid en geskiktheid van Suid-Afrikaanse sand en gietvormmateriale vir gieterydoeleindes. Die aanvangstadium van die ondersoek bestaan uit 'n opname van die gieterynywerheid om vertrouwd te raak met sy hoofprobleme en om 'n skatting van plaaslike grondstowwe te verkry.

Plastiese Eienskappe van Metale

Die plastiese eienskappe van metale is van groot praktiese belang aangesien hulle 'n hoogsbelangrike rol in die vervorming van metale en die gedrag van metale onder belasting speel.

In die voortgesette ondersoek aangaande die invloed van voorvervorming op die plastiese eienskappe van metaal-enkelkristalle, is die aandag veral toegespits op die Bauschinger-effek. Laasgeneemde is die verskynsel dat, wanneer 'n monster belas word buite die elastiese bestek in 'n spesifieke rigting, sy elastiese grens afneem by belasting in die teenoorgestelde rigting.

Die spanning-verlengingseienskappe van sferiese enkelkristalle van sink van hoë suiwerheid is bepaal deur hierdie kristalle te onderwerp aan omgekeerde skuifspanning in 'n spesiale dooiegegewig-skuifbelastingstoestel. Afskuiwing word toegepas op die kristalle se basisvlak in voorbepaalde kristallografiese rigtings en die aangewende vervormings word deur 'n noukeurige optiese verlengingsmeter waargeneem.

Daar is gevind dat die afname van die elastiese grens, die gevolg van die Bauschinger-effek, toeneem met 'n toenemende graad van vervorming. Daar

The growth in activities on behalf of outside bodies is reflected in the increase in the Institute's revenue. This was about £43,000 in 1958/59, compared with £36,600 for the financial year 1957/58. At the end of the financial year the staff of the Institute consisted of 42 graduated scientists, 46 scientific assistants and 10 administrative personnel.

METALLURGY

As in previous years, a large proportion of activity in the metallurgical laboratory was devoted to sponsored research. Of this, some was undertaken directly while the rest supplemented work in other laboratories. The investigations involved macro- and micro-hardness and tensile testing, heat treatment of materials and components and metallographic examinations. In addition, the staff dealt with about 60 technical enquiries from a wide variety of sources.

A Foundry Sands Research Fellowship was established, which is financed by the Institute of British Foundrymen (South African Branch) on behalf of 39 subscribing firms. It marks the beginning of a co-operative research effort aimed at a systematic investigation of the availability and suitability of South African sands and moulding materials for foundry practice. The first phase of the research will entail a survey of the foundry industry to become acquainted with its major problems and to assess local raw materials.

Plastic Properties of Metals

The plastic properties of metals are of great practical importance, since they exercise a major influence on the shaping and forming of metals and the behaviour of metals under load.

An investigation into the influence of predeformation on the plastic properties of metal single crystals was continued, particular attention being paid to the Bauschinger effect, the phenomenon, in which the elastic limit of a specimen stressed beyond the elastic range in one direction, decreases upon stressing in the opposite direction.

The stress-strain characteristics of spherical high-purity zinc single crystals were determined by subjecting these crystals to reversed shear stressing in a specially constructed dead-weight loading apparatus. The crystals are sheared on their basal plane in predetermined crystallographic directions and the deformations applied are measured with an accurate optical extensometer.

It was found that the decrease of the elastic limit, resulting from the Bauschinger effect, increases with an

word voortgegaan met 'n stelselmatige kwantitatiewe waarneming. Die werk wat nou volg, sal bes moontlik gaan om die bepaling van die effek van die kristallografiese rigting van belasting op die grootte van die Bauschinger-effek.

Spanningskorrosie in Metale

Die gelyktydige inwerking van spanning en korrosie mag, in sommige gevalle, spoedige verswakking en selfs swigting van metale en legerings teweegbring. Hierdie verskynsel, bekend as spanningskorrosie, is vanselfsprekend van praktiese belang. Die gevare wat dit inhou in die praktyk, word daardeur verskerp dat die korrosie, sonder uitsondering, van so'n uiters gelokaliseerde aard is dat dit nie maklik opgemerk word nie, terwyl interne spannings die verskynsel kan veroorsaak. Hierdie feite het onlangs duidelik aan die lig gekom in swigtings van 'n groot hoeveelheid vlekvrystaal draadgaas. Die ondersoek oor die oorsaak van hierdie swigtings het aan die lig gebring dat 'n spanningskorrosiemeganisme werksaam was.

Navorsing oor tussenkristallyne kraging in alfa-geelkoper, wat een van die basiese aspekte van die spanningskorrosieprobleem is, het as doelwit die bepaling van die invloed van interkristaloriëntasie op die gevoeligheid van patroonkoper vir spanningskorrosiekraging. Vir hierdie doel is bi-kristalle met 'n korrelgrens in die lengterigting gekweek in 'n gesplete grafiëtvorm. Om die monsters aan spanning te onderwerp in aanwesigheid van 'n invretende medium, is 'n geskikte belastingshulpstuk van die stemvurktipe ontwerp en gebou. Tot dusver is nog geen eksperimentele gegewens beskikbaar nie, maar die eksperimentele tegnieke om bi-kristalle te toets en te produseer, is bemeester.

Loogbrosheid, wat 'n spanningskorrosieprobleem van toegepaste aard is, kom veral voor in geklinkte stoomketeldromme. Die doel van die navorsing is om die werklike, tot dusver onbekende, meganisme van alkaliese kraging vas te stel asook tegelykertyd die invloed van faktore soos temperatuur, druk, alkaligehalte van die water, staalsamestelling en metallurgiese toestand te bepaal. 'n Metode moes gevind word om betreklik klein grade van verbrossing in 'n andersins rekbare materiaal waar te neem en te meet, en 'n uitgebreide reeks toetse op sagtetaalmonsters, wat met opset verbros is, het getoon dat die „ware spanningware verlenging“-trektoets en stadige deurbuigingstoets vir hierdie doel gebruik kan word. Slagtoets en die standaardingenieurstrektroets het nie so goed beantwoord aan die doel nie.

Stoomketeltoestande is nageboots deur staalmonsters onder spanning bloot te stel in 'n outoklaaf. Hiervoor is 'n geskikte belastingsapparaat, wat geen geskroefde of trekspanningsdele het nie, ontwerp en gebou. Tot dusver het alle pogings om verbrossing of kraging te verkry in die monsters, wat getoets is, nog misluk. Dit

increasing degree of deformation. A systematic quantitative determination is being continued. Subsequent work will aim at determining the effect of the crystallographic direction of straining on the magnitude of the Bauschinger effect.

Stress-corrosion in Metals

The simultaneous action of stress and corrosion may, in certain cases, produce rapid deterioration and even failure of metals and alloys. This phenomenon, which is known as stress-corrosion, is of obvious practical importance. Its possible hazard in service is aggravated by the fact that corrosion is invariably of such a localized nature that it may easily escape detection, while residual stress can initiate the phenomenon. This was evident in the recent failures of a large number of stainless steel wire meshes, subsequent investigations revealing that stress-corrosion had been operative.

Research into intercrystalline cracking in alpha-brass, which is one of the fundamental aspects of the stress-corrosion problem, was continued, and aims at determining the effect of intergranular orientation on the susceptibility of cartridge brass to stress-corrosion cracking. To this end, bi-crystals having a single longitudinal grain boundary were produced in a split graphite mould. To subject the specimens to stress in the presence of a corrosive agent, a suitable loading fixture of the tuning-fork type was designed and constructed. No experimental results are yet available but the experimental techniques for testing and bi-crystal production have been mastered.

Caustic embrittlement, representing a stress-corrosion problem of an applied nature, occurs predominantly in riveted steam boiler drums. The research is aimed at determining the actual, as yet unknown, mechanism of caustic cracking. Simultaneously, the influence of such factors as temperature, pressure, degree of alkalinity of the water, steel composition and metallurgical condition is being determined. It was necessary to establish a means for detecting and measuring relatively small degrees of embrittlement in an otherwise ductile material, and an extensive series of tests on purposely embrittled mild steel specimens revealed that both the "true stress—true strain" tensile test and the slow-bend test can be used for this purpose. Impact tests and the standard engineering tensile test proved much less suitable.

Steam boiler conditions were simulated by exposing stressed steel specimens in an autoclave. A suitable loading jig, which contains no threaded parts or tensile members, was designed and constructed. All attempts to obtain embrittlement or cracking in the specimens have, however, failed. It appears, therefore, that

lyk dus of sekere stale nie vir loogbrosheid gevoelig is nie. Gevolglik moet stale van ander metallurgiese samestelling verkry word vir verdere toetse.

Etsgaatjies in Metale

Angesien sekere chemiese etsmiddels op selektiewe wyse invreet op gepoleerde oppervlakke van metale, gee dit etsgaatjies met duidelike geometriese vorm. Die vorm van sulke etsgaatjies besit 'n besliste verwantskap met die kristallografiese oriëntasie van die betrokke korrel, terwyl hulle posisies ontwigtings, leë roosterposisies en ander puntdefekte afteken. Die sogenaamde etsfiguurtegniek kan dus metallografies waardevol wees. Hierdie tegniek is ontwikkel en suksesvol toegepas op koper, alfa- en beta-geelkoper en sink. Aandag is veral toegespits op die aard van korrelgrense en -subgrense en van plaaslike vervorming en herstelprosesse by warmtebehandeling na vervorming.

Die gegewens oor beta-geelkoper is reeds gepubliseer en dié oor etsgaatjies in sink, koper en alfa-geelkoper verskyn eersdaags.

Die gegewens oor hierdie ondersoek is veelvuldig en ingewikkeld. Net 'n paar belangrike aspekte kan dus hier aangestip word. Daar is gevind dat in beta-geelkoper die vervormingsbande kernvormig is by korrelgrense en dat hulle gevorm word deur kanteling van die rooster. In koper en alfa-geelkoper ontstaan verrekingslyne en vervormingsbande in verskeie stadia, afhangende van die graad van makroskopiese vervorming, sinkgehalte en warmtegeskiedenis, terwyl 'n duidelike verband gevind is tussen spanningsmerke en leë roosterposisies wat neergeslaan is op die glijvlakke. Daar is bewys dat, in die geval van sink, die formasie en getal van die etsgaatjies beheer word deur die diffusie van onsuiverheidsdeeltjies na ontwigtings en die uitwerking van temperatuur op die stabiliteit van ontwigtings.

Swigtings tydens Gebruik

Namens die nywerheid is 15 gevalle van swigting tydens gebruik ondersoek. Hiervoor was uitgebreide laboratoriumnavorsing nodig. Daar is ook 'n hele aantal minder belangrike gevalle ondersoek en mondelings raad gegee. Enkele ondersoeke betreffende ontydige swigting van toetsmonsters en toetsmasjienonderdele is vir ander laboratoria gedoen. In al die gevalle is die oorsaak van die swigting of die fout vasgestel en is die opdraggewer van raad gedien om verdere moeilikhede te voorkom.

STERKTE VAN MATERIALE

Uitgebreide ondersoeke na spanningsontledings ten behoeve van buiteliggame het 'n groot gedeelte uitgemaak van die werksaamhede op die gebied van sterkte van materiale. Die ontwikkeling van 'n handige

certain steels are not susceptible. Consequently, it is intended to obtain steels of different metallurgical condition for future tests.

Etch Pits in Metals

Certain chemical etchants are very selective in the manner in which they attack the polished surfaces of metals and this results in the development of etch pits of definite geometrical shape. The shape of such etch pits bears a definite relation to the crystallographic orientation of the relevant grain, while their sites delineate dislocations, vacancies and other point defects. Consequently, the method known as the etch-figure technique can form a valuable metallographic tool. This technique was developed and successfully applied to copper, alpha- and beta-brasses and zinc. In particular, studies were made of grain boundaries and sub-boundaries, and of localised deformation and recovery processes on thermal treatment after deformation.

The work on beta-brasses has been published and publications on etch pits in zinc, copper and alpha-brasses will appear in the near future.

The results of this research are manifold and complex. Accordingly, only a few highlights can be mentioned here. It was found that in beta-brass the deformation bands are nucleated at grain boundaries and are formed by tilt of the lattice. In copper and alpha-brasses strain-markings and deformation bands are developed in several stages, depending on the degree of macroscopic deformation, zinc content and thermal history, while a definite association was found between strain-markings and vacancies condensed on the glide planes. In zinc it was shown that the formation and the number of etch pits are controlled by the diffusion of impurity atoms to dislocations and the effect of temperature on the stability of dislocations.

Failures in Service

Investigations of 15 failures in service, involving extensive laboratory work, were conducted on behalf of individual firms. In addition, several minor cases were inspected and verbal advice given. A few investigations concerned with premature failure of test specimens and testing machine components were carried out for other laboratories. In every case the cause of the failure or defect was established and the sponsor advised of ways and means of preventing further difficulties.

STRENGTH OF MATERIALS

A large proportion of the work in the strength of materials field was related to stress analysis investigations on behalf of outside bodies. The development of a convenient model-testing technique, using acrylic plastic

modeltoetstegniek waarby akrielkunshars gebruik word, het die doeltreffendheid waarmee spanningsontledings uitgevoer kan word op prototipe strukture of onderdele, heelwat verhoog.

Behalwe verskeie ondersoeke wat deur die laboratorium gedoen is, is ook omtrent 35 tegniese navrae afgehandel.

Op grond van die steeds toenemende aanvraag vir navorsing i.v.m. vermoeidheid van materiale en strukture vir plaaslike nywerhede, moes nog drie vermoeidheidstoetsmasjiene aangeskaf word met 10 tot 60 ton toetsvermoë. Hierdie toerusting word nou geïnstalleer.

Vermoeidheid van Metale

'n Ondersoek na die invloed van verskillende belastingsiklusfrekwensies op die vermoeidheidssterkte in wentelbuiging van EN-45 staalmonsters is voltooi. Eenvoudige buisvormige monsters is onderwerp aan vermoeidheidstoetse teen frekwensies wat wissel van 1 tot 9,000 siklusse per minuut en dit het geblyk dat daar 'n merkbare afname in die lewe van die monster is, uitgedruk in siklusse tot swigting, wanneer lae toetsfrekwensies aangewend word. Daar is vasgestel dat die frekwensie-effek nie toegeskryf kon word aan faktore soos atmosferiese korrosie by lae frekwensies, of verhitting van die monster by hoër temperature nie. Uiteindelik het geblyk dat die grootste gedeelte van die verhoogde beskadingstempo wat gepaard gaan met die laer toetsnelheid, voorkom gedurende die eerste 10 persent van die toetsmonster se lewe, nog voor 'n sigbare vermoeidheidskraak opgemerk kon word. Dit word veroorsaak deurdat monsters wat getoets word teen 'n lae frekwensie, 'n groter vervormingsamplitude vir 'n gegewe belasting ontwikkel as by 'n hoër frekwensie.

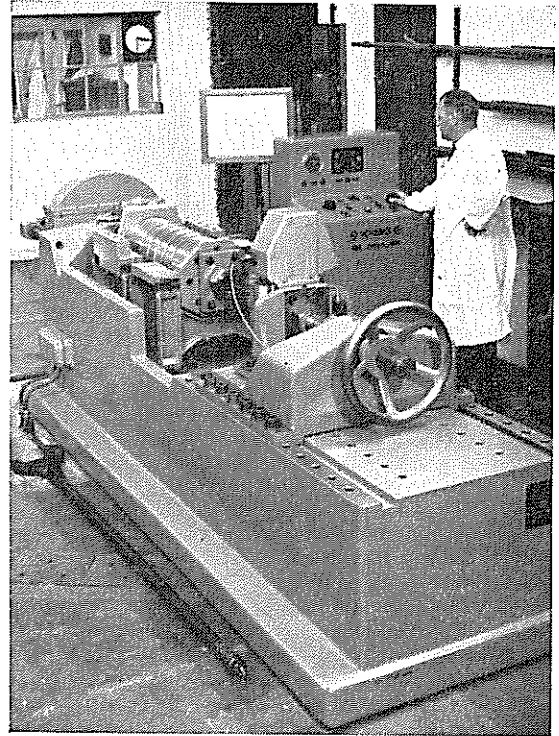
Vermoeidheid in Spoorstawe

Uitgebreide toetse is gedoen om die vermoeidheidsienskappe te bepaal van slytvaste spoorstawe van omtrent 2% mangaansamestelling. Toetse in verband met die weerstand van soosgewalste en boogstompgesweiste spoorstaafleengtes teen herhaalde buigbelasting en van ongesweiste toetsstukke teen herhaalde

material, has increased the efficacy with which stress analyses on prototype structures or components can be carried out.

In addition to various investigations undertaken by the laboratory, about 35 technical enquiries were dealt with in the period under review.

The increasing demand for investigations into fatigue of materials and structures has made it necessary to purchase three additional fatigue-testing machines with capacities in the range of 10 to 60 tons. This equipment is now being installed.



Die nuwe Schenck-vermoeidheidstoetsmasjiene van 20 ton wat onlangs in die Sterkteleerlaboratorium opgestel is.

The new Schenck 20-ton fatigue-testing machine, recently installed in the strength materials laboratory

Fatigue of Metals

An investigation was made into the influence of different load cycle frequencies on the rotating bending fatigue strength of EN-45 steel specimens. Plain cylindrical specimens were fatigue-tested at frequencies varying between 1 and 9,000 cycles per minute, and it was found that at low testing frequencies a marked

dwarsbelasting (soos ondervind word in skerp draaie van die spoorbaan), is afgehandel. Navorsing word nog gedoen om 'n eenvoudige vermoeidheidstoets op klein monstertjies te ontwikkel. Dit sal die ingewikkelde toetse wat tans op groot spoorstaaf lengtes gedoen word, vervang.

Vermoeidheid in Draad en Draadkabels

Die ondersoek na die invloed van verskeie konstruksieveranderlikes op die vermoeidheidslewe van draadkabels is voortgesit om vas te stel wat die optimum konstruksie vir 'n lang kabellewe is. Nadat die voorlopige werk, wat nodig was om 'n bevredigende standaardvermoeidheidstoets vas te stel, voltooi is, is stelselmatige navorsing gedoen op toue van $1\frac{1}{2}$ en $1\frac{7}{8}$ duim deursnee. 'n Verdere aspek van die werk waarmee begin is, is die trekvermoeidheidstoetsing van drade wat op verskillende maniere en van verskillende soorte staal vervaardig is.

Spanningsontledings

'n Hele aantal uitgebreide spanningsontledings is afgehandel waarby foto-elastiese, rekstrook-, broslak- of modeltoetse toegepas is. Geriewe hiervoor is beskikbaar in die laboratorium. Hierdie toetse het onder andere ingesluit: die bepaling van skokspannings in die sykantstawe van 'n lughamer, skokspannings in deurstuitvere van 'n spoorwegtrok, die volledige spanningsontleding van 'n groot roterende filter, vasstelling van die maksimum spannings en aanvangspunt van plastiese vloei in die gevormde endplaat van 'n kragentrale se ontlugtingsketel, die ontwikkeling van verbeterde liggewigontwerpe vir die staalgietstukke van 'n trokdraaistel en die drie-dimensionele foto-elastiese ontleding van die spannings in 'n myn se rotsboor waarby die watertoevoer van buite geskied. In al die gevalle kon die spannings onder gebruikstoestande bereken word en aanbevelings gedoen word oor verbeterde ontwerpe wat oortollige struktuur sowel as lokale oorspanning uitskakel.

Plaaslike Hout vir Verpakkingsdoeleindes

Daar is voortgegaan met navorsing op die gebruik van plaaslike gekweekte hout vir vervaardiging van sitruskissies. Vergelykingstoetse is uitgevoer op verskeie prototipe en standaardkissies onder toestande wat

reduksie in spesimen lewe, uitgedruk in siklusse tot faalure. Dit is gevestig dat die frekwensie effek nie kan toegeskryf word aan faktore soos atmosferiese korrosie op lae frekwensies, of tot die verhitte van spesimene op hoër temperature. Einde toe is dit gevind dat, van die toegewasde skade tempo wat verbonde is met die langsame toets tempo, die grootste deel gebeur tydens die eerste 10% van die spesimen lewe, alhoewel geen moegheidskrisse sigbaar was aan die einde van hierdie tydperk. Dit is toegeskryf aan die feit dat spesimene getoets op 'n lae frekwensie ontwikkel 'n groter deformatsie amplitude vir 'n gegewe lading as op 'n hoër frekwensie.

Fatigue in Rails

Uitvoerige ondersoekings is uitgevoer om te vestig die moegheids eienskappe van weer-wedstandige rails met ongeveer 2% manganees inhoud. Toetsing is voltooi op die weerstand van as-gerolde flash-butt geselde rail-lengtes tot herhaalde buigings ladinge, en tot herhaalde laterale ladinge (soos ervaar op skerp krommes van rail spoor) op ongeselde rail spesimene. Werk is voortgesit op die ontwikkeling van 'n eenvoudige moegheids toets op klein spesimene. Dit sal die behoefte aan uitvoerige ondersoekings op volledige rail seksies.

Fatigue in Wires and Wire Ropes

Die ondersoek na die invloed van verskeie konstruksie veranderlikes op die moegheids lewe van draadkabels is voortgesit, met die doel om te vestig die optimum konstruksie in verband met draad lewe. Systematiese ondersoekings is in voorgesit op $1\frac{1}{2}$ en $1\frac{7}{8}$ duim deursnee draadkabels. Die voorlopige werk wat nodig is om 'n bevredigende standaard moegheids toets vas te stel, is voltooi. Die werk het ingesluit die bepaling van skokspannings in die sykantstawe van 'n lughamer, skokspannings in deurstuitvere van 'n spoorwegtrok, die volledige spanningsontleding van 'n groot roterende filter, vasstelling van die maksimum spannings en aanvangspunt van plastiese vloei in die gevormde endplaat van 'n kragentrale se ontlugtingsketel, die ontwikkeling van verbeterde liggewigontwerpe vir die staalgietstukke van 'n trokdraaistel en die drie-dimensionele foto-elastiese ontleding van die spannings in 'n myn se rotsboor waarby die watertoevoer van buite geskied. In al die gevalle kon die spannings onder gebruikstoestande bereken word en aanbevelings gedoen word oor verbeterde ontwerpe wat oortollige struktuur sowel as lokale oorspanning uitskakel.

Stress Analyses

Uitvoerige stress analiese is voltooi. Gebruik is gemaak van een of meer van die foto-elastiese, elektriese weerstand draad strek meet, bros lak of model tegnieke vir watter ook al beskikbaar is in die laboratorium. Die werk het ingesluit die bepaling van skokspannings in die sykantstawe van 'n lughamer, skokspannings in deurstuitvere van 'n spoorwegtrok, die volledige spanningsontleding van 'n groot roterende filter, vasstelling van die maksimum spannings en aanvangspunt van plastiese vloei in die gevormde endplaat van 'n kragentrale se ontlugtingsketel, die ontwikkeling van verbeterde liggewigontwerpe vir die staalgietstukke van 'n trokdraaistel en die drie-dimensionele foto-elastiese ontleding van die spannings in 'n myn se rotsboor waarby die watertoevoer van buite geskied. In al die gevalle kon die spannings onder gebruikstoestande bereken word en aanbevelings gedoen word oor verbeterde ontwerpe wat oortollige struktuur sowel as lokale oorspanning uitskakel.

dié van die praktyk naboots. Die toetse met kissies, volgepak met vars lemoene, is met welslae voltooi. Met sommige van die ontwerpe is belowende resultate verkry, maar daar sal verder getoets moet word om die invloed te bepaal van faktore soos die effense inkrimp van lemoene nadat hulle geberg en vervoer is, voordat tot finale gevolgtrekkings gekom kan word.

MEGANIKA VAN VASTE STOWWE

Die werksaamhede op hierdie gebied behels ingenieursdinamika (veral trillings- en balansprobleme), rotsmeganika met betrekking tot rotsstortings en stratabewegings in diep mynbou, meganika van bros materiale (veral vergruising en verpoeiering van bros materiale) en bedryfsnavorsing met betrekking tot die ontwikkeling van masjinerie vir verskeie spesifieke doeleindes.

Trilling in Masjinerie en Strukture

Verskeie praktiese trillingsprobleme, wat voorkom in masjiene en strukture, is ondersoek. Hierdie navorsing is gedoen sowel ter plaatse as in die laboratorium met behulp van 'n uitgebreide reeks trillingsmeetinstrumente wat 'n draagbare dinamiese balanseringseenheid insluit.

Op 'n versoek van 'n ingenieursfirma is die oorsaak van trilling in die gebou van 'n diamantwinningsaanleg nagegaan. Daar is gevind dat die trillings veroorsaak is deur resonanstrillende vervoeropstellings wat op die boonste verdieping van die gebou geïnstalleer was. Eksperimentele en teoretiese ontledings het aan die lig gebring dat die voorskrifte vir die balansering van die vervoeropstellings nie stiptelik nagekom is nie. Die Instituut kon toe maatreëls aan die hand doen om die trillings wat na die gebou oorgedra is te verminder, indien nie uit te skakel nie.

Ondersoek is ingestel na die oorsaak van swigting van 'n vleuelratblad. 'n Onbeskadigde blad is in die laboratorium by verskillende frekwensies gevibreer. Die knooppuntpatrone is sigbaar gemaak met behulp van Chladny se sandfiguurtegniek by elkeen van die resonerende frekwensies. Daar het geblyk dat by 'n sekere frekwensie die knooppuntlyne (wat die meetkundige pad van punte met geen verplasing en met maksimum spanning is), ooreenstem met dié van die breukvlak van die swigting tydens gebruik. Hierdie frekwensie is aanvaar as die kritiese frekwensie. Aanbevelings kon gemaak word om dit te vermy en dus ook swigting uit te skakel.

Local Timber for Packaging

The investigation continued on the use of locally grown timber for the manufacture of citrus boxes. Several prototype and standard boxes were subjected to comparative tests, simulating conditions, which could be expected in practice. Tests on boxes fully packed with fresh oranges were satisfactorily completed. Very promising results were obtained from certain designs, but before final conclusions can be drawn, further tests are needed to establish the influence of such effects as the slight shrinking of oranges after storage and transport.

MECHANICS OF SOLIDS

The activities in this field include engineering dynamics (especially vibration and balancing problems), rock mechanics related to the problems of rockbursts and strata movement in deep mining, brittle material mechanics (particularly the comminution and grinding of brittle materials) and operational research concerned with the development of machinery for special purposes.

Vibration in Machinery and Structures

Several practical vibration problems encountered in machines and structures were investigated. An extensive range of vibration-measuring instruments, including a portable dynamic balancing unit, made it possible to carry out experimental investigations both on site and in the laboratory.

At the request of an engineering firm, an investigation was made into the cause of vibration in the building of a diamond recovery plant. It was found that the vibrations were caused by resonance-vibrating conveyors installed on an upper floor. Experimental and theoretical analyses revealed that conditions which would ensure balance of the conveyors were not completely fulfilled and the Institute was able to recommend measures whereby the vibrations could be reduced, if not completely eliminated.

An investigation was carried out to determine the cause of failure of an impeller blade. An unfractured blade was caused to vibrate in the laboratory, the exciting frequency being varied. The nodal patterns at the various frequencies were made visible by means of the Chladny sand figure technique. It was found that at a certain frequency, the contours of the nodal lines (which are loci of zero displacement and maximum stress) coincided with those of the fracture in service. This frequency was hence recognised as the critical one, and recommendations were made as to how to avoid it in operation, thus preventing fracture.

Ander ondersoek het gegaan oor die balansering van roterende lugkompressoreenhede en raad is gegee in verband met die ontwerp van fundamente van masjinerie om steurende of gevaarlike trillings te voorkom.

Dempingsvermoë van Materiale

Die dempingsvermoë van 'n materiaal bepaal die vermoë van die materiaal om trillingsenergie te absorbeer en sodoende die amplitude van wisselende spanning en vervorming te verminder. Damping is dus 'n belangrike kenmerk ten opsigte van die vermoedheidslewe van materiale en strukture. Daar is voortgegaan met basiese navorsing aangaande die dempingsverskynsel, aangesien dit van groot belang is vir die ontwerp van onderdele wat blootgestel is aan trilling en vermoeidheid.

Toetse is gedoen om die invloed van die dwarsdeursneevorm en die manier van belasting op die dempingsvermoë van balke, wat aan buigingstrillings onderwerp is, vas te stel. Die toetse is eintlik bedoel om teoreties afgeleide formules, waarmee die dempingsvermoë van balke bereken kan word, na te gaan. Die toetsbalke is toegelaat om vry in buiging te tril en die afnemende trillingsamplitude van die defleksie en die damping is gemeet. Die ontleding van die gegewens is feitlik voltooi. Hierdie gegewens sal van belang wees wanneer meganiese onderdele soos tande van dryfratte en die blaai van waaiers en turbines, wat tipiese voorbeelde is van vrydraende balke wat moontlik mag tril, ontwerp moet word.

Rotsmeganika

Die werk in verband met rotsstortings en stratabewegings in diep mynbou is voortgesit ten behoeve van die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese.

Ondergrondse waarnemings om die toestand van die grond rondom uitgrawings te ondersoek, het bygedra tot 'n betreklik duidelike begrip van die grootte en vorm van die sone van gekraakte rots rondom die meeste mynuitgrawings. Om hierdie begrip aan te vul, is wiskundige ontledings gedoen. Dit is gegrond op die begrip dat ongekraakte rots beskou kan word as 'n aaneenlopende elastiese vaste liggaam en ook op die aanname van verskeie swigtingsveronderstellings. Met dieselfde doel voor oë is foto-elastiese ondersoeke gedoen op geskikte modelle.

Die veranderinge in spanning in die rots voor die werksfront van uitgrawings is gemeet met behulp van vervormingsmeters wat aangebring is in boorgate in die rots. Afsluitingsregistreerders en verskuiwingsmeters is ook geïnstalleer in hierdie toetsdelfplekke om vas te stel of daar 'n verband bestaan tussen faktore soos vernouing, relatiewe beweging tussen dak en vloer (verskuiwing), veranderinge in rotsspanning en die feit dat rotsstortings voorkom.

On another occasion, the balance conditions of rotary air compressor units were investigated and advice was given on the design of machine foundations to avoid annoying or dangerous vibration.

Damping Capacity of Materials

The damping capacity of a material is the property describing the extent to which it can absorb vibration energy and thereby diminish the amplitude of alternating stress and deformation. Damping is, therefore, an important property with respect to the fatigue life of materials and structures. In view of its fundamental importance in the design of components subjected to vibration and fatigue, basic research into the phenomenon of damping was continued.

Experimental studies were carried out to determine the influence of the cross-sectional shape and the method of loading on the damping capacity of beams subjected to flexural vibration. The immediate object of the tests was to verify theoretically-derived formulae for calculating the damping of beams. The test beams were made to vibrate freely in bending and the decaying vibration amplitude of the deflection and damping were measured. The analysis of results is nearing completion. The results of the work have a bearing on the design of such mechanical engineering parts as gear teeth and the blades of fans and turbines, these being typical examples of cantilevers which are likely to vibrate.

Rock Mechanics

The research into rockbursts and strata movement in deep level mining was continued on behalf of the Transvaal and Orange Free State Chamber of Mines.

Underground observations were made to study the condition of the ground around excavations at depth, and much was learned of the size and shape of the zone of fractured rock surrounding most mining excavations. Mathematical analyses were conducted to supplement the picture. These were based on the concept of the unfractured ground being considered as a continuous, elastic, solid body and the assumption of various failure hypotheses. Photo-elastic investigations on suitable models were conducted with the same object.

The changes in stress in the rock ahead of advancing faces of stoping excavations were measured by means of strain cells installed in boreholes drilled in the rock. Closure recorders and ridemeters were also installed in these test stopes to determine whether a relationship exists between such factors as closure, ride, changes in rock stress and the occurrence of rockbursts.

Die gegewens van opmetings van die stratabeweging in delfplekke, vervoertunnels bo die dak en onder die vloer, skagte en op die oppervlakte is ontleed om inligting te win oor hoe die gebied van beweging, bokant en onderkant uitgrawings, uitbrei.

Aangesien sekere fisiese eienskappe van rots die moontlikheid van 'n rotsstorting in 'n spesifieke ondergrondse omgewing sterk beïnvloed, is uitgebreide laboratoriumtoetse uitgevoer op die digtheid, sterkte, elastisiteitsmoduli en ander eienskappe van rots van verskeie strata wat voorkom in 'n groot myn van die Sentrale Witwatersrand.

Met intensiewe navorsing in verband met die meganisme van kunsmatige ontspanning van die steunmure van mynuitgrawings is begin. Hierdie tegniek bekamp rotsstortings deur gate, wat loodreg in die vlak geboor is, te skiet om sodoende die rots te breek en die breek-sone te vergroot. Die verwagte gevolge van hierdie tegniek is tweeledig. Eerstens bring dit gunstiger verdeling van spanning voor die werksfront uit, wat die moontlikheid van 'n storting verminder; tweedens skep of verbreed dit die buffer van gekraakte rots tussen die hooggespanne gebied in die vaste massa en die eintlike front waar gewerk word. Al sou 'n rotsstorting voorkom in die hooggespanne gebied in die vaste massa op die rand van die breekgebied, sal die dempingsuitwerking van die buffer die strafheid daarvan verminder. Vir geruime tyd is hierdie tegniek reeds met bemoedigende resultate in 'n aantal delfplekke toegepas. Tot dusver kon die doeltreffendheid daarvan net statisties nagegaan word. Die huidige werk is dus daarop gemik om die uitwerking van ontspanning in toetsdelfplekke na te gaan. Dit sal moontlik wees om die ontspanningsmeganisme te bestudeer met behulp van onlangs ontwikkelde metodes soos die ultrasoniese pulsrefleksiemetode, boorkern-ondersoeke en optiese peiling van boorgate om die omvang en graad van breuk by 'n rotsvlak te bepaal. Die moontlikheid om uiteindelik te kan raad gee in verband met die doeltreffendste metode van ontspanning met betrekking tot faktore soos afstand tussen en lengte van gate, tussenpose tussen ontspannings en tipe van springstof vir spesifieke toestande in 'n delfplek, word in die vooruitsig gestel.

Hollerith-kaartering van die getal rotsstortings en delfplekgegewens vir ses groot myne, gedurende die afgelope paar jaar, is voltooi. Die gegewens word nou statisties ontleed. Die doel van hierdie ontledings is om die belangrikste faktore wat 'n uitwerking op rotsstortings het, te bepaal en om dan die gegewens aan te vul met ander werksmetodes.

Samesprekings met mynbeampies is gereeld gevoer oor die moontlike oorsake en ander aspekte van rotsstortings wat in hulle myne voorgekom het. Die plekke waar rotsstortings van besondere belang voorgekom het, is besoek om 'n beter insig van die

The results of measurements of the strata movement in stopes, hanging and footwall haulages, shafts and on surface were analysed to obtain information on the growth of the zone of movement above and below excavations.

Since certain physical properties of rock have an important bearing on the susceptibility to bursting of certain localities underground, extensive laboratory tests were carried out to determine the density, strength, elastic moduli and other properties of rock from the various strata encountered in a large mine on the Central Witwatersrand.

An intensive programme of investigations into the mechanism of artificially de-stressing abutments of mining excavations has commenced. This technique, which is a means of ameliorating rockburst conditions, consists of drilling holes perpendicularly into the face, exploding them and thereby shattering the rock and increasing the fracture zone. It is believed that this results, not only in a more favourable distribution of stress ahead of the face (so that the susceptibility of the face to burst is decreased), but that it also creates or widens the cushion of fractured rock between the highly-stressed zone in the solid and the actual face where men are working. Even if a burst occurs in the highly-stressed zone in the solid at the boundary of the fracture zone, the damping effect of the cushion will reduce its severity. This technique has been applied to a number of stopes and has shown encouraging results. Thus far, however, its effectiveness can only be assessed by statistical means. The present work, therefore, aims at studying the effects of de-stressing in test stopes. Recently-developed methods, such as the ultrasonic pulse reflection method, drill core examination, and optical probing of boreholes to determine the extent and degree of fracture at a rock face, will enable the mechanism of de-stressing to be studied. It is hoped that it will be possible, eventually, to advise on the most effective procedure for de-stressing with regard to such factors as pitch and length of holes, time interval of de-stressing and type of charge for any particular set of conditions in a stope.

Rockburst incidence and stope history data for six large mines, covering a period of several years, were recorded on Hollerith punch cards. Statistical analyses of the data are in progress. These are aimed at finding the most significant factors which influence the incidence of rockbursts and at supplementing the results obtained by other methods of approach.

Regular meetings were held with mine officials to discuss the possible causes and other aspects of rockbursts which had occurred on their mines. The sites of rockbursts of exceptional interest were visited to obtain

oorsake, en die betrokke toestande, te verkry. Onder die publikasies wat verskyn het oor rotsstortingsprobleme is een wat voorgedra is tydens die „International Strata Control Congress” wat in Oktober 1958 in Leipzig gehou is.

Die probleem van water wat in myne instroom, is nou verbonde aan stratabeweging en rotskraking in mynbou. Nadat ’n goudmyn in die Oranje-Vrystaat oorstroom is toe ’n betonskagprop geswig het, is ’n ondersoek ten behoeve van die mynbounerwerheid ingestel na die gedrag van proppe. Hieraan het die Instituut deelgeneem. Gedurende die vorige jaar is spanningsmetings rondom ’n toetsprop, wat in ’n toevoertunnel geïnstalleer was geneem. Voorbereidings is in die laboratorium getref vir etlike soortgelyke spanningsmetings rondom ’n tweede toetsprop. Die eintlike ondergrondse toetse sal waarskynlik in Junie 1959 ’n aanvang neem.

Vergruising en Verpoeiëring

Vergruising en verpoeiëring, wat die gebied van opbreking van materiale in kleiner fragmente deur werkmodes soos sny, masjineer, boor, vergruis en skiet omvat, is veral vir die Suid-Afrikaanse mynbou- en sementnywerhede van belang. Vir ontginningdoeleindes is dit in mynbou noodsaaklik om die erts ekonomies op te breek en tot die vereiste graad van fynheid te vergruis.

’n Uitgebreide literatuuroorsig in verband met die boor van rots deur middel van skokboormasjiene is opgestel. Navorsing aangaande die metodes waarmee die energie wat deur ’n rotsboormasjien verbruik word, gemeet kan word, is voortgesit.

’n Omvattende studie van die literatuur oor vergruising, en meer bepaald, die vergruising van sementklinker in koeël- en silindermeulens, is ten behoeve van ’n industriële opdraggewer afgehandel. ’n Program vir toekomstige ondersoek na die meganika van vergruising van bros materiale, is opgestel en mee begin gedurende die laaste paar weke van die behandelde tydperk.

Verwerking van Munisipale Afval tot Kompos

Namens die Nasionale Waternavorsingsinstituut is ’n proefaanleg vir die verwerking van munisipale afval tot kompos gebou en opgerig. Die Stadsraad van Pretoria het £10,000 van die totale koste van ongeveer £12,000 bygedra.

Gedurende September 1958 is hierdie proefaanleg in werking gestel. Nadat klein veranderings aangebring is, is die aanleg voltyds in werking gestel vanaf November 1958, en word dit gebruik om te bepaal of dit moontlik is om huis- en straatafval en ander rommel ekonomies te verwerk tot kompos. Landswyd is die verwydering van afval ’n steeds toenemende probleem vir munisipaliteite, en al het die huidige toetsaanleg

a more intimate insight into the causes and conditions associated with these bursts. A number of papers on rockburst problems were published, amongst them a paper presented to the International Strata Control Congress held at Leipzig in October, 1958.

The problem of water inrush in mines is closely related to strata movement and rock fracture induced by mining. Following the flooding of a gold mine in the Orange Free State, due to the failure of a concrete shaft plug, an investigation into the behaviour of plugs was initiated by the mining industry. The Institute participated in this investigation, and during the previous year stress measurements were carried out on an experimental plug installed in a haulage. Preparations for numerous measurements of this kind on a second experimental plug were made in the laboratory. The actual underground tests are anticipated to commence in June, 1959.

Comminution and Grinding

The subject of comminution, covering the field of reduction of materials to smaller particles by such processes as cutting, machining, drilling, grinding and blasting, is of importance to South Africa, particularly in the mining and cement industries. The success of mining hinges largely on the economic breaking of ore and its reduction to the required degree of fineness for extraction purposes.

An extensive literature survey of rock drilling by means of percussion drilling machines was completed. Investigations into the methods of measuring the energy used by a percussion drilling machine in drilling rock, were continued.

A comprehensive study of the literature covering the field of comminution, with particular reference to comminuting cement-clinker in ball and tube mills, was completed on behalf of an industrial sponsor. A programme of future research into the mechanics of comminution of brittle materials was decided upon, and was commenced during the last weeks of the period under review.

Composting of Municipal Wastes

The manufacture and erection of a pilot plant for composting municipal waste was completed on behalf of the National Water Research Institute. The total cost of the plant was approximately £12,000, to which the Pretoria City Council contributed £10,000.

This pilot plant was first started during September, 1958, and after minor modifications it has operated continuously since November, 1958. It is being used to determine the economic possibilities of composting such materials as household refuse, garbage and street sweepings. Municipalities throughout the country are finding the disposal of such waste materials an increasingly embarrassing problem and, although the

net 'n kapasiteit van 6 ton per dag, behoort dit tog te bewys of dit moontlik is om groter aanlêe in die toekoms te gebruik.

HITTE-OORDRAGING

Temperatuur- en Vogbeheerde Windtonnel

Daar is verder gevorder met die opstelling van die temperatuur- en vogbeheerde windtonnel wat die belangrikste toerusting uitmaak vir basiese navorsing oor hitte-oordraging.

Na voltooiing van die bouwerk van die windtonnel is begin met die oprigting van die kontrolestelsel om die temperatuur, betreklike vogtigheid en spoed van die lug in die tonnel te reguleer. 'n Plooibare maar tog taamlik ingewikkelde stelsel word gebruik om hierdie veranderlikes oor 'n wye bereik met besondere presiesheid te kontroleer. Die hulpwerktoeie soos verkoelings-eenheid, stoomketel, pompe, warm- en kouwaterenke en mengkleppe is reeds geïnstalleer en gereed om getoets te word.

Hitte-oordragingkoeffisiënte

'n Groot gedeelte van die werk het bestaan uit 'n studie van beskikbare literatuur oor hitte-oordraging na suspensies van vaste deeltjies in vloeistof en vloeibare metale. Dit sal die grondslag vorm vir die ontwerp van toerusting om die gegewens van teoretiese ontleding te bevestig. 'n Instrument is ontwerp om die warmtegeleiding van suspensies van vaste deeltjies in 'n vloeistof te meet. Ook is die moontlikhede nagegaan om ander fisiese eienskappe van suspensies van vaste deeltjies in vloeistof te bepaal, soos viskositeit, digtheid en hittekapasiteit.

Meet van Snelwisselende Temperature

'n Deeglike literatuurstudie van die meet van snelwisselende temperature is voltooi. Om eksperimentele werk mee te begin is toerusting ontwerp vir die opwekking van temperatuurveranderings waarmee die dinamiese reaksies van termokoppels en ander toerusting vir temperatuurmetings bestudeer kan word.

Ontwerp van 'n Menskalorimeter

'n Geheel nuwe metode van werking vir 'n kalorimeter vir die vasstelling van die verandering in liggaamswaarmte-inhoud tussen twee werksvlakke is ontwikkel. Geen hittemetende laag is nodig in die nuwe kalorimeter nie, en dit vereenvoudig die konstruksie en verminder die koste. Daarteenoor moes in die ouer tipes van 'n hittemetende laag met termokoppels of weerstandstermometers as gevoelige elemente gebruik gemaak word.

present pilot plant only has a capacity of 6 tons per day, it should demonstrate the feasibility of using plants of much greater size in the future.

HEAT TRANSFER

Temperature and Humidity-controlled Windtunnel

Further progress was made with the installation of the temperature- and humidity-controlled windtunnel, which will constitute the main facility for basic heat transfer research.

Upon completion of the windtunnel structure, the installation of the control system for regulating the temperature, relative humidity and velocity of the air in the tunnel commenced. A flexible, although rather intricate, system is used to control these variables over a wide range with extremely fine accuracy. The auxiliaries such as refrigerating plant, steam boiler, pumps, hot and cold water tanks and mixing valves have been installed and are ready for testing.

Heat Transfer Coefficients

A study of available literature on heat transfer to liquid-solid suspensions and liquid metals constituted a major portion of the work. This will serve as a basis for the design of apparatus to verify the results of theoretical analysis. An instrument to measure the thermal conductivity of liquid-solid suspensions was designed and the possibilities of determining other physical properties of liquid-solid suspensions, such as viscosity, density and heat capacity, were also studied.

Measurement of Rapidly-fluctuating Temperatures

An intensive literature study was made of the problem of measuring rapidly-fluctuating temperatures. As a first step to carry out experimental work, a device was designed for the generation of temperature fluctuations to study the dynamic responses of thermocouples and other temperature-measuring devices.

Design of a Human Calorimeter

An entirely new method of operation was developed for a calorimeter to be used in determining the change in body heat content between two levels of activity. As compared with the older types, making use of thermocouples or resistance thermometers as sensitive elements, no heat-metering layer is required in the new calorimeter. This simplifies its construction and reduces its cost.

Die nuwe tipe besit die wenslike eienskappe dat die lug in een rigting en egalig deur die kalorimeter vloei. Die belangrikheid hiervan is reeds deur vroeëre navorsingswerk beklemtoon.

Die ontwerpswysing, wat deel uitmaak van die nuwe kalorimeter, bestaan uit 'n bykomende of binneste dop van ligte konstruksie wat binne die hoofdop bevestig word. Die binneste dop het drie of meer lengtegleuwe wat die lug raaklynig binnelaat. Hierdeur word 'n werwelvloei, soos in die oorspronklike ontwerp, in stand gehou. Die lug moet egter eers deur die annulus tussen die buitenste en binneste doppe vloei, en sleur sodoende die buitenste grenslaag van die binneste dop saam. Die proefliggaam, wat in die middel van die binneste dop gehou word, verloor hitte deur konveksie en verdamping as gevolg van die lugstroom, en ook deur straling wat deur die omringende dop opgeneem word. Hierdie straling veroorsaak 'n geringe styging in temperatuur van die binneste dop. Die grootste gedeelte van hierdie hitte word egter deur die inkomende lugstroom verwyder aangesien die lugstroom oor die binneste dop vloei. As gevolg van die vloeiing in een rigting word hierdie hitte deur die kalorimeter gevoer en net eenmaal gemeet by die uitgang. Foute mag insluiting deur stralingsverliese tussen die binneste en die buitenste dopvlak oor die annulus. Deur die oppervlakte met helder aluminiumfolie te bedek, kan hierdie foute egter heel gering gemaak word.

Toetse is uitgevoer op 'n toetsmodel van omtrent een-vyfde skaal. Merkwaardig is dit dat die tydskonstante kleiner was as dié van 'n kalorimeter met die hittemetende lae. Dit was net ongeveer 20 sekondes teenoor 90 sekondes vir tipes met hittemetende lae. Ander toetse het getoon dat die temperatuur styging geheel en al lineêr vir 'n gegewe lugvloei tempo deur die kalorimeter is. Deur die toetsliggaam van een temperatuurvlak tot 'n ander af te koel, het geblyk dat die hitteberging in die liggaam bepaal kan word tot noukeurigheid van binne 5%.

Die ontwerp van 'n volskaalse kalorimeter wat volgens hierdie beginsel werk, is voltooi en tenders vir die bou daarvan is gevra.

Fisiologiese Reaksies van die Menslike Liggaam onder verskillende Omgewingstoestande

Daar is voortgegaan met die ontwikkeling van instrumente vir die regstreekse meting van die hitteverliese van 'n proefpersoon. Van die drie maniere van hitteverlies het konveksie die meeste aandag ontvang en is 'n geslaagde metode ontwikkel om dit te bepaal. Die metodes van verdampings- en stralingshitteverliesbepaling word tans bestudeer.

Model- sowel as volskaalse studies van die konveksie hitteverliese van 'n verhitte liggaam in 'n lugstroom, is voortgesit. Aandag is gegee aan verskeie

The new type possess the desirable features of uni-directional and uniform air flow through the calorimeter. The importance of these requirements had already been emphasized by earlier research work.

The design modification incorporated in the new calorimeter consists of an additional or inner shell of light construction being fixed inside the main shell. The inner shell has three or more longitudinal slots which allow air to enter it tangentially, thus maintaining a vortex flow as in the original design. First, however, the air has to flow round the annulus between the outer and inner shells, thus sweeping the outer surface of the inner shell. The body under test, which is held in the centre of the inner shell, loses heat by convection and evaporation to the air stream and by radiation which is absorbed by the surrounding shell. This radiation causes a small rise in temperature of the inner shell, but since it is swept by the air stream, the largest portion of this heat is removed by the incoming air-stream. Due to the uni-directional nature of the flow, this heat is carried through the calorimeter and measured once only at the outlet. Errors may be introduced through radiation losses between the inner and outer shell surface across the annulus. This can, however, be reduced to negligible proportions by covering the surfaces with bright aluminium foil.

Tests were carried out on a model of approximately one-fifth scale. An interesting feature was that the response time was better than that of the heat-metering layers, being of the order of 20 seconds only as compared with 90 seconds for types with heat-metering layers. Other tests have shown the calibration to be absolutely linear for a given rate of air flow through the calorimeter. Cooling the model body from one temperature level to another revealed that the heat storage in the body could be determined to an accuracy of within 5%.

The design of a full-scale calorimeter working on this principle has been completed and tenders for its construction called for.

The Physiological Reactions of the Human Body Under Different Environmental Conditions

Work on the development of instruments for the direct measurement of the heat losses from a human subject was continued. Of the three modes of heat loss, convection has been given most attention and a successful method developed for its determination. The evaporative and radiant heat loss components are being studied at present.

Model as well as full scale studies were continued on the convective heat loss from a heated body in an air-stream. Several methods of integrating this heat loss

metodes om hierdie hitteverlies te integreer, maar dit het geblyk dat die meeste van hulle omslagtig en moeilik is. Uiteindelik het die keuse geval op die gebruik van integrerende roosters om die temperatuurstyging in die naloop agter die liggaam te meet. Om die hitte wat die liggaam verloor in die naloop te bepaal is dit, onder meer, noodsaaklik om te weet wat die gemiddelde aksiale snelheid in die naloop is. By gebrek aan geskikte meetinstrumente is gebruik gemaak van 'n semi-empiriese metode waardeur die vereiste gemiddelde lugspoed verwant is aan die vrystroomspoed deur 'n faktor β , wat eksperimenteel bepaal moet word. 'n Hele aantal ykingstoetse sal nodig wees om hierdie faktor β vir alle moontlike omstandighede wat in die praktyk kan voorkom, te bepaal.

'n Alternatiewe metode is derhalwe ontwikkel. Dit is gebaseer op die verskynsel dat, vir 'n stomp liggaam in 'n lugstroom, die temperatuurverdeling in die naloop, wat deur 'n warmtebron agter die liggaam veroorsaak word, identies is met dié wat veroorsaak word deur die liggaam se hitte. Die uitwyking op die integrerende roosters veroorsaak sal dus dieselfde wees vir dieselfde hitteverlies van die liggaam of hittebron. Aangesien die uitwyking ook 'n lineêre verband het met die hittetoevoeging, is dit maklik om die onbekende hitteverlies te bepaal van 'n liggaam wat 'n gegewe defleksie veroorsaak, indien die defleksie te wyte aan 'n bekende hoeveelheid hitte van die hittebron, bekend is.

Die bestudering van die verdampingshitteverlies het op dieselfde wyse geskied as die aanvanklike semi-empiriese metode vir konveksiehitteverlies. Die gemiddelde toename in vog sal met 'n integrerende rooster van infrarooi strale gemeet word. Sodra dit bekend is, kan die latente warmte, wat verteenwoordig word deur die vogtoename, natuurlik bepaal word van tabelgegevens. Tans word hierdie navorsing vertraag deur 'n gebrek aan geskikte filters wat nog ontvang moet word. Intussen word alternatiewe metodes ondersoek.

Daar word beplan om die stralingshitteverlies te meet met behulp van 'n roterende hoepelvormige arm met die proefpersoon in die rotasie-as. Die hoepelvlakke regoor die proefpersoon en sy omgewing word uitgevoer met stralingsgevoelige elemente wat differensiaal geskakel word. In een omwenteling rondom die proefpersoon sal elke element 'n volle 4π -ruimtehoek voltooi. Die netto straling kan dan bereken word van die oppervlakte onder die kromme getrek tydens die omwenteling.

Van hierdie roterende stralingsmeter is 'n model gebou deur termosuile te gebruik wat met behulp van 'n elektrolitiese neerslagmetode gemaak is. Alhoewel resultate bemoedigend was, sal verder in die klimaatkamer getoets moet word. Die plan is ook om 'n

were considered, but most of them were found laborious and difficult. The use of integrating grids to measure the temperature increase in the wake behind the body was finally decided upon. To determine the heat lost by the body to the wake, it is necessary to know, amongst other factors, the average axial velocity in the wake. Due to the lack of suitable measuring instruments, a semi-empirical method was resorted to, the required average velocity being related to the free stream velocity by a factor β which has to be determined experimentally. Numerous calibration tests are required to find this factor β for all possible conditions prevalent in practice.

An alternative method was, therefore, developed. It is based on the fact that, for a bluff body in an airstream, the temperature distribution in the wake, produced by a heat source of suitable form behind the body, is identical to that produced by heat coming from the body. Therefore, the deflection produced on the integrating grids would be the same for the same heat release from the body or heat source. Since the deflection is also linearly related to the heat output, it is easy to calculate the unknown heat loss from a body producing a given deflection, if the deflection due to a known quantity of heat from the heat source is known.

The study of the evaporative heat loss has followed the same trend as the initial semi-empirical method for the convective heat loss. An integrating grid of infrared rays will be used to measure the average increase in moisture. Once this is known, of course, the latent heat represented by the moisture increase can be found from tabled data. At present this study is being retarded by lack of suitable filters, delivery of which is awaited. In the meantime, alternative methods are being investigated.

For the measurement of the radiant heat loss component, it is proposed to make use of a rotating hoop with the test subject in the axis of rotation. The surfaces of the hoop facing the subject and its environment are lined with radiation-sensitive elements which are differentially connected. In one revolution about the subject, each element will have covered the full 4π -solid angle. The nett radiation can then be calculated from the area under a curve obtained on the recorder during one revolution.

A model of this rotating radiometer was built, using thermopiles made by an electrolytic deposition method. Encouraging results were obtained but further tests will have to be carried out in the climatic chamber. It is

wentelarm met weerstanddraad as stralingsgevoelige element te bou, aangesien die hittekapasiteit van die termokoppeltipe taamlik groot is en die reaksie gevolglik te stadig.

Halfbolvormige Stralingsmeter

'n Stralingsmeter is gebou om die lae temperatuurstralingsuitruiling tussen 'n platvlak en die lug wat dit halfbolvormig omring, te meet. Die instrument bevat heelwat wat nuut is. Poliëteen word as konveksieskerm gebruik. Alhoewel die materiaal voorheen al vir hierdie doel gebruik is, is die metode van konstruksie nuut. Die termosuil se konstruksie is ook enig in sy soort. Die doel is om die hittekapasiteit te verlaag en sodoende die reaksiegevoeligheid teenoor skielike veranderinge te verhoog.

Die instrument is etlike kere tydens veldwerk getoets, onder meer gedurende twee ekspedisies na die Kalahariwoestyn. Besondere welslae is behaal. Weens gebrek aan geskikte toerusting was dit moeilik om die instrument te yk, en hierdie aspek ontvang tans aandag.

Son-energie

In samewerking met die Nasionale Bounavorsingsinstituut is toerusting om water deur middel van die son te verhit, ontwerp. Dit is geskik vir Suid-Afrikaanse toestande en daar is geen besondere gereedskap nodig om dit te vervaardig nie.

Onder die 55 navrae aangaande die gebruik van son-energie ontvang, was 10 van buite die Unie.

LUGREËLING EN VERKOELING

Lugreëlingsprobleme

Lugreëlingsprobleme in die Unie kan in twee groepe verdeel word: ontleding van klimaatsgegewens vir die ontwerp en keuse van lugreëlingstelsels vir verskillende klimaatstreke in die land, en probleme wat gepaard gaan met die verdeling van lug in ruimtes wat vir menslike gerief gereël moet word.

Daar is begin met die ontleding van klimatologiese gegewens vir die ontwerp en keuse van lugreëlings-toerusting. Met die inwin van nuttige gegewens vir die ontwerp van koeltoerings en verdampingsverkoelingstelsels is ook vooruitgang gemaak.

Die lugverdeling in 'n groot luggereëelde gebou is deeglik nagegaan. Hierdie inligting is waardevol met die oog op tipes probleme wat verwag kan word en met behulp daarvan is 'n nuwe tipe verdelingstelsel ontwerp.

also proposed to construct a rotating arm with resistance wire as the radiation-sensitive element, since the thermal capacity of the thermocouple type is somewhat large, resulting in a reaction which is too slow.

Hemispherical Radiometer

A radiometer for the measurement of low temperature radiation exchange between a plane surface and the atmosphere hemispherically surrounding it was constructed. Several innovations are embodied in the instrument. Polyethylene is used for the convection screen. The material has been used for this purpose before, but the method of construction is new. The thermopile is also of unique construction, the aim being to reduce heat capacity and, therefore, to increase the reaction of response to sudden changes.

The instrument was field-tested on several occasions, amongst others during two expeditions to the Kalahari desert. The performance under such circumstances was excellent. Difficulty was experienced in calibrating the instrument due to lack of suitable apparatus. At present, attention is being given to a solution of this problem.

Solar Energy

In collaboration with the National Building Research Institute, a design was evolved of a solar water-heating installation that is well suited to South African conditions and which requires no special tools or equipment in its manufacture.

During the period under review, 55 enquiries in regard to the use of solar energy were dealt with, 10 coming from outside the Union.

AIR CONDITIONING AND REFRIGERATION

Air Conditioning Problems

Air conditioning problems in the Union may be classified into two categories: analysis of climatological data for designing and selecting air-conditioning systems for various climatic regions in the country, and problems pertaining to the distribution of air in spaces to be conditioned for human comfort.

A start was made with the analysis of climatological data for designing and selecting air conditioning equipment. Some progress has also been made with the compilation of data suitable for use in the design of cooling towers and evaporative cooling systems.

A thorough investigation of the air distribution in a large air-conditioned building was carried out. The information obtained provides a valuable background to the types of problems which can be expected. With the aid of this information a new type of distribution system was designed.

Omkeerbare Hittepompe

'n Teoretiese studie van vloeistofstraalpompe vir die saampersing van kondenseerbare dampe is voltooi. 'n Oorsig van beskikbare literatuur het aangetoon dat dit moontlik mag wees om vloeistofstraalpompe te ontwerp wat goed kan vergelyk met meganiese dampverdigters om dampe saam te pers. As dit uitvoerbaar is, sal goedkoper verkoelingsstelsels as wat nou gebruik word, ontwerp kan word. Verskillende soorte vloeistowwe het vir hierdie doel aandag geniet. By gebrek, egter, aan voldoende termodinamiese gegewens aangaande die meeste vloeistowwe en omdat water so goedkoop is en so 'n hoë latente verdampingshitte besit, is daar besluit om 'n prototipe stelsel te ontwerp, en te bou, met water as verkoelingsmedium.

Presiese Meting van Lugvogtigheid

'n Instrument om lugvogtigheid noukeurig mee te meet en te beheer is in die laboratorium ontwikkel. Hierdie instrument wat op die beginsel van adiabatiese versadiging van 'n lugmonster werk, sal gepatenteer word.

Toetse is ook uitgevoer met 'n nuwe soort instrument waarvan die gevoeligheid gebaseer is op die verandering van elektriese oppervlakweerstand van 'n glasplaat met verandering in betreklike vogtigheid van die lug. Met die ontwikkeling van hierdie instrument is heelwat moeilikhede ondervind. Die belangrikste daarvan is die groot elektriese weerstandsverandering van hierdie instrument oor die gebied van betreklike vogtigheide wat normaalweg voorkom. Die ontwikkeling van 'n geskikte meetstroombaan het egter geslaag en hierdie instrument word nou geëyk en getoets. Die voorlopige toetsgegewens is baie bemoedigend.

Absorpsieverkoelingsseenhede

Die moontlikheid om van sonenergie gebruik te maak as die hittebron vir absorpsieverkoelingsseenhede, word ondersoek. Dit het as grondslag die „drie-vloeistofsisteem” met ammoniak as verkoelingsmedium, water as absorbeermedium en waterstof as die inerte gas. Hierdie eenheid word nog getoets.

Diens aan die Nywerheid

Talle navrae is afgehandel terwyl spesifieke probleme van privaat firmas 'n groot gedeelte van die laboratorium se werk gevorm het. Een van hierdie probleme het betrekking op die ondersoek van natuurlike en meganiese hulpmiddels om natriumchloried en natriumsulfaat te skei. Hiervoor was intensiewe navorsing na die weersomstandighede by soutpanne in die noordweste van die Unie nodig en 'n ontleding van die koste

Reversible Heat Pumps

A theoretical study of liquid jet pumps for compressing condensable vapours was completed. A survey of available literature, indicated that it may be possible to design liquid jet pumps to compress condensable vapours with an efficiency comparable to that of mechanical vapour compressors. Should this prove feasible, it will be possible to design cheaper refrigeration systems than those now in use. Various types of liquids have been considered for this purpose but, due to the absence of sufficient thermodynamic data on most fluids and due to cheapness of water and its high latent heat of evaporation, it was decided to design and construct a prototype system using water as the working medium.

Accurate Measurement of Air Humidity

An instrument for the accurate measurement and control of humidity was developed by the laboratory. This instrument, which works on the principle of adiabatic saturation of a sample of the air, will be patented.

Tests were also carried out on a new type of instrument, the sensitivity of which is based on the change of electrical surface resistance of a glass plate with change in relative humidity of the air. Many problems were encountered during the development of this instrument, the most important being that of the high electrical resistance variation of this instrument over the normal range of the relative humidities encountered. However, the development of a suitable measuring circuit was successful and the calibrating and testing of this instrument is in progress. The preliminary test results appear to be very promising.

Absorption Refrigerators

The possibility of using solar energy as the heat supply for absorption refrigerators is being studied. For this purpose a prototype unit was built. This is based on the “three fluid system” with ammonia as refrigerant, water as absorbent and hydrogen as the inert gas. This unit is being tested.

Services to Industry

Numerous enquiries were handled whilst a large proportion of the laboratory's activity was devoted to investigating specific problems on behalf of private firms. One of these involved a study of natural and mechanical means for the separation of sodium chloride and sodium sulphate. This required a detailed study of the weather conditions at salt pans in the north-west of the Union and an analysis of the cost of various

van verskeie natuurlike en meganiese stelsels om hierdie twee soute te skei.

Daar is ook nagegaan waarom absorpsiekoelkaste ophou om te verkoel by hoë temperature.

HITTEMASJIENE EN VERBRANDING

Gasturbines en Verbrandingstoerustingtoetse

Die werksaamhede van hierdie laboratorium was hoofsaaklik toegespits op die ontwikkeling van 'n steenkoolgasturbine met die doel om 'n krageneheid te verkry waarin steenkool in plaas van vloeibare brandstof gebruik kan word.

Die Instituut het van die Britse Ministerie van Kragvoorsiening oortollige toerusting vir steenkoolgasturbinenavorsing teen 'n baie billike prys gekry met die verstandhouding dat inligting uitgeruil sal word. Hierdie toerusting bestaan uit 'n klein gasturbine wat veral geskik is vir lem-erosie- en aanpakkingstoetse,

natural and mechanical systems for the separation of the two salts.

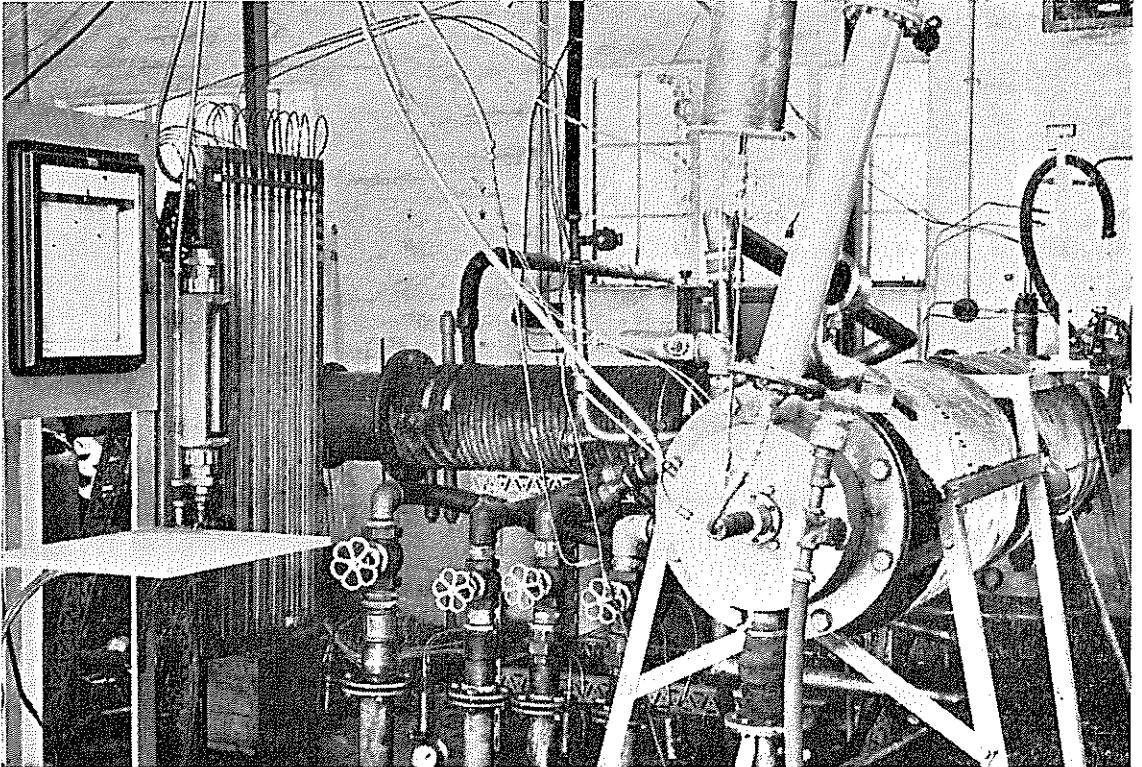
A further problem investigated, was to establish the reason for the breakdown of absorption refrigerators at high temperatures.

HEAT ENGINES AND COMBUSTION

Gas Turbines and Combustion Rig Tests

The activities in this laboratory were concerned mainly with the development of a coal-burning gas turbine in which coal, instead of liquid fuels, can be used.

The Institute succeeded in procuring from the British Ministry of Supply at a very nominal price and on the basis of exchange of information, some of their coal-burning gas turbine equipment which has become redundant. This consists of a small gas turbine, specially designed and built for blade erosion and deposition tests, an all-metal combustion chamber for



Toetsopstelling vir die studie van die verbranding van verpoëerde steenkool vir gasturbines

Experimental rig for the study of the combustion of pulverized coal for gas turbines

'n verbrandingskamer geheel uit metaal vir hierdie gasturbine, 'n prototipe asseker sowel as twee Mamba-gas turbines wat vir resonerende verbrandingswerk gebruik kan word.

Om die nodige verbrandingstoerusting vir 'n steenkoolgasturbine te ontwikkel, is 'n verbrandingsaanleg bestaande uit 'n verbrandingskamer, 'n asseker en 'n lemroostertunnel, voltooi. Die eerste moeilikheid in verband hiermee was om steenkool in klein egalige hoeveelhede na 'n verbrandingskamer onder druk te voer. Daar is gelyktydig in drie rigtings te werk gegaan.

Eerstens is 'n tenk-met-vibratorstelsel ontwikkel waarmee redelik bevredigend gevorder is. Dit was egter te gevoelig vir die drukskommelings wat vanaf die verbrandingskamer teruggewerk het, en was gevolglik onstabiel in bedryf.

Tweedens is ondersoek ingestel om te bepaal of die vervloeiingskolomstelsel prakties is. Die probleem, om uiters fyn steenkool naamlik, 90% deur 200 maas, behoorlik te vervloei is opgelos deur die kolom self te onderwerp aan elektromagnetiese trillings. Om dit teen 'n egalige spoed uit te voer, is van 'n hoëspoedlugstraal by die ingang na die voerpyl in die vervloeiingskolom, gebruik gemaak.

Derdens is 'n klein roterende steenkoolpomp gebou. Aangesien die oorspronklike ontwerp onbevredigend was in etlike opsigte, is 'n nuwe ontwerp, wat binnekort vervaardig sal word, ontwikkel.

Min aandag is bestee aan die ontwikkeling van 'n lugstraalmeul wat geen waardevolle resultate gelewer het nie en die werk is gestaak. In plaas daarvan is 'n spiraalvloei-lugsif in die steenkoolbereidingsaanleg ingebou en steenkool van die vereiste fynheid kan nou van die meul verkry word.

Voorlopige verbrandingstoetse is uitgevoer in die genoemde verbrandingskamer vir gasturbinewerk. Die branderontwerp het eerstens aandag geniet en daar is gevind dat 'n swaaibrander beter resultate lewer as 'n straalbrander. Nadat 'n keramiese vlambuis met welslae gebruik is, word 'n metaalvlambuis nou getoets. Steenkooltoevoer vanaf 'n vervloeiingskolom was heeltemal bevredigend mits die voggehalte onder 1.0% was.

Min is gedoen in verband met die aksiaalvloei-sikloonassekers. 'n Nuwe ontwerp van die inlaat waarby 'n gegleufde konus die nodige swaai verskaf, is getoets. Dit was 'n poging om die sterk sekondêre vloei vanaf die gewone swaaieruitlaat, in die werwelkern in, te stuit. Die gegewens was bemoedigend maar daar kan nog nie finale gevolgtrekkings gemaak word nie.

this turbine together with an ash separator, as well as two Mamba gas turbines which can be used for resonant combustion work.

In order to develop the necessary combustion equipment for a coal-burning gas turbine, a combustion rig consisting of a combustion chamber, an ash separator and a set of stationary blades, was completed. The main problem associated with this test rig was that of feeding coal in small, even quantities to a combustion chamber under pressure. Three lines of attack were followed simultaneously.

The first was the development of a hopper-cum-vibrator system which reached a satisfactory stage. It was, however, so sensitive that it became unstable when feeding into a combustion chamber, because of the inherent pressure fluctuations.

The second method investigated was the practicability of a fluidized column system. The difficulty of properly fluidizing very fine coal, namely 90% through 200 mesh, feeding it at an even rate, was partially solved by using a high speed air jet at the inlet to the delivery pipe in the fluidized column, subjecting the column itself to electro-magnetic vibrations.

The third method investigated was to employ a rotary coal pump. The original design was found to be unsatisfactory in a number of aspects, and a new design was developed which will soon be manufactured.

The limited effort put into the development of a pneumatic pulverizer did not produce any worthwhile results and the work was abandoned. Instead, a spiral flow air classifier was built into the coal-handling plant and coal of the required fineness can now be obtained from the mill.

Preliminary combustion tests have been carried out in a small chamber for gas turbine work. The accent was firstly on burner design and it was found that a swirler burner gives better results than a straight flame burner. After successful operation with a ceramic flame tube, efforts will now be made to use a metal flame tube. Coal feeding was from a fluidized column and was found to be completely satisfactory provided that the moisture content was below 1.0%.

Very little work was done on the axial flow cyclone ash separators. A new design of inlet, using a slotted cone to give the swirl, was tried in an attempt to stop the powerful secondary flow from the usual swirler outlet into the vortex core. Although results were promising, no final opinion can as yet be passed.

As gevolg van gebrek aan beskikbare ontwerp-gegewens vir die soort verbrandingskamers onder bespreking, is 'n begin gemaak met basiese navorsing wat na gehoop word, nuwe lig sal werp op die ontwerp. Gas word as brandstof gebruik in die huidige ondersoek van die invloed van branderontwerp op lugbrandstofvermenging.

Resonerende Verbranding

'n Resonator met 'n meganiese inlaatklep in ontwerp en gebou om die werkverrigting in sorgvuldig beheerde toestande van die resonerende verbrandingskamer wat in die verlede ontwikkel is, te bestudeer. Die belangrike kenmerke van hierdie nuwe eenheid is eerstens 'n roterende klep wat die vars lug wat in die verbrandingskamer ingesuiig word beheer, en tweedens 'n brandstof-toedeler wat deur dieselfde as die klep aangedryf word maar so ontwerp is dat die faseverwantskap tussen die klep en die inspuittingspunt verander kan word. Hierdie resonator is ten volle van instrumente voorsien sodat druk, temperature, en lug- en gasvloei gemeet kan word.

'n Vereenvoudigde dog omvattende teorie is ontwikkel en 'n toetsprogram opgestel om die teorie te staaf. Met hierdie werk word nog voortgegaan.

In die loop van hierdie navorsingswerk is die resonator so opgestel dat dit lug vanaf 'n houer by lae druk gesuig het en dit aan 'n ander houer by 'n hoër druk gelewer het, om werksomstandighede in 'n gasturbine na te boots. Vroeg reeds het dit geblyk dat 'n totale drukverhouding van 1.06 maklik bereikbaar is met 'n turbine-inlaattemperatuur wat beperk is tot 1073°K. Vir 'n spesifieke geval kon die totale termiese rendement van die kringloop verhoog word van 19.2% tot 21.4%. Die soortlike lewering kan ook opgeskuif word van 29.5 na 32.5 C.H.E. per pond. Dit dui nie die maksimum aan wat van 'n resonerende verbrandingstelsel verwag kan word nie, maar is net 'n ontwikkelingsstadium wat bereik is.

Diens aan die Nywerheid

Vir die Suid-Afrikaanse Buro vir Standaarde is die rendement-krommes van twee elektriese motors noukeurig bepaal op die dinamometer. Vir 'n myngroep is die moontlikheid om fosfate droog van klei te skei, nagegaan. Voorheen is die fosfate met behulp van water van die klei geskei maar water is skaars in die betrokke streek. Met behulp van die stofontledings-toerusting in die laboratorium is toetsmonsters verdeel in verskillende korrelgroottefraksies. Die fosfaat-konsentrasie van elk is toe bepaal en 'n korrelgrootte gekies waarbo die konsentrasie te laag word om ekonomies te wees. 'n Memorandum word opgestel oor lugklassifisering in die moontlike ondersifgrootte.

In view of the lack of available design data for combustion chambers of the type under consideration, it was decided to start a fundamental investigation which, it is hoped, will lead to a better understanding of the processes. The effect of burner design on air-fuel mixing is being studied, gas being used as fuel.

Resonant Combustion

In order to study the performance under carefully controlled conditions of the resonator type combustion chamber developed in the past, a unit having a mechanical inlet valve, was designed and constructed. The important features of this new unit are a rotating valve controlling the fresh air drawn into the combustion chamber and a fuel-metering device driven from the same shaft as the valve, but so designed that the phase relationship between valve and injection point can be varied. This resonator was fully instrumented to enable pressure, temperatures, air and gas flows to be measured.

A simplified, but comprehensive theory has been evolved and a test programme drawn up to verify the theory. This work is still in progress.

During the course of the investigations, the resonator was arranged to draw air from a reservoir at low pressure and to deliver it to another at a higher pressure, thus simulating the conditions of operation in a gas turbine. Some early results indicated that an overall pressure ratio of 1.06 was easily attained with a limiting turbine inlet temperature of 1073°K and for a particular case the overall thermal efficiency of the cycle could be raised from 19.2% to 21.4%, while the specific output could be raised from 29.5 to 32.5 C.H.U. per pound. This does not represent the maximum that can be expected of a resonant combustion system, but is merely a stage reached in the development.

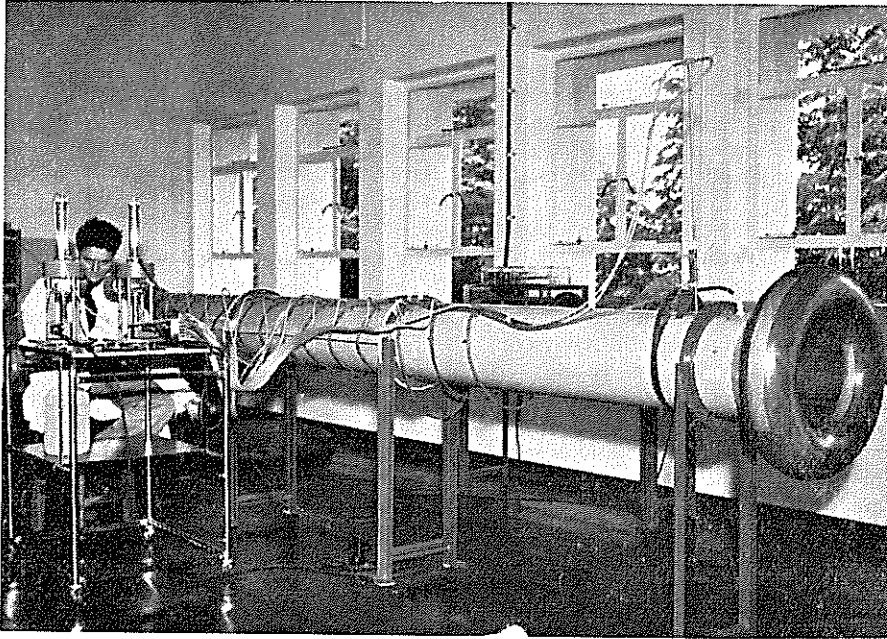
Services to Industry

On behalf of the South African Bureau of Standards, the efficiency curves of two electric motors on the dynamometer were accurately determined. On behalf of a mining group, an investigation into the possibility of dry separation of phosphates from clay was carried out. Thus far, the phosphates were separated from clay with the aid of water, which, however, is a very scarce commodity in the area concerned. The dust analysis apparatus in the laboratory was used to divide samples into different size fractions, and the concentration of phosphate in each was then determined and a particle size selected above which the concentration became too low. A memorandum is being prepared on air classification in the sub-sieve range.

LUGMEGANIKA

Lugvloeiweerstand in Mynskagte

Die spesiale 100-perdekragwindtonnel van 78-duim middellyn het voltyds gewerk in verband met twee navorsingsprojekte ten behoeve van die Nywerheid. Hierdie windtonnel word gebruik as 'n skaalmodel-mynskag om vloei-verliese in belugte skagte te verminder.



12-duim-skaalmodel van 'n mynshag om lugvloeiweerstand in slagte mee te bepaal

Die eerste projek het gegaan oor die probleem om lugvloei-verliese in 'n bestaande skag te verminder deur stroombelyning van die interne struktuur. In hierdie spesifieke geval kon die skagweerstand verminder word met 56% deur die balke te bedek met semi-stroombelynde omhulsel.

Die tweede projek was meer fundamenteel van aard. Die opdraggewer het verlang dat daar nagegaan moet word hoe geskik modeltoetsing in die algemeen is om skagweerstand te bepaal. Skaalmodelle van 'n bestaande skag waarvan die weerstandskoeffisiënt bekend is, is ingebou in sowel die 78-duim tonnel as in 'n spesiaal toegeruste 12-duimtonnel. Dit het geblyk dat skaaleffekte by uiters lae Reynolds-getalle verder bestudeer sal moet word.

In die tussentyd is gepoog om mynshagweerstand teoreties te bereken. Die slotsom was egter dat daar

AEROMECHANICS

Airflow Resistance in Mine Shafts

The special 100-horsepower 78-inch diameter wind tunnel which constitutes a scale-model mine shaft, and which is being used for research aimed at reducing flow losses in shafts, has been kept fully occupied by work on two research projects on behalf of industrial sponsors.

12-inch scale model of a mine shaft used for determining air flow resistance in shafts

The first project was concerned with the problem of reducing the air flow losses in an existing shaft by suitable streamlining of the internal structure. In this particular case it was found possible to reduce the shaft resistance by as much as 56% by the use of semi-streamlined fairings on the buntons.

The second project involved work of a more fundamental nature. The sponsor required a study to be made of the general suitability of model testing as a means of determining shaft resistance. Scale models of an existing shaft, of which the resistance coefficient was known, were built into both the 78-inch tunnel and a specially rigged 12-inch tunnel. The results indicated that scale effects at very low Reynolds numbers required further study.

In the meantime an attempt was made to calculate mine shaft resistance theoretically. It was found,

nog te min fundamentele gegewens bestaan oor onderlinge sturingseffekte in skagstrukture. Om in die vervolg navorsing te kan doen op fundamentele aspekte van die probleem, is 'n sleepkragbalans van 100-lb. kapasiteit gebou en oor die 78-duimwindtonnel opgerig.

Drukluigvervoer

'n Drukluigvervoerder met geslote kringloop is voltooi en in die laboratorium opgerig. Dit sal gebruik word vir navorsing i.v.m. die moontlikhede van ekonomiese vervoer van materiale soos graan, meel, steenkoolas en sement, deur middel van saamgeperste lug in pype. Die vervoerder is getoets en uiters bevredigend bevind. Heelwat aandag sal egter nog gegee moet word aan die ontwikkeling van instrumente om veranderlikes soos graanspoed, lugdrukke en graanhoeveelhede te meet.

Meesleuring van Lug in Lugstrale

Die vervoerder wat gebruik word vir drukluigvervoernavorsing word aangedryf deur 'n toetsstraalpompe wat ontwerp is volgens 'n ontwerpsteorie wat vroeër in die Instituut ontwikkel is. Die toetse wat op hierdie straalpompe uitgevoer is, was bedoel om die teorie te staaf en inligting te versamel oor die mengproses. Die moontlikheid om die mengseksie se vorm te verander om sodoende die pompendement te verhoog, word nou ondersoek.

Windtonnelontwikkeling

Daar is verder gevorder met die ontwerp van die voorgestelde nuwe supersoniese afblaaswindtonnel wat 'n toetsseksie van 18-duim in die vierkant moet hê en wat vir snelhede tot Mach 4.5 ontwerp moet word.

'n Noukeurige ontwerp van die tonnel se verwarmers en sametrekking is voltooi en hierdie gedeelte word nou vervaardig. Goeie vordering is ook gemaak met die noukeurige ontwerp van die supersoniese mondstuk vir Mach 1.5 tot Mach 2.5. Grenslaagberekeninge van die vorm van die sametrekking en die mondstuk is ook gemaak.

Die lugdroër, naverkoeler en filter is bestel en die druktent en vleuelklep is ontvang van die onderskeie vervaardigers. Gegewens in verband met die beheer-eienskappe van die kleppe is saamgestel en aandag is geskenk aan die beheerstelsel vir die klep sowel as vir die mondstukwande.

Matematiese ontleding van die dempingsinvloed van die plat plaatverwarmer op sturings agter die vleuelklep staaf die geldigheid van die ontwerpnaamnames. Dit het ook regstreeks bygedra tot die teoretiese oplossing van die dempingsinvloed van gewone gaasskerms, wat ooreenstem met beskikbare toetsgegewens.

however, that there was still too great a lack of fundamental data on mutual interference effects in shaft structures. By way of preparation for future research into such fundamental aspects of the problem, a 100-lb. capacity drag balance was built and erected over the 78-inch wind tunnel.

Pneumatic Conveyance

A closed-circuit pneumatic conveyor, which is to be used for research into the possibilities of economically conveying materials such as grain, flour, coal-ash and cement by means of compressed air in pipes, has been completed and erected in the laboratory. The conveyor was tested and found to work very satisfactorily, but considerable attention had to be devoted to the development of suitable instrumentation for measuring such variables as grain velocity, air pressures and grain quantities.

Air Entrainment in Air Jets

The conveyor which is used for the pneumatic conveyance research is driven by an experimental jet pump that was designed on the basis of a design theory previously developed within the Institute. Tests were conducted on this jet pump in order to verify the theory and to obtain information on the mixing process. A start was also made on investigating the possibility of altering the mixing section shape so as to improve pump efficiency.

Wind Tunnel Development

Further progress was made with the design of the proposed new supersonic blowdown wind tunnel, which is to have an 18-inch square test section and is to be designed for velocities up to Mach 4.5.

Detailed design of the tunnel heater and contraction was completed, and a start made with the manufacturing of this part, whilst good progress was made with the detailed design of the supersonic nozzle for Mach 1.5 to Mach 2.5. Boundary layer corrections to the ordinates of the contraction and the nozzle were also calculated.

The air dryer, aftercooler and filter were ordered, and the pressure vessel and butterfly valve received from the respective manufacturers. Information bearing on the control characteristics of the valve was compiled, and consideration given to the control systems for both the valve and the nozzle walls.

A mathematical analysis that was made of the damping effect of the flat plate heater on disturbances behind the butterfly valve, confirmed the validity of the design assumptions, and also yielded directly a solution for the damping effect of ordinary gauze screens which closely agrees with available experimental data.

Pulserende Vloei

Een van die Instituut se beamptes is tans aan die Universiteit van Cambridge besig met 'n studie van die probleem van pulserende vloei in die algemeen en in die besonder, met die oog op die ontwikkeling van 'n nuwe metode, om die gemiddelde massavloeiempo te bepaal van gase in pype of in geleibuisse waar kragtige pulsering teenekom word.

Volgens hierdie metode word merkgas in die hoofgasstroom ingespuut in skadelose hoeveelhede maar teen 'n bekende, egalige spoed. Na turbulente vermenging van die gase word monsters op so'n manier geneem dat die merkgaskonsentrasie 'n weerspieëling sal wees van die gemiddelde massavloeiempo van die hoofstroom.

'n Toetsaanleg is ontwikkel en gebou en 'n merk-gasontleder is ontwikkel. Toerusting om die ontleder te yk, is ook gebou en daar is begin met die yking van die toetsopstelling en sy merkgasspuut.

Mynhysers met Gidskabels

Die doel van hierdie projek wat ten behoeve van 'n myngroep onderneem word, is om vas te stel of die lugdinamiese kragte, verbonde aan die beweging van mynhysers met gidskabels in 'n skag, die hysers gevaarlik sal laat afwyk van hulle koers en teen die mure of teen ander hindernisse sal laat bots. Die probleem word teoreties sowel as eksperimenteel aangepak.

Teoreties is die differensiaalvergelykings van die beweging nagegaan om nuwe lig te werp op die aard van die beweging. Hierdie gegewens sal waardevol wees vir die ontleding van die toetsgegewens en mag uiteindelik van nut wees vir ontwerpsdoeleindes.

Vir die eksperimentele werk het dit nodig geblyk om 'n volledige dinamiese skaalmodel van die skag met gidstoue en hysers te bou. Die model het 'n hoogte van 150 voet vereis vir 'n skaalmodelskag met 'n 12-duim middellyn. Gevolglik is 'n put, 80-voet diep en 10-voet wyd gegrawe en 'n 80-voet hoë toring bo-oor geplaas om die modelskag te huisves. 'n Skaalmodelskagstruktuur is geïnstalleer en 'n modelhyser met 'n outomatiese remstelsel is gemaak om die skaalmodelhysers mee op en af te beweeg. Die waaier, wat geïnstalleer is om die vloei van ventilasielug deur die skag na te boots, is so ingestel dat of op- of afwaartse stromings verkry kan word.

Waaiergeraas

'n Onderzoek is in opdrag van 'n myngroep begin om die aard en omvang van geraasprobleme wat gepaard sal gaan met 'n nuwe mynventilasie-aanleg van 10,000

Pulsating Flow

One of the Institute's officers has been admitted to Cambridge University, where he is studying the problem of pulsating flow on a general basis as well as from the point of view of developing a new method of determining mean mass flow rates of gases in pipes or ducts under conditions where severe pulsations are encountered.

The method involves the use of a tracer gas which is injected into the main gas stream in harmless quantities, but at a known, constant rate. After turbulent mixing of the gases, samples are extracted in such a manner that the tracer gas concentration will be a measure of the mean mass flow rate of the main stream.

An experimental rig was designed and built, and a tracer gas analyser developed. Apparatus for calibrating the analyser was also built, and work was started on the calibration of the test rig and its tracer gas injector.

Rope-guided Mine Shaft Conveyances

The object of this project, which is being undertaken on behalf of a mining group, is to determine whether the aerodynamic forces associated with the passage of rope-guided conveyances in a shaft will cause the conveyances to deviate dangerously from their course so as to collide with the walls or other obstructions. The problem is being approached theoretically as well as experimentally.

On the theoretical side, the differential equations of the motion were investigated to give an insight into the nature of the motion. These results will be useful when interpreting the experimental results, and may also eventually have some practical value for design purposes.

For the experimental work it was found necessary to build a dynamic scale model of the shaft complete with guide ropes and conveyances. This meant that for a scale model shaft of 12 inches diameter the height had to be 150 feet. Accordingly, a 10-foot diameter, 80-foot deep well has been sunk and surmounted by an 80-foot high tower to house the model shaft. A scale model shaft structure was installed, and a model hoist, together with an automatic braking system, was made for the purpose of winding the scale model conveyances. The fan which was installed to simulate the flow of ventilating air through the shaft, was arranged so as to enable either upcast or downcast conditions to be obtained.

Fan Noise

Research which is being undertaken on behalf of a mining group aims at predicting and solving the noise problems that will be encountered when a new 10,000

perdekrag wat 700 voet van die naaste woonbuurt af sal wees, te bepaal.

Voordat besluite in verband met die ontwikkeling van geskikte geraasdempende strukture geneem kon word, was redelike sekerheid nodig oor die geraasintensiteit wat in die omtrek van die voorgestelde aanleg verwag kon word. Die teoretiese beraming is gebaseer op empiriese gegewens wat nie noodwendig van toepassing is in die geval van waaiers van die voorgestelde grootte nie. Om die beramings te bevestig, moes die waaiergeraas by bestaande mynventilasiewaaiers van vergelykbare grootte en ontwerp gemeet en ontleed word.

Gerasastudies is dus gemaak by twee bestaande waaierinstallasies. Bandopnames van die waaiergeraas is op verskillende plekke in die omtrek van die installasies gemaak en hierdie opnames is toe in die laboratorium ontleed om intensiteite en spektrumvorme te lewer. Die gegewens het die geldigheid van die empiriese vergelykings wat in die ontwerp gebruik word, bevestig.

Daarna is 'n verdere ondersoek onderneem om inligting in verband met die invloed van die terrein op die geraasvoortplanting te verskaf. Om hierdie inligting te verkry is 'n geraasopname gemaak in die nabyheid van die voorgestelde aanleg. Luidsprekers wat op die werklike terrein van die voorgestelde waaiers aangebring is, is as geraasbron gebruik. Die opname is oor 'n dag-en-nag-tydperk gemaak en het ook inligting gelever in verband met die intensiteit van die omgewingslawaai. Dié was nuttig om die beraamde ontwerpmaatstawwe te bevestig.

Werkverrigting van Windmeulens

Nadat 4 windmeulens met 'n wielmiddellyn van 8, 10, 12 en 14-voet respektiewelik getoets is, is 'n skaalmodel met 'n middellyn van 20 duim van die 10-voetwiel gebou vir toetsdoeleindes in die 10-voetwindtonnel. Hierdie werk is gedoen om die nodige tegniek te ontwikkel en om vas te stel of toetse op skaalmodelle, algemeen gesproke, gebruik kan word om die lomp en duur prosedure van toetse op volkskaalse wiele te vervang.

Daar het geblyk dat, met die spesiaal ontwikkelde instrumentasie, die metings vinnig en noukeurig gedoen kon word en dat skaalinvloede skynbaar onbeduidend is. Ongelukkig het die gemete kenkrommes van die skaalmodel egter nie bevredigend vergelyk met dié van die volkskaalse 10-voetwiel nie.

'n Tweede noukeurig vervaardigde skaalmodel se kenkrommes is toe bepaal. Daar was egter dieselfde teenstrydighede tussen die kenkrommes van die model en die volkskaalse prototipe. Om hierdie afwykinge te verklaar, is begin met die ondersoek na die vloei-verdeling in die windtonnel.

horsepower mine-ventilating installation is brought into operation. The installation will be situated within 700 feet of the nearest residential areas.

Before decisions relative to the development of suitable noise-attenuating structures could be undertaken, it was necessary to be reasonably certain about the noise levels to be expected in the vicinity of the proposed installation. Theoretical estimates that were made were based on empirical data not necessarily applicable in the case of fans of the proposed size, so that in order to confirm or modify the estimates, it became necessary to measure the fan noise at some existing mine-ventilating fans of comparable size and design.

Noise surveys were, therefore, made at two existing fan installations. The procedure was to make tape recordings of the fan noise at various stations in the vicinity of the installations, and these recordings were then analysed in the laboratory to yield levels and spectrum shapes. The results confirmed the validity of the empirical data used.

Another investigation was subsequently conducted to obtain information regarding the effects of terrain on noise propagation. To determine these effects a noise survey was made in the vicinity of the proposed installation, loudspeakers placed at the actual site of the proposed fans being used as noise source. The survey was conducted over a day-and-night period, and also yielded information on the ambient noise levels which proved useful for the purpose of confirming estimated design criteria.

Windmill Performance

Following the testing of four windmills of respectively 8, 10, 12 and 14-foot wheel diameter, a 20-inch diameter scale model of the 10-foot wheel was constructed for testing in the 10-foot diameter wind tunnel. The purpose of this work was to develop the technique, and to determine whether scale model testing could, in general, be used to replace the cumbersome and expensive procedure of testing full scale wheels.

It was found that the specially developed instrumentation enabled measurements to be made rapidly and accurately, and scale effects seemed to be negligible. Unfortunately, however, the measured performance characteristics of the scale model did not correspond well to the performance characteristics of the full-scale 10-foot wheel.

A second, but very accurate, scale model was then built, and its performance determined. The same discrepancies between the characteristic curves for model and full scale prototype were evident. In an attempt to account for these discrepancies, a start was made with investigating the flow distribution in the wind tunnel.

Vlieënde Platforms met omhulde Waaiers

By die opstelling van 'n toetsprogram vir die bepaling van die werkvermoë van ventilasiewaaier-inlate, nawe, leilemme, diffusors en soortgelyke onderdele, is tot die besef gekom dat sommige gegewens van hierdie projek maklik gebruik kon word om vlieënde platforms met omhulde waaiers te ontwerp. So'n ontwerp, wat maar een rigting voorstel in die huidige wêreldwye belangstelling in vliegtoe wat vertikaal kan opstyg en land, word dikwels in die bestaande literatuur beskryf, en prototipes is reeds in Amerika gebou en getoets. Tot dusver is egter feitlik geen ontwerp-gegewens beskikbaar gestel nie.

Deur die nuut-ontwikkelde ontwerpsteorie vir kontraroterende waaiers te gebruik, is 'n studie gemaak van die vlieënde platform in sy swewende posisie. Daaruit is 'n teorie ontwikkel waar slegs empiriese faktore ingevoer is in soverre dit omhulselverliese raak.

Om die teorie te staaf, is 'n klein vlieënde platform van balsahout gebou. Die toetsresultate het redelik ooreengestem met die teorie en het aangedui hoe verdere ondersoeke uitgevoer moet word.

Diens aan die Nywerheid

Daar is ook heelwat kleinere ondersoeke ingestel en roetinetoetse en ontledings afgehandel. Die Afdeling Lugmeganika het, in samewerking met ander laboratoria, die oorsaak van swigting van 'n vleuelratlem in 'n turbokompressor vasgestel. Ten behoeve van 'n firma is 'n straalpomp ontwerp. By nog 'n ander projek is 'n voorgestelde veiligheidskode vir die toets van gasaanlegte in hospitale ondersoek. Tans word in die 10-voetwindtonnel lugdinamiese toetse uitgevoer op 'n stel sonskerms wat gebruik gaan word op 'n nuwe gebou waarvoor die opdraggewer gedeeltelik verantwoordelik is. Behalwe hierdie ondersoeke en dienste is daar weer 'n aantal lugdinamiese meetinstrumente geyk vir ander W.N.N.R.-laboratoria en vir verskeie organisasies en firmas buite die W.N.N.R. Hierdie ykings is hoofsaaklik in die 24-duimwindtonnel en op die wentelarm gedoen.

'n Warmdraadlugspoedmeter wat voorheen deur die Instituut ontwikkel is, is gebou vir 'n firma in die Verenigde State van Amerika. Die firma, wat 'n verskeidenheid lae-spoedlugspoedmeters vervaardig, het die instrument nodig as 'n ykingstandaard.

Ducted-fan Flying Platforms

While planning an experimental programme aimed at determining the component efficiencies of ventilating fan inlets, nose fairings, guide vanes, diffusers and similar components, it was realized that some of the results of this project could readily be applied for the purposes of designing ducted-fan "flying platforms". These devices, which represent one trend in the present worldwide interest in "vertical take-off and landing" aircraft, are often described in the literature, and prototypes have already been flown in America. So far, however, almost no design data have been published.

Using the newly-developed design theory for contra-rotating fans as a basis, a brief study of the flying platform in its hovering state was undertaken. This work resulted in the development of a simple theory that involves empiricism only as far as "duct" losses are concerned.

A small balsa wood flying platform was subsequently built for the purpose of verifying the theory. The results of the tests showed reasonable agreement with the theory and served to indicate the lines along which further investigations should be carried out.

Services to Industry

In addition, several minor investigations, routine tests and analyses were dealt with. The Aeromechanics Division collaborated with other laboratories to establish the cause of failure of an impeller blade in a turbo-compressor. A jet pump was designed on behalf of an industrial firm, while a further small project involved an investigation into a proposed safety code for the testing of gas installations in hospitals. Work is at present in hand on aerodynamic tests, in the 10-foot diameter wind tunnel, on a set of sun louvres of a type that will be used on a new building for which the sponsor is partly responsible. Apart from these investigations and services, a number of aerodynamic measuring instruments were again calibrated on behalf of other C.S.I.R. Laboratories and on behalf of various outside organizations and firms. These calibrations were mainly done in the 24-inch diameter wind tunnel and on the whirling arm.

A stable hot-wire anemometer of the type developed by the Institute in the past, was constructed on behalf of a firm in the United States of America. The firm, which manufactures a variety of low-speed anemometers, required the instrument as a standard of calibration.

LUGVAARTKUNDE

Kennis van die atmosferiese toestande oor Suidelike Afrika en die invloed daarvan op die reaksies en sterkte van vliegtuie, is 'n vereiste vir veilige lugvervoer in die Unie. 'n Navorsingsondersoek na die werkverrigting van vliegtuie in tropiese en subtropiese weerstoestande maak dus deel uit van die Nasionale Advieskomitee vir Lugvaartkundige Navorsing se program. Die doel van hierdie projek is om inligting te versamel oor atmosferiese steurings en temperatuurskommelinge en hoe dit die werkverrigting van 'n Dakota-vliegtuig beïnvloed. Die navorsing word deur die Instituut in samewerking met die Suid-Afrikaanse Lugmag en die Suid-Afrikaanse Weerburo gedoen.

'n Instrumentasie-opstelling is in 'n Dakota-vliegtuig aangebring, en is ontwikkel namate onderverinding in die loop van etlike toetsvlugte opgedoen is. Die doel is om die volgende veranderlikes aan te teken: stertspaar- en vlerkspaarbuigmomente; oppervlakspanning by 'n punt op die bakboordvlerk; vertikale skuifspanning op die gondel van die stuurboordmotor, vertikale versnelling by die swaartepunt en by die stert; buitelugtemperatuur; die temperatuur op die vlerkspaar van die bakboordvlerk; oppervlaktemperatuur by twee punte, nl. een op die boonste vlak van die bakboordvlerk en die ander op die gondel van die bakboordmotor; lugvogtigheid en hittestraling vanaf die aarde.

Terwyl drie veranderlikes aangeteken word op 'n CEC-registreertoestel met 14 kanale, word vluggewens aangeteken deur 'n duplikaatstel vluginstrumente te fotografeer.

Op vlugte na Kaapstad, Durban en Port Elizabeth is 'n groot aantal gegewens met welslae aangeteken. Vlugte na Windhoek en noordwaarts na die Caprivistreek word in vooruitsig gestel.

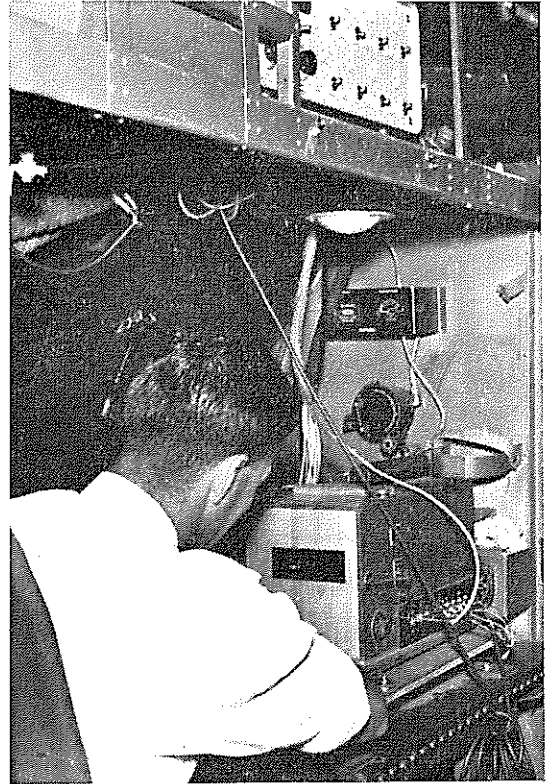
HIDROMEGANIKA

Navorsingswerk op die gebied van hidromeganika is gestrem deur beperkte geriewe in die tydelike huisvesting van die Afdeling Hidromeganika. Een van die hoofake was die beplanning van basiese toerusting wat in die nuwe laboratorium aangebring sal word. Heelwat belangrike toerusting is vervaardig, onder andere die onderdele vir 'n oop waterkanaal.

AERONAUTICS

Knowledge of the atmospheric conditions over Southern Africa and their bearing on the reactions and strength of aircraft is very important for the safe operation of the country's air transport. A research investigation into the operation of aircraft under tropical and subtropical weather conditions was, therefore, started as part of the programme of the National Advisory Committee for Aeronautical Research. The object of this project was to obtain information on atmospheric gustiness and temperature variations and their effects on the performance of a Dakota aircraft. The investigation is being carried out in collaboration with the South African Air Force and the South African Weather Bureau.

An instrumentation system was installed in a Dakota freighter, and developed as a result of experience gained during the course of several flight tests, so as to record the following variables:—tail plane and port and



Registreerinstrumente wat in 'n Dakota-vliegtuig aangebring is vir toetsvlugte

Recording instruments installed in a Dakota aircraft for flight tests

Daar is nogtans bevredigend gevorder met 'n aantal hoofprojekte, en enkele kleinere ondersoeke en navrae is ook afgehandel. Onder laasgenoemde ressorteer sulke uiteenlopende onderwerpe soos die verwydering van slakke van leiwater vir die bestryding van bilharzia, die ontwerp van 'n skroef vir 'n snelboot en die ontwerp van 'n eenvoudige hidrouliese turbine van 2 kilowatt vir plaasbeligting wat maklik vervaardig kon word sonder spesiale toerusting.

Daar is ook vooruitgang gemaak met die oprigting van navorsingsingsgeriewe vir kavitasienavorsing, insluitende die bestelling van 'n klein geslote hoë-spoed-watertunnel.

Die eksperimente om die uitwerking van pybuiing op drukval te bepaal is voltooi vir die laminêre stromingsgebied en vir die gebied van oorgang tot turbulente stroming. Uitbreiding van die gegewens na die turbulente stromingsgebied sal egter moet wag totdat die nuwe laboratorium klaar is aangesien die watervoorraad in in die bestaande gebou ontoereikend is.

Hersirkulasie van Water in Myne

Een van die hoofondersoeke was om te bepaal in hoeverre die water wat uit myne in 'n sekere gebied gepomp word, weer in hulle terugvloei. Hiervoor is 'n spoortoets uitgevoer deur fluoressensie by die water te voeg. Daar het geblyk dat noemenswaardige hoeveelhede van die uitgepompte water werklik weer teruggevloei het. Die resultate het bewys dat die fluoressensie spoortoets handig is om dergelike probleme op te los. So byvoorbeeld kan die syferdigtheid van dyke deur hierdie metode te gebruik, bepaal word.

Vervoer van Steenkool deur Pyplyne

In samewerking met die Nasionale Fisiese Navorsingslaboratorium is hulp verleen aan die Elektrisiteitsvoorsieningskommissie in verband met ondersoek na 'n toetsopstelling om steenkool te pomp. Die doel is om inligting te versamel wat sal dien om alreeds in die ontwerp stadium te bepaal op 'n steenkoolpomp aanleg in die beplanning van 'n EVKOM kragstasie ingesluit moet word. Radio-aktiewe isotope is gebruik om die steenkoolspoed in die toetspylyn te meet. Die toets het nie alleen inligting verskaf in verband met drukafval, toelaatbare steenkoolkonsentrasie en steenkool- en waterspoede, maar

starboard main plane bending moments, skin stress at a point on the port main plane, vertical shear stress on the starboard engine nacelle, vertical acceleration at the centre of gravity and the tail, outside air temperature, port main plane rear spar temperature and skin temperature at two points, one on the port main plane upper surface and the other on the port engine nacelle, air humidity and heat radiation from the earth.

While three variables are recorded on a 14-channel CEC recorder, flight information is recorded by photographing a duplicate set of flight instruments.

A large number of measurements was successfully recorded during flights over the Union, to such places as Cape Town, Durban and Port Elizabeth. Flights to Windhoek and northwards to the Caprivi Strip will also be undertaken.

HYDROMECHANICS

The research work in the field of hydromechanics was somewhat handicapped by the limited experimental facilities in the temporary accommodation of the Hydromechanics Division. Planning of basic laboratory equipment to be installed in the new laboratory was one of the main tasks and several major items of equipment, including the components for an open flume, were manufactured.

Nevertheless, significant progress was made on several major projects and a number of smaller investigations and enquiries were dealt with. These involved such diverse topics as the removal of snails from irrigation water for bilharziasis control, the design of a propeller for a speed boat, and the design of a simple 2-kilowatt hydraulic turbine for farm lighting that could be manufactured without special equipment.

Progress was also made with establishing research facilities for cavitation research, including the preparations for erecting a small high-speed water tunnel.

Experiments to determine the effect of pipe curvature on pressure drop have been completed for the laminar flow region and for the region of transition to turbulent flow. Extension of the results into the turbulent flow region, however, will have to await completion of the new laboratory as the water supply in the existing building is inadequate.

Water Recirculation in Mines

One of the major investigations was to determine the extent to which water pumped from mines in a certain area was returning into them. For this purpose a tracer test was carried out by adding fluorescein to the water. The experiments indicated that significant quantities of pumped water were, indeed, recirculated. The results proved the fluorescein tracer test to be a useful tool in solving problems of this kind, as for instance determining the imperviousness of dykes.

het ook getoon dat die steenkool (wat 'n korrelgrootte kleiner as $\frac{3}{4}$ duim het) nie noemenswaardig opgebreek word as dit deur die pyplyn vloeï nie, en dat dit nie 'n besondere probleem skep om die steenkool aan die eiende van die pyplyn droog te maak nie. Verdere toetse in verband met die laasgenoemde probleem word egter beplan.

Verwydering van vaste Deeltjies in Suspensie uit Mynwater

Ondersoek is ingestel na die moontlikheid van meganiese afskeiding van fyn vaste deeltjies uit mynwater voordat dit gepomp word, ten einde onnodige slytasie van pompstelsels te voorkom. Die werk behels 'n studie van hidrouliese sikloontipe skeiers om vaste deeltjies van 10 tot 40 mikron te verwyder. 'n Aanvullende studie oor die verband tussen korrelgrootte en pompslytasie, om te bepaal watter korrelgroottes uit die mynwater verwyder moet word, is gedoen. Vir toetsdoeleindes word radio-aktiewe isotope gebruik.

Hierdie projek is veral vir die mynbounerweerdigheid van belang, op grond van die hoë koste verbonde aan die gebruiklike soort sedimentasieafskeiers waarmee die groot hoeveelhede water in diep mynbou gehanteer word.

Verslikking van Hawens

Ten behoeve van die hawe-owerhede in Oos-Londen is die seestrominge by Oos-Londen bestudeer in 'n poging om uitbaggering te verminder, en tog die nodige diep water by die hawe-ingang te behou. Vir vereenvoudiging van hierdie studie is 'n klein hidrouliese model van die gebied gebou. Die resultate van hierdie modeltoetse het aan die lig gebring dat die patroon van die seestrominge by Oos-Londen in een uiters belangrike opsig afwyk van die bestaande opvatting. Die modeltoetse het veral getoon dat die welbekende, noordwaartse vloeï van die water teenaan die kus, nie 'n aaneenlopende noordwaartse stroming is nie, maar die gevolg van 'n reeks reusagtige werwelstrominge of warrelstrominge, wat veroorsaak word deur die inwerking van die sterk Agulhasstroom op die topografie van die vasteland. Aanbevelings, wat gebaseer is op die modelnavorsing, is aan die hawe-owerhede

Conveyance of Coal in Pipelines

In collaboration with the National Physical Research Laboratory, assistance was given in an investigation by the Electricity Supply Commission on an experimental coal-pumping installation. The tests were aimed at obtaining information to determine whether a coal-pumping scheme should be incorporated in the layout of an Escom power station now at the design stage. In these tests, use was made of radio-active isotopes for the measurement of the coal speed in the test pipeline. In addition to giving information on pressure drop, allowable coal concentration and coal and water speeds, the tests showed that the coal (which is minus $\frac{3}{4}$ inch grading) is not significantly broken up in flowing through the pipeline and that drying of the coal may not present serious difficulties; though further tests are projected in the latter connection.

Removal of Suspended Solids from Mine Water

An investigation was started to establish the feasibility of mechanical separation of fine particles from mine water, prior to pumping, to avoid excessive wear of the pumping system. The work involves a study of hydraulic cyclone-type separators for removal of particles in the 10 to 40 micron range. A supplementary study aims at establishing the relationship between particle size and pump wear to determine which particle sizes must be removed from the mine water. In the experimental work use is made of radio-active isotopes.

This project is of particular importance to the mining industry because of the considerable cost that would be involved in providing conventional gravity-type settlers in deep level mines to handle the large quantities of water involved.

Siltation of Harbours

At the instigation of the harbour authorities at East London, a study of the ocean currents at East London was initiated in an attempt to advise on measures to reduce the amount of dredging that is needed to maintain deep water at the harbour entrance. To facilitate study of ocean currents, a small hydraulic model of the area was constructed. The results of these model tests led to the conclusion that the pattern of ocean currents off East London differs in one very significant aspect from what is generally believed to be the case. In particular, the model tests indicated that the well-known northward drift of water close to the shore, is not a continuous northward drift all the way up the coast, but is due to a series of vast whirl flows, or eddies, caused by the interaction of the strong Agulhas current with the topography of the continental shelf. Arising out of the model investigation, suggestions were made to the harbour authorities as to how the

gedoen in verband met die verligting van die verslikingsprobleem. Bespreking van die toetsresultate met die Stadsingenieursafdeling in Oos-Londen het aangedui dat hierdie toetse belangrik is ook vir gevalle soos die erosie van strande en die gebruikmaking van die see vir die verwydering van afval.

ERKENNING

Die Britse Ministerie van Krag het toerusting vir gasturbinenavorsing teen nominale vergoeding beskikbaar gestel. Die Suid-Afrikaanse Spoorwegadministrasie het £5,000 vir gasturbinenavorsing geskenk. Die Transvaalse en Vrystaatse Kamer van Mynwese het sy medewerking in verband met navorsing na rotsbarstings verleen deur in arbeid en addisionele fondse vir ondergrondse navorsingswerk te voorsien benewens die kontrakprys van £20,000 per jaar vir die ondersoek van rotsbarstings.

siltation problem could be alleviated. Also, discussion of the results of the study with the City Engineer's Department at East London indicated the significance of these tests in relation to such diverse matters as the erosion of beaches and the disposal of effluents into the sea.

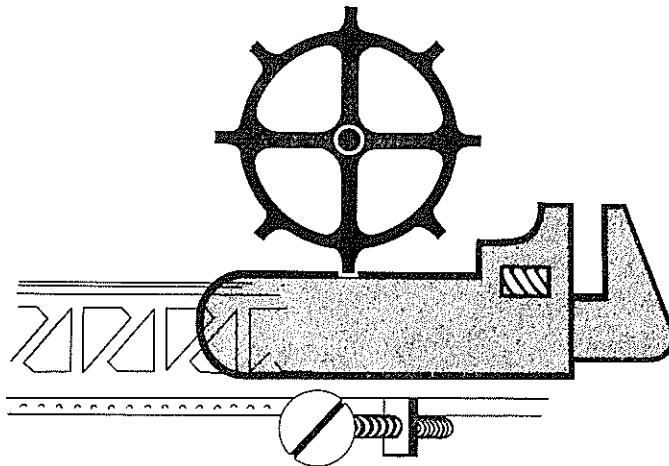
ACKNOWLEDGEMENT

The British Ministry of Power made gas turbine research equipment available at nominal cost. The South African Railways and Harbours donated £5,000 for gas turbine research. The Transvaal and Orange Free State Chamber of Mines co-operated in the rockburst research in providing for labour and additional funds for underground research work in addition to the contract price of £20,000 per annum for the rockburst investigation.

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DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL X
NASIONALE
PADNAVORSINGS-
INSTITUUT

PART X
NATIONAL INSTITUTE
FOR ROAD RESEARCH

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. Box 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)



Aansig van Sauerstraat, Johannesburg, gedurende die ure met druk verkeer in die oggend

View of Sauer Street, Johannesburg, during morning traffic peak hour

NATIONALE PAD- NAVORSINGSINSTITUUT

Direkteur: DR. P. J. RIGDEN

Die grootste gedeelte van die Instituut se navorsings-program is nog steeds toegespits op probleme in verband met padbedekkings, sekere aspekte van padfondamente en op die ontwikkeling van verbeterde metodes om die verskillende prosesse van padbou te beheer. Die res van die program is gemik op ekonomiese studies en navorsing in verband met verkeer en padveiligheid. Die Bituminese Bindstof Navorsingseenheid, wat tot dusver vir navorsing op padbedekkings en bituminese materiale verantwoordelik was, bestaan sedert 31 Maart 1959 nie meer as afsonderlik gefinansierde Eenheid nie, maar dit is omgeskep in die Bituminese Materiale-afdeling van die Instituut. Die nyweraar-opdraggewers van hierdie werk en die Suid-Afrikaanse Spoorweë en Hawensadministrasie het egter ingestem om voort te gaan met hulle finansiële ondersteuning aan die Instituut vir Navorsing i.v.m. Bituminese Materiale. Die Raad is baie dankbaar vir hierdie volgehoue praktiese ondersteuning van die werk. 'n Besonder belangrike probleem wat tans aangepak word, is die vasklewing van bitumens aan padklip, aangesien sekere moeilikhede deur ingenieurs ondervind word wanneer hulle bitumens van Midde-Ooste ru-olies gebruik.

Werk van spesiale belang is op die gebied van grondmeganika en padfondamente verrig deur 'n stelselmatige studie van die verhouding tussen klimaat en die eienskappe van verweerde doleriete wat dwarsdeur die Unie in padfondamente gebruik word. Omdat die keuring van geskikte padboumateriale van die grootste belang is vir die padingenieur, sal 'n benadering van die probleem op 'n streeksgrondslag hopelik bydra tot 'n bevredigende oplossing.

Die noodsaaklikheid van deeglike kontrole by alle padbouprosesse kan nie genoeg beklemtoon word nie en die ontwikkeling van 'n eenvoudige draagbare vogtigheids- en digtheidsmeter wat radio-isotope gebruik, sal derhalwe 'n waardevolle hulpmiddel vir die padingenieur verskaf om die verdigting van padfondamentlae te kontroleer.

Die Afdeling belas met verkeers- en ongeluksprobleme is gedurende die jaar vergroot en was in staat om sy werksaamhede uit te brei. Sekere statistiese navorsing i.v.m. ongelukke is voorgesit en 'n verkeersteekproef is in Johannesburg geneem.

'n Belangrike gebeurtenis op die gebied van padbouprobleme in Afrika was die eerste byeenkoms van padboukundiges uit die verskillende lande suid van die Sahara wat in Augustus 1958 onder die beskerming

NATIONAL INSTITUTE FOR ROAD RESEARCH

Director: DR. P. J. RIGDEN

The major part of the Institute's research effort has continued to be focussed on problems in the field of road surfacings, on several aspects of road foundations and on the development of improved methods of controlling the various processes of road building. The remainder of the effort has been devoted to economic studies and also to development of research in the field of traffic and road safety. The Bituminous Binder Research Unit, which has hitherto been responsible for the work on road surfacings and bituminous materials, ceased to exist as a separately financed Unit on 31st March, 1959, and becomes now the Bituminous Materials Division of the Institute. The industrial sponsors of this work have, however, agreed to continue to give some financial support to the Institute for bituminous materials research, as has also the South African Railways and Harbours Administration. The Council is very grateful for this continued practical expression of support for its work. A particularly important problem being tackled at present is that of the adhesion of bitumens to road stone, as certain difficulties have been reported by engineers when using bitumens prepared from Middle East crude oils.

Work of special importance on the soil mechanics and road foundation side has included a systematic study of the relation between climate and the properties of weathered dolerites used extensively in the Union in road foundations. As the selection of suitable road making materials is of the greatest importance to the road engineer, the regional approach now being developed will, it is hoped, make a useful contribution to this problem.

The necessity for good control of all road building processes cannot be stressed too much and, in this connection, the development of a simple, portable moisture and density meter using radio isotopes will, it is expected, place a valuable tool in the hands of the road engineer for controlling rapidly the compaction of road foundation layers.

The section dealing with traffic and accident problems has grown during the year and has been able to extend its work on studies of urban traffic problems. Some statistical work on accidents has been continued and a sample traffic survey in Johannesburg has been carried out.

In the general field of African road problems a notable event was the first meeting in August 1958, under the auspices of C.C.T.A., of certain specialists in

van C.C.T.A. gehou is. Op hierdie vergadering is 'n reeks aanbevelings gemaak oor die totstandkoming van samewerking in Afrika deur middel van die C.C.T.A. by die oplossing van tegniese probleme i.v.m. padbou.

BITUMINEUSE MATERIALE EN BEDEKKINGS

Volskaalse Proefopervlakke

Sedert die Navorsingseenheid i.v.m. Bitumeneuse Bindstowwe in 1951 in die lewe geroep is, is ses volskaalse proefopervlakke gelê met die doel om die werkverrigting van inheemse en ingevoerde bindstowwe in gewone dienstoestande met mekaar te vergelyk.

Die eerste van hierdie proefopervlakke wat in 1951 en 1952 gelê is verskaf tans bruikbare inligting oor die werkverrigting van die verskillende bindstowwe:—

(a) *Werkverrigting in enkelherseelingswerk:* Die ingevoerde petroleumbitumens het die beste resultate gelewer; enkeleelings met hierdie bindstowwe en $\frac{1}{2}$ dm. of $\frac{3}{4}$ dm. klip hou langer as 7 jaar. Natuurlike vloei-meerasfalt lewer ook 'n goeie werkverrigting maar nie heeltemal so goed soos dié van die petroleum bitumens nie.

Inheemse tere het oor die algemeen 'n swakker werkverrigting gelewer; nogtans het enkeleherseelings op 'n pad met digte verkeer in sommige gevalle 'n dienslewe van 4 jaar gelewer.

(b) *Werkverrigting in voorafgemengde bolae:* Net een omvattende volskaalse proefopervlak is (1953) op 'n pad naby Pretoria gelê wat ongeveer 1200 voertuie per dag dra. In hierdie eksperiment is die relatiewe werkverrigting van die verskillende bindstowwe dieselfde as dié van die bindstowwe in die herseelingseksperimente.

Tabel 1 gee die voorlopige aanbevelings vir die spesifikasie vir voorafgemengde materiaal-samestellings wat op die resultate van hierdie eksperiment gegrond is.

road matters from various countries in Africa South of the Sahara. The outcome of this meeting was a series of recommendations regarding the setting up, through C.C.T.A., of inter-African co-operation on technical road problems.

BITUMINOUS MATERIALS AND SURFACINGS

Full-scale Road Experiments

Since the Bituminous Binder Research Unit started work in 1951, six full-scale road experiments have been laid to compare the performance of locally produced and imported binders under normal service conditions.

The earliest of these experiments (laid in 1951 and 1952) are now giving definite information on relative binder performance:—

(a) *Performance in single reseal work:* The imported petroleum bitumens have given the best performance, single seals with these binders using $\frac{1}{2}$ " or $\frac{3}{4}$ " nominal size stone having a life greater than 7 years. Fluxed natural lake asphalt has also given a very good performance but not quite so good as that of the petroleum bitumens.

The locally produced tars have generally given a poorer performance although single reseals on a heavily trafficked site gave, in some cases, a life of 4 years.

(b) *Performance in premix surfacing:* Only one comprehensive full-scale experiment has been laid (1953) and this is on a site near Pretoria carrying approximately 1200 vehicles/day. The order of merit of the different binders in this experiment is the same as that obtained in the single reseal experiments.

Tentative recommendations for the specification of premix composition based on the results of this single experiment are given in Table 1.

TABEL 1

Voorlopige aanbevelings vir die voorafgemengde padbedekingskomposisies gebaseer op resultate van padeksperimente na 5 jaar

| Gradering ($\frac{1}{2}$ " maksimum klipgrootte) | Oop en medium oop (10/25% deur $\frac{1}{8}$ " maas) | Medium (30/35% deur $\frac{1}{8}$ " maas) | Dig (50/55% deur $\frac{1}{8}$ " maas) |
|--|---|--|---|
| Bindstofinhouds- bestek (% gewig van gemengde materiaal) aanbeveel: Wanneer 150/200 pen. aaneengedistilleerde petroleum-bitumen gebruik word | 5.0-7.5 | 5.0-7.5 | 5.0-6.0 |
| Wanneer 150/200 pen. vloei-meerasfalt gebruik word | niks aanbeveel | 7.0-8.0 | 6.5-7.5 |
| Wanneer No. 2 graad kooksoondteer (45°/50°C „E.V.T”) gebruik word | niks aanbeveel | niks aanbeveel | 8.0-9.0 |

Ontwikkeling van Werkverrigtingstoetse in die Laboratorium

As gevolg van onlangse ontwikkelings in Europa op die gebied van laboratoriumwerkverrigtingstoetse vir bitumineuse bindstowwe, word tans navorsing gedoen om die padwerkverrigting van bindstowwe te voorspel deur middel van toetse gebaseer op die blootstelling van baie dun bindstoflagies aan kunsmatige toestande van verwerking.

Weens die klein hoeveelheid bindstof wat gebruik word, word die eienskappe van die bindstof deur middel van mikrometodes gemeet na blootstelling. 'n Dunlaagviskosimeter word gebruik om die vloeieienskappe by betreklik lae belastingsnelhede te meet en 'n vibrasie-apparaat (waarna elders in hierdie Verslag verwys)

Development of Laboratory Performance Tests

Following recent developments in Europe on laboratory performance tests for bituminous road binders, work is in progress on the assessment of the road performance of binders by tests based on the exposure of very thin films of binder to artificial weathering conditions.

With the small quantities of binder involved, micro-methods of assessment of the properties of the binder after exposure are being used. A thin-film viscometer is being used to measure flow properties at comparatively low rates of loading and a vibration apparatus referred to elsewhere in this Report will be

TABLE 1

Tentative recommendations on premix surfacing compositions based on results of road experiment after 5 years

| Grading ($\frac{1}{2}$ " maximum size stone) | Open and Medium- Open (10/ 25% passing $\frac{1}{8}$ " mesh) | Medium (30/35% passing $\frac{1}{8}$ " mesh) | Dense (50/55% passing $\frac{1}{8}$ " mesh) |
|--|---|---|--|
| <i>Binder content range (% by wt. of mixed material recommended)</i> | | | |
| Using 150/200 pen. straight-run petroleum bitumen . . . | 5.0-7.5 | 5.0-7.5 | 5.0-6.0 |
| Using 150/200 pen. fluxed lake asphalt . . . | none recommended | 7.0-8.0 | 6.5-7.5 |
| Using No. 2 grade coke-oven tar (45°/50° E.V.T.) . . | none recommended | none recommended | 8.0-9.0 |

word gebruik om die visko-elastiese eienskappe van die bindstof by hoë belastingsnelhede te meet. Bepalings deur laasgenoemde metode is belangrik by die skatting van die bindstof brosheid by lae padtemperatuur.

Padwerkverrigting van Koolteerbindstowwe

Aangesien 'n aansienlike hoeveelheid steenkoolteer jaarliks in die Unie as neweproduk van die staalnywerheid geproduseer word, word padbindstowwe uit hierdie materiaal vir verskeie padbedekkingsdoeleindes gebruik.

Hoewel sulke bindstowwe hulle bruikbaarheid bewys het in die sproeilae onder die bolaag van die pad, is hulle minder duursaam as die ingevoerde petroleum-bitumens en word hulle gevolglik nie normaalweg in die slytvlak van 'n pad gebruik nie. Studies in die laboratorium het egter getoon dat die duursaamheid van hierdie tere verbeter kan word deur hulle vlugtigheids- en vloeieienskappe te verander, en dus is daar ook tere reeds met verbeterde vlugtigheidseienskappe ontwikkel. Aandag word nou bestee aan metodes om die viskositeit/temperatuur-afhanklikheid te verminder en om brosheidseienskappe by lae temperatuur te verbeter.

Daar is ondervind dat die oplossing van sekere Suid-Afrikaanse steenkoolsoorte in die teer by temperatuur bo 300°C en die verstuiwing van klein hoeveelhede sintetiese rubber in die teer die belowendste behandeling is om die viskositeit/temperatuur-kenmerke te verbeter. Daarbenewens is daar ondervind dat die gekombineerde effek van die twee byvoegings groter is as die som van die effekte van elkeen van hulle apart. Dus kan mengsels van teer, steenkool, en sintetiese rubber verkry word wat vloeieienskappe besit wat beter of gelyk is aan dié van petroleum-bitumens.* Dit lyk of hierdie mengsel, bestaande uit drie bestanddele, goeie resultate in die praktyk sal lewer want weens sy steenkoolinhoud in net 'n klein hoeveelheid van die betreklik duur kunsrubber nodig. Die byvoeging van steenkool veroorsaak egter 'n aansienlike verharding en daarom moet aansienlike hoeveelhede teerolie met 'n hoë kookpunt by die steenkooldispersie gevoeg word om 'n materiaal met 'n geskikte viskositeit vir padgebruik te verkry.

Gedurende laboratoriumwerk is ook gevind dat kuns- en natuurlike rubbersoorte teer en petroleum-bitumen mengsels kan stabiliseer wat normaalweg onmengbaar is. Hierdie gestabiliseerde mengsels het 'n lae viskositeit/temperatuur-afhanklikheid en is goed bestand teen brosheid by 'n lae temperatuur. Dié wat kunsrubber bevat, is minder vatbaar vir hitte as mengsels met natuurlike rubber.

used to measure the visco-elastic properties of the binder at high rates of loading. Measurements by the latter method are important for the assessment of the brittleness characteristics of a binder at low road temperatures.

Road Performance of Coal-tar Binders

A considerable quantity of coal-tar is produced in the Union as a by-product of the Iron and Steel Industry and road binders prepared from this material can be used for various road surfacing purposes. Although such binders have proved their use for priming the base and binding the underlying layers of the road, they are less durable than imported petroleum bitumens and consequently are not normally used in the wearing surface of the road. Laboratory studies have indicated however, that the durability of these tars can be improved by changing their volatility characteristics and their flow behaviour, and tars with improved volatility characteristics have already been developed. Attention is now being given to methods for reducing viscosity/temperature dependence and for improving brittleness characteristics at low temperatures.

Digestion of certain types of South African coal in the tar at temperatures above 300°C and dispersion of small amounts of synthetic rubber in the tar have been found to be the most promising treatments for improving the viscosity/temperature characteristic. Further, the combined effect of the two additives has been found to be greater than the sum of their separate effects so that tar-coal-synthetic rubber blends can be obtained with flow properties equal to or better than those of petroleum bitumens*. These three-component blends show particular promise of practical application because, with coal present, the amount of relatively expensive synthetic rubber required can be kept small. Addition of coal, however, produces a considerable hardening effect and substantial quantities of high-boiling tar oil must be added to the coal dispersion to obtain a material with a viscosity suitable for road use.

In the course of the laboratory work, it was also observed that synthetic and natural rubbers stabilise mixtures of tars and petroleum bitumen which are normally incompatible. These stabilised mixtures have a low temperature-susceptibility of viscosity and show good resistance to brittle failure at low temperatures. Those containing synthetic rubber are more stable to heat treatment than mixtures containing natural rubber.

*Hierdie proses van saamgestelde byvoeging van die rubber en steenkool word gepatenteer.

*This process of the combined addition of the rubber and coal is the subject of a patent

Alhoewel veelomvattende laboratoriumtoetse aangedui het dat hierdie gewysigde tere verbeterde padwerkverrigting behoort te lewer, moet dit bewys word deur hulle met gewone bindstowwe onder werklike dienstoestande te vergelyk. Tere wat deur die byvoeging van steenkool en steenkool-en-kunsrubber verbeter is, is in 500-gel. hoeveelhede voorberei, en hulle werkverrigting word tans op die pad vergelyk met

Although comprehensive laboratory testing has indicated that these modified tars should have improved road performance, this must be proved by comparison with normal binders under actual conditions of service on the road. Accordingly, tars modified by the addition of coal and by the addition of coal and synthetic rubber were prepared on a 500 gallon scale, and their performance on the road is now being compared with that of



FIGUUR 1

Die sproei van rubberbitumen by 'n herseëlings-eksperiment naby Pienaarsrivier, Transvaal

FIGURE 1

Spraying rubberised binder in a resealing experiment near Pienaar's River, Transvaal

dié van gewone tere en bitumens in 'n enkelherseëling wat in Februarie/Maart 1958 naby Pienaarsrivier uitgevoer is. Met die spuit van die verbeterde tere deur 'n bindstofsproeier van die gleufmondstuktipe is geen moeilikhede ondervind nie. Fig. 1 toon die sproeiing van 'n bitumen wat rubber bevat gedurende die aanleg van die proefseksies.

Om toekomstige volskaalse padeksperimente tot 'n minimum te beperk, word 'n kleinskaalse pad proefneming (6 gel. verbeterde bindstof) tans uitgevoer en slegs die belowendste kombinasies van hierdie eksperiment sal later in 'n volskaalse eksperiment getoets word. Neëntien verskillende verbeterde tere word in die kleinskaalse enkellaagproefnemings gebruik.

normal-production tars and bitumens in a single seal experiment laid near Pienaar's River in February/March, 1958. No difficulties were encountered in the spraying of the modified tars through a slot-jet type binder distributor, and Figure 1 shows the spraying of a rubberised binder during the laying of the experimental sections.

To reduce future full-scale road testing to a minimum, a small-scale road trial (using 6 gallons of modified binder) is now being laid and only the most promising compositions used in this experiment will be laid in a full-scale experiment later. Nineteen different modified tars are being laid in the small-scale single-seal trial.

Midde-Ooste Petroleumbitumens vir Gebruik in Padbedekkings

Bitumens wat in die Unie van Midde-Ooste ru-petroleum vervaardig word, is nou 4 jaar of langer in gebruik vir paddoeleindes. Sedert die tweede helfte van 1956 vervaardig die Durbanse raffinadery 'n bitumen van Agha Jari (Persiese) ru-olie. Padingenieurs het gerapporteer dat die werkverrigting van hierdie Midde-Ooste-bitumens, veral by herseelingswerk, abnormaal is vergeleke met dié van bitumens wat voorheen van raffinaderye buite die Unie ingevoer is. As gevolg hiervan word 'n opname van die werkverrigting van hierdie bitumens gemaak.

Uit die inligting wat tot dusver verkry is, lyk dit of die Agha Jari-bitumen slegs onder ongunstige omstandighede (óf koue óf nat weer, óf albei) onbevredigende diens lewer. Die aard van hierdie mislukkings toon aan dat die vasklewing van die bitumen aan die padklip ietwat slegter is as dié van ander bitumens. Hierdie gevolgtrekking is ook deur die verskil in vasklewing tussen 'n Agha Jari-bitumen en 'n bitumen van Texas gestaat wat in 'n padeksperiment t.o.v. metodes van herseëling in koue weer waargeneem is. (Sien „Herseëling in koue weer”, bls. 299). In hierdie eksperiment is beter vasklewing by lae pad-temperatuur verkry tussen teerbedekte klip en die Texas-bitumen as met die Agha Jari-bitumen.

'n Algemene opname van die eienskappe van petroleumbitumens is gemaak om uit te vind of daar enige belangrike verskille tussen die Agha Jari-bitumen en ander bitumens is wat die vasklewing van die bitumen aan padklip mag beïnvloed. Gegewens in hierdie verband word in Tabel 2 aangegee.

Die Agha Jari-bitumen bevat meer was en het 'n hoër temperatuurvatbaarheidsindeks as die ander twee bitumens en die suurgehalte is onbeduidend. In teenstelling het die Venezuela- en Trinidad-bitumens (erkende goeie padbitumens) 'n laer temperatuurvatbaarheidsindeks, min was en 'n noemenswaardige suurgehalte. 'n Ligte lugstroom is deur die Agha Jari-bitumen geblaas om die temperatuurvatbaarheidsindeks te verminder, maar die behandeling het

Middle-East Petroleum Bitumens for Surfacing

Road bitumens manufactured in the Union from Middle-East crude petroleum have now been in use for 4 years or more. Since late in 1956, the Durban petroleum refinery has produced a bitumen from an Agha Jari (Persian) crude. Road Engineers have reported abnormal behaviour of these Middle-East bitumens compared with that of bitumens previously imported from refining points outside the Union, particularly in resealing work. As a consequence, a survey of the behaviour of these bitumens in use is being made.

The information to date from this survey suggests that the Agha Jari bitumen has given unsatisfactory service only under adverse conditions of either cold or wet weather (or both). The nature of the reported failures suggests that the adhesion of the bitumen to roadstone is somewhat inferior to that of the other bitumens. This conclusion was also supported by a difference in adhesion behaviour between an Agha Jari bitumen and a Texan bitumen observed in a road experiment to investigate methods for resealing in cold weather (see “Resealing in cold weather”, page 299). In this experiment better adhesion was obtained at low road temperatures between tar-coated chips and the Texan bitumen than with the Agha Jari bitumen.

A general survey of the properties of petroleum bitumens has been made to find if there are any important differences between the Agha Jari bitumen and other bitumens which might affect the ease with which bitumen adheres to roadstone. Data indicating such differences are given in Table 2.

The Agha Jari bitumen contains more wax and has a higher temperature susceptibility index than the other two bitumens and its acid value is negligible. On the other hand the Venezuelan bitumen and Trinidad bitumens (recognised as being good road bitumens) have a lower temperature susceptibility index, a low wax content and a significant acid value. The Agha Jari bitumen was subjected to a mild air blowing treatment in an attempt to reduce its temperature susceptibility

geen noemenswaardige verandering in óf hierdie eienskap óf die suurgehalte óf wasinhoud teweeggebring nie.

'n Ondersoek na die vasklewing van bitumens aan „droë” padklip is begin onder toestande wat dié van seelingswerkzaamhede naboots.

'n Toets is ontwerp om die snelheid waarmee bitumen aan padklip vaskleef, te meet. Dit bestaan hoofsaaklik daaruit dat 'n lagie klip onder beheerde temperatuur en lugvog vir 'n bepaalde tyd met 'n lagie bitumen in aanraking gebring word, en dan word die lagie bitumen vibreer om al die klip wat nie aan die bindstof vaskleef nie, te verwyder, en die oorblywende hoeveelheid klip op die bitumen word dan vasgestel deur dit te weeg. Die apparaat word in Fig. 2 gewys. Die invloed van die toetstoestande of die hoeveelheid klip wat deur die bindstoflaag behou word, is vasgestel. Toetse by verskillende temperature het die belangrikheid van oppervlakkviskositeit (volgens die gemiddelde viskositeit van die laag) beklemtoon as 'n faktor wat die vasklewing-snelheid beïnvloed. 'n Vergelyking tussen die vasklewingseienskappe van verskillende bindstowwe (by

TABLE 2

A comparison of some properties of Agha Jari bitumen and petroleum bitumens from other crude sources

| Crude source of bitumen | Venezuelan | Trinidad | Agha Jari |
|--|------------|----------|----------------|
| Standard penetration at 25°C | 172 | 180 | 149 |
| Temperature susceptibility index* | 11.2 | 12.2 | 13.2 |
| Acid value (ccs N/10 alkali/gm.) | 0.49 | 0.43 | less than 0.01 |
| Wax content % wt. (Modified Richardson's method) | 0.5 | 0.3 | 4.3 |

index but the treatment used produced no significant change either in this property or in its acid value or wax content.

A detailed investigation of the adhesion of bitumens to 'dry' roadstone has been started under conditions simulating the surface sealing operation.

A test has been developed to measure the rate of wetting which consists essentially of bringing a layer of roadstone into contact with a film of bitumen under controlled conditions of temperature and humidity. Contact is maintained for a given time and then the bitumen film is vibrated to remove all stone not adhering to the binder, and the amount of stone remaining on the film is determined by weighing. A general view of the apparatus is shown in Figure 2. The test conditions affecting the amount of stone retained by the binder film have been evaluated and tests at different temperatures have indicated the importance of surface viscosity (as reflected by bulk viscosity) as a factor influencing the rate of wetting. A comparison of the wetting properties of different binders (on the basis of

TABEL 2

'n Vergelyking tussen sommige eienskappe van Agha Jari-bitumens en Petroleum-bitumens uit ander bronne

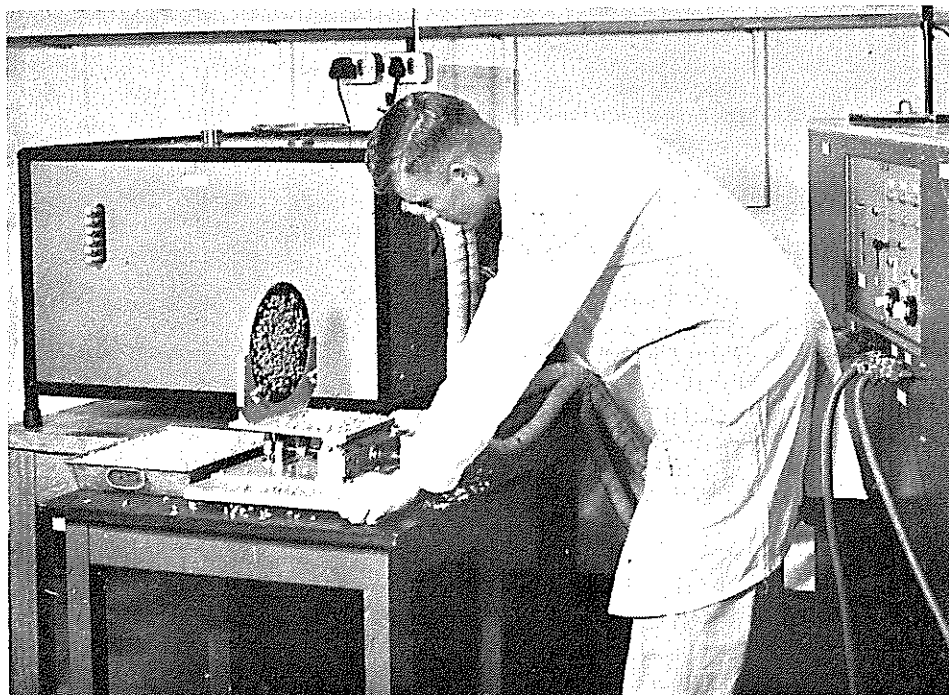
| Bron van Bitumen | Venezuela | Trinidad | Agha Jari |
|---|-----------|----------|----------------|
| Standaardpenetrasie by 25°C | 172 | 180 | 149 |
| Temperatuurvatbaarheidsindeks* | 11.2 | 12.2 | 13.2 |
| Suurgehalte (ccs N/10 alkali/gm.) | 0.49 | 0.43 | minder as 0.01 |
| Wasinhoud % gewig (Gewysigde metode van Richardson) | 0.5 | 0.3 | 4.3 |

*'n Hoë waarde vir hierdie indeks dui minderwaardige temperatuur/viskositeitseienskappe aan.

*A high value of this index indicates inferior temperature/viscosity characteristics.

dieselfde viskositeit) en kwartsietklip van die Witwatersrand het bewys dat, Agha Jari-bitumen onder die onderhawige toetstoestande swakker vasklewing as die Venezuela-bitumen het. Die toetsresultate word in Fig. 3 aangetoon. Die Agha Jari-bitumen vorm 'n laag by die bitumen/lug-skeidingsvlak wanneer dit tot

equal bulk viscosity) with quartzite stone from the Witwatersrand has shown that, under the conditions of the test, Agha Jari bitumen shows poorer wetting properties than Venezuelan bitumen. The experimental results are shown in Figure 3. The Agha Jari bitumen forms a film at the bitumen/air interface on cooling



FIGUUR 2

Apparaat vir die meet van die tempo waarin „lugdroë” padklip deur bitumen benat word

FIGURE 2

Apparatus for measuring the rate of wetting of “air dry” roadstones by bitumens

kamertemperatuur afkoel. Hierdie laag bestaan waarskynlik uit waskristalle en mag die oorsaak wees van die Agha Jari-bitumen se swakker vasklewing.

to room temperature which probably consists of wax crystals and this film may be the cause of the poorer wetting behaviour of the Agha Jari bitumen.

Instandhouding van Gebarste Paaie

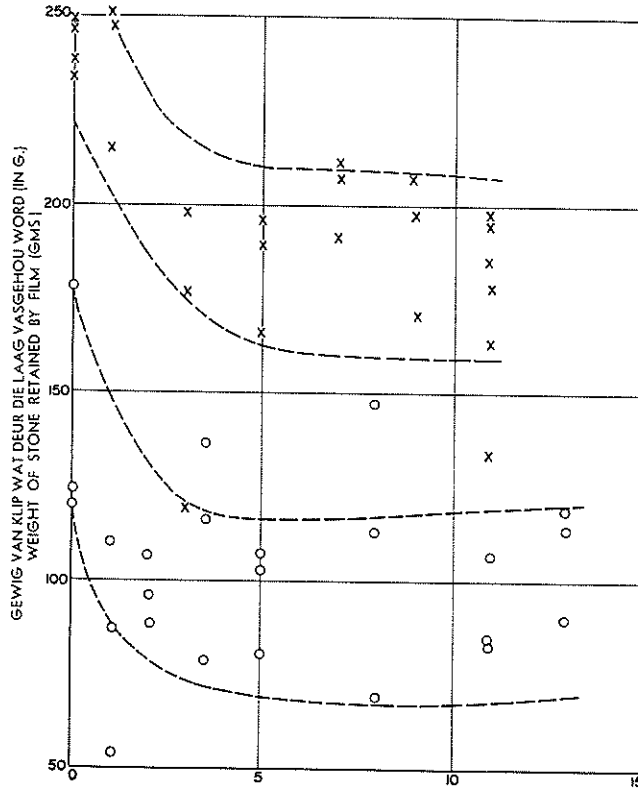
Wanneer 'n gebarste pad op die gewone manier herseël word, is daar 'n neiging vir die barste om weer na 'n kort tydjie te verskyn en dan deug die oppervlakseël nie meer as verseëling teen die insypeling van bogrondse water nie. Flodderseëls word nou vir pad-instandhouding gebruik en 'n ondersoek is ingestel na die waarde van hierdie instandhoudingsmetode vir gebarste paaie. Dis bekend dat die gewone flodders saam met die onderliggende bolaag bars, maar flodders wat rubberbindstof bevat, is minder geneig om te bars.

Maintenance of Cracked Roads

When a cracked road is resealed in the normal way, the cracks tend to reappear after a short time and the surfacing no longer acts as a seal against the ingress of surface water. Slurry seals are now being used for road maintenance and a start has been made on an investigation of their value for maintaining a seal on cracked roads. The normal slurry is known to crack in sympathy with the underlying surface but slurries made with rubberised binders may be less prone to this behaviour.

'n Voorlopige flodderseëlpadtoets waarin altwee bindstowwe naamlik flodders met bitumenemulsie (wat rubberlatex bevat) en „warm bitumen” (wat gedispergeerde natuurlike rubber bevat) gebruik is, is op 'n plek in Pretoria uitgevoer.

A preliminary road trial of slurry seals containing rubberised binders has been laid at a site in Pretoria using both bitumen emulsion slurries (with rubber latex added) and 'hot bitumen' slurry with natural rubber dispersed in the bitumen.



X 172 PEN VENEZOLAANSE BITUMEN BY 12.3° C
 O 148 PEN AGHA-JARI BITUMEN BY 16.2° C
 OPBERGINGSTYD (IN UUR) VAN DIE BITUMENLAAG VOOR
 DIE TOETS

KLIP: RIFKWARTSIET 5/16" — 1/4"
 VISKOSITEIT TYDENS OPBERGING EN TOETSTEMPERAATUUR:
 6.6 LOG. POISES IN ALBEI GEVALLE

X 172 PEN VENEZUELAN BITUMEN AT 12.3° C
 O 148 PEN AGHA JARI BITUMEN AT 16.2° C
 TIME (HOURS) BITUMEN FILM STORED BEFORE TESTING
 STONE: REEF QUARTZITE 5/16" — 1/4"
 VISCOSITY AT STORAGE AND TEST TEMP.: 6.6 LOG. POISES
 IN BOTH CASES

FIGUUR 3

*Die natmaak van „droë” pad-
 klip met behulp van bitumens*

FIGURE 3

*The wetting of “dry” road-
 stone by bitumens*

Herseëling in Koue Weer

Normaalweg word die instandhouding van bitumene oppervlakke deur herseëling nie in die koue seisoen onderneem nie omdat gewoonlik moeilikheid

Resealing in Cold Weather

Normally, maintenance of bituminous surfacings by resealing is not carried out in the cold season because of the difficulty of obtaining adhesion between the

ondervind word om by 'n lae padtemperatuur vasklewing tussen die normale somergraad-bindstof en die klip te verkry. As die werk met sukses in die koue seisoen gedoen kan word, sou padowerhede beter in staat wees om hulle jaarlikse instandhoudingsprogram op te stel, en die moontlikheid om dwarsdeur die jaar te werk, sou dan ook lei tot 'n groot besparing in masjienhuurkoste en man-ure.

Een proefoppervlak is gelê om herseëlingsmetodes in koue weer te ondersoek, en 'n voorlopige verslag is gepublisee. Die resultate van hierdie eksperiment toon dat die eenvoudigste metode om bevredigende verseëlings in koue weer te verkry, is om 'n vloei-bitumen in plaas van die gewone 150/200 graad materiaal te gebruik. 'n M.C.5 graad bitumen het 'n bevredigende verseëling gegee toe die padtemperatuur 14°C (57°F) was. Waarnemings t.o.v. hierdie eksperiment word nog steeds voortgesit.

Werkverrigting van Bindstofsproeiers

Aangesien die grootste deel van die paaie met bitumineuse bolaag in die Unie gebou en in stand gehou word deur middel van oppervlakbehandeling met meganiese bindstofsproeiers, het die navorsing hom veral toegelê op die ontwikkeling van metodes om sulke sproeiers te toets en hulle werkverrigting te verbeter. Tensy die sproeier 'n egalige laag bindstof van vasgestelde dikte op die pad sproei, sal 'n duursame oppervlak nouliks verkry word. Metodes om sproeiers te toets, is in samewerking met die Transvaalse Paaiedepartement ontwikkel. Hierdie Provinsie het nou ook 'n stelsel aanvaar waarvolgens hulle sproeiers gereeld gekontroleer en in stand gehou word. Die ander Provinsies is tans besig om toetsapparate te installeer.

'n Apparaat om die werkverrigting van enkel sproei-mondstukke en 'n klein aantal mondstukke te toets, is gebou en daar sal binnekort met 'n ondersoek na die mondstukwerkverrigting begin word.

Klipgehalte vir Bitumineuse Oppervlakke

In die verlede was die gehalte van die klip wat vir bitumineuse oppervlakke verskaf is dikwels swak veral wat betref grootte, stofinhoud en wisselvallighede in die voorraadposisie. Die gebruik van sulke klip het ongetwyfeld die lewensduur van baie bitumineuse oppervlakke verkort veral in die geval van enkelbehandelings vir herseëling. Op grond van vertoë van die Instituut, het die Suid-Afrikaanse Buro van Standaarde besluit om 'n nasionale spesifikasie vir enkelgrootte padklip op te stel as die eerste maatreef in 'n poging om padklipgehalte te verbeter.

normal, summer grade binder and the stone when the road temperature is low. If work could be successfully done in the cold season, road authorities would be better able to plan maintenance programmes and 'round the year' work should lead to a large saving in plant hire costs and 'man-hours' working time.

One road experiment has been laid to investigate methods for resealing in cold weather and an interim report on this experiment has been published. The results of this experiment indicate that the simplest method for obtaining satisfactory seals in cold weather is to use a cut-back type bitumen instead of the normal 150/200 grade material. An M.C.5 grade bitumen gave a satisfactory seal when the road temperature was +14°C (57°F). This experiment is being kept under observation.

Performance of Binder Distributors

Since the bulk of the mileage of bituminous surfacing in the Union is built and maintained by the surface-dressing treatment method using binder sprayed from a mechanical distributor, considerable attention has been given to methods for testing such distributors and improving their performance. Unless the distributor sprays an even film of binder of controlled thickness on to the road a durable surfacing is unlikely to be obtained. Methods of testing distributors have been developed in co-operation with the Transvaal Roads Department) and this province now has a regular system for checking and maintaining its machines. The other three provinces are now installing testing equipment.

An apparatus to investigate the behaviour of single distributor jets and a small number of jets has been constructed and an investigation of jet performance is being started.

Quality of Stone for Bituminous Surfacing

In the past, the quality of the stone provided for bituminous surfacing has very often been poor, particularly with regard to size, dust content and variability of supply. The use of such stone has undoubtedly reduced the life of many bituminous surfacings, particularly the single dressings used for resealing. Following representations from the Institute, the South African Bureau of Standards has decided to formulate a national specification for single sized roadstone as a first step in an attempt to improve quality.

Stabiliteit van Bindstowwe gedurende Warm Opberging

Bitumeneuse bindstowwe word dikwels in dromme gelewer wat ter plaatse genoegsaam verhit word sodat die bindstof na 'n veldverhitter oorgeplaas kan word waar die temperatuur van die materiaal na die vereiste hittegraad vir sproeiing of vermenging verhoog kan word. Daar word nog gesoek na gegewens oor die toestande waaronder 'n bindstof in 'n verwarmer opgeberg kan word sodat die viskositeit nie in 'n noemenswaardige mate toeneem nie. 'n Ondersoek is 'n jaar of twee gelede begin om maatstawwe vir veilige opberging onder sulke omstandighede vas te stel. 'n Model van 'n verhittingstenk is gebou om opbergingstoestande op die terrein na te boots en nege verskillende bindstowwe, wat die soorte en grade dek wat gewoonweg in die Unie gebruik word, is reeds getoets. Uit hierdie gegewens is maksimum temperatuur vir veilige opberging op die basis van 'n willekeurige toelaatbare verhoging in viskositeit bereken. Die resultate van hierdie ondersoek word vir publikasie in die vorm van 'n bulletin voorberei.

GRONDMEGANIKA EN PADFONDAMENTE

Elastiese Defleksie van Padfondamente

Tot onlangs is baie min aandag geskenk aan die momentele (elastiese) defleksie van 'n padoppervlak onder bewegende verkeer en die ontwerp van paaië was grotendeels gebaseer op oorwegings in verband met die drasterkte van die grondlae in 'n padfondament. Onlangse ontwikkelings oorsee het die belangrikheid van hierdie verskynsel beklemtoon, maar baie ingenieurs is nie bewus van die implikasies hiervan op die ontwerp van buigsame padfondamente nie. Verskeie gevalle van swigting of barsing van 'n padoppervlak is hier te lande ondersoek en defleksiebepalings ter plase het die belangrikheid van hierdie buigsameheidsfaktor aangetoon.

'n Aantal swigtings op een van die ouer nasionale paaië, wat ongeveer sewentien jaar gelede bedek is, is bestudeer deur gebruik te maak van die Benkelman-balktegniek (die oorspronklike apparaat is ontwerp deur A. C. Benkelman van die „Bureau of Public Roads”, V.S.A.). Die metode bestaan daaruit om een punt van 'n lang dun draaibare aluminiumbalk tussen die dubbelwiele van 'n swaar vragmotor te plaas. Die een punt van die balk, wat op die padoppervlak rus, word deur die nadering van die wiele beïnvloed en dié punt se beweging word by die ander punt gemeet.

Stability of Binders when Stored Hot

Bituminous road binders are often supplied in drums which are heated on site sufficiently to transfer the binder to a field heating kettle where the temperature of the bulk material is then raised to that required for spraying or mixing. Information is required on the conditions under which a binder can be stored hot in a heating kettle so that its viscosity does not increase significantly, and an investigation was started a year or two ago to establish criteria for safe storage under such conditions. A model heating tank was constructed to simulate storage conditions in the field and nine different binders, representative of the types and grades commonly used in the Union, have now been tested in it. From the data obtained, maximum temperatures for safe storage have been calculated, an arbitrary permissible increase in viscosity being assumed. The results of this work are being prepared for publication as a bulletin.

SOIL MECHANICS AND ROAD FOUNDATIONS

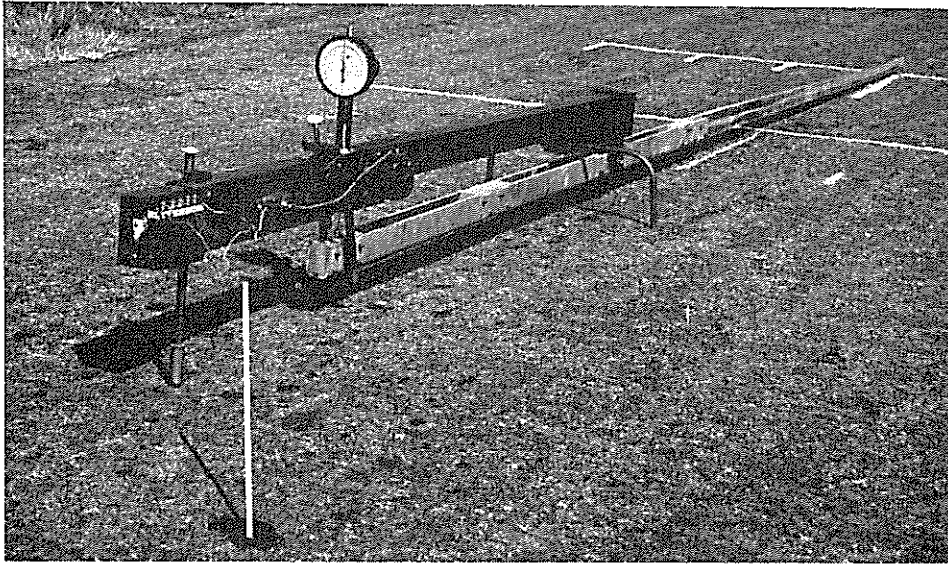
Elastic Deflection of Road Foundations

Until recently, little attention was paid to the instantaneous (elastic) deflection of a road surface under moving traffic and road design was based largely on considerations of the bearing strength of the soil layers in a road foundation. Recent developments overseas have emphasized the importance of this phenomenon, but many engineers are not aware of its implications in flexible pavement design. Several instances of failure or cracking of a road surface have been investigated in this country and deflection measurements on site have indicated the importance of this flexibility factor.

A number of failures on one of the older national roads, which had been surfaced about seventeen years ago, were studied using the “Benkelman Beam” technique (the original apparatus was designed by A. C. Benkelman of the Bureau of Public Roads, U.S.A.). The method consists of inserting one end of a long thin pivoted aluminium beam between the dual wheels of a heavy truck. One end of the beam, resting on the road surface, is affected by the approach of the wheels and its movement is measured at the other

Die apparaat word in Figuur 4 afgebeeld. Die padstruktuur bestaan oor die algemeen uit verskeie oppervlakbehandelings van 'n basiese laag gruis klip van 5 dm. dikte wat op 'n fondament van 5 dm. dikte lê en

end. The apparatus is shown in Figure 4. In general, the road structure consisted of several surface dressings on a 5 in. crushed stone base-course, overlying a 5 in. subbase and other selected material which together



FIGUUR 4

Die Benkelman-straalapparaat wat gebruik word om die defleksie van 'n pad onder stadig bewegende swaar wielbelasting te meet

FIGUUR 4

The Benkelman Beam apparatus used for measuring deflection of a road under slowly moving heavy wheel loads

ander uitgesoekte materiaal wat tesame tenminste 'n bedekking van 18 dm. oor die swart kleiformasie (algemeen bekend as „Swart turf”) vorm. Die resultate van hierdie werk is opgesom in Tabel 3 wat 'n korrelasie aantoon tussen die toestand van die padoppervlak en die defleksie wat onder 'n asbelasting van 12,000 pd. gemeet is.

made up at least 18 in. cover over a black clay foundation (commonly known as “swart turf”). The results of this work are summarised in Table 3 which shows a correlation between the condition of the road surface and the deflection measured under a 12,000 lb. axle load.

TABEL 3

Toestand van padoppervlak en verwante defleksie

| Toestand van padoppervlak (Verskeie oppervlakbehandelings) | Maks. defleksie vir 12,000 pd. asbelasting |
|---|---|
| Baie goed—geen barste | 0–.005 dm. |
| Goed—ligte barste | .005”–.015 dm. |
| Medium—„Krokodilbarsing” | .015”–.050 dm. |
| Swak—Verbrokkel | .050”–.150 dm. |

TABLE 3

Condition of road surface and associated deflection

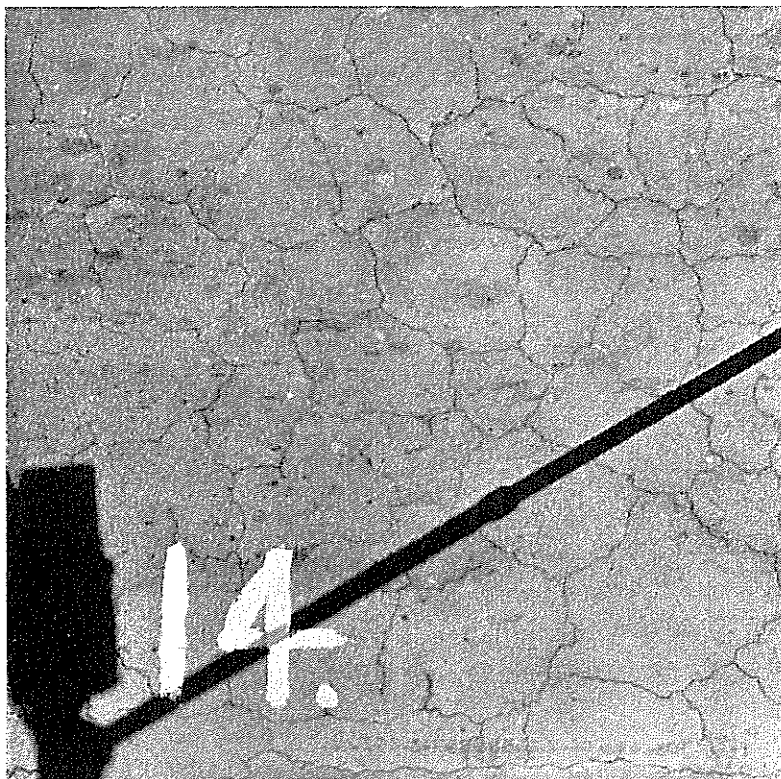
| Condition of road surface (Several surface dressings) | Maximum deflection for 12,000 lb. axle load |
|--|--|
| | <i>inch</i> |
| Very good—no cracks | 0–.005 |
| Good—slight cracks . . | .005–.015 |
| Medium—“Crocodile cracking” | .015–.050 |
| Bad—breaking up | .050–.150 |

'n Ander pad wat meer onlangs gebou is, het vir 'n aantal jare tekens getoon van buitengewone oppervlakbarsing sonder ernstige vormverandering en daar is gemeen dat oorgangsdefleksies onder swaar wielbelasting die oorsaak van die barsing was. Metings het aangetoon dat krokodilbarsing van die voorafgemengde bedekking $1\frac{1}{4}$ dm. in die algemeen meesal toegeskryf kan word op herstelbare defleksies van meer as 0.030 dm. onder 'n asbelasting van 10,000 pd.

Die krokodilbarsingspatroon sonder vormverandering kan feitlik altyd toegeskryf word aan oorbelasting van die oppervlak; 'n tipiese geval hiervan word

Another road constructed more recently has, for some years, been showing signs of excessive surface cracking without serious loss of shape, and it was thought that transient deflections under heavy wheel loads were the cause of the cracking. Measurements showed that, in general, "crocodile cracking" of the $1\frac{1}{4}$ in. premix surfacing was associated with recoverable deflections of more than 0.030 in. under a 10,000 lb. axle load.

The pattern of "crocodile cracking" without loss of shape can nearly always be ascribed to overstraining of the surface and a typical case is shown in Figure 5,



FIGUUR 5

Kenmerkende „krokodil“-kraakvorming in 'n voorafgemengde bolaag as gevolg van herhaaldelike defleksie onder verkeersbelasting

FIGURE 5

Typical "crocodile" cracking of a premix surfacing caused by repeated deflection under traffic

in Figuur 5 aangetoon; die grootte van die gebied wat op die foto verskyn, is 30 dm. in vierkant. Tipiese defleksie-opmetings wat naby hierdie spesifieke gebied gedoen is, word weergegee deur kurwe B in Figuur 6. Kurwe A word geassosieer met die „goeie” toestand van Tabel 3 en kurwe C met die „swak” toestand.

the size of the area shown in the photograph being 30 in. square. Typical deflection measurements made near this particular area are shown by Curve B in Figure 6. Curve A is associated with the 'good' condition of Table 3 and Curve C with the 'bad' condition.

Verdere navorsing word onderneem om 'n metode te vind om te voorspel watter subgrade geneig is om moeilikhede te veroorsaak as gevolg van hoë elastiese deformatsie en ook om maniere te vind om groter buigsamheid in die bedekking of groter styfheid in die fondament te weeg te bring.

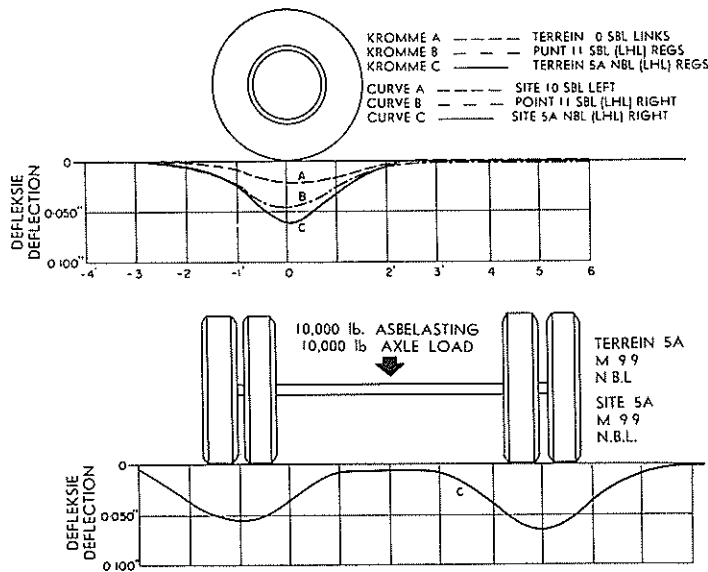
Gebruik van verweerde Rotse

Hoe om goeie materiale vir padfondamente te vind en om die bes moontlike gebruik van plaaslike materiale te maak, is een van die belangrikste probleme waarvoor die padingenieur te staan kom. 'n Belangrike

Further research is being undertaken to find a means of predicting which subgrades are liable to cause difficulties due to high elastic deformation and also to find ways of providing greater flexibility in the surfacing or greater stiffness in the foundation.

Use of Weathered Rocks

Finding good materials for road foundation making the best possible use of local materials is one of the most important problems facing the road engineer. In this connection, an important project on the research



FIGUUR 6
Kenmerkende defleksiepatrone soos geweef onder 'n wielbelasting van 5,000 lb

FIGURE 6
Typical shapes of deflection measured under 5,000 lb wheel load

projek in hierdie verband op die navorsingsprogram is gemoed met die gebruik van verweerde rotse vir padfondamente en dek 'n wye veld van navorsing sowel t.o.v. die beskikbaarheid van materiale as van hulle gebruikswyse. Aan die begin is daar gekonsentreer op doleriete, aangesien hierdie rotse dwarsdeur die Unie voorkom en algemeen gebruik word in die verskillende lae van 'n padfondament. Die padwerkverrigting van hierdie dolerietgruis verskil in verskillende dele van die land en die roetinetoetse wat gewoonlik gebruik word, is nie altyd suksesvol wat die versekering van die keuse van goeie materiaal betref nie. Die verskille tussen materiale soos aangetoon deur toetsresultate verkry by die bepaling van die

programme is concerned with the use of weathered rocks for road foundations and includes a wide field of research on both the occurrence of materials and their usage. Initial work has so far been concentrated on dolerites, as these rocks have a wide distribution throughout the Union and are commonly used in the various layers of a road foundation. The engineering performance of these dolerite gravels varies in different parts of the country and the routine tests normally employed are not always successful in ensuring the selection of sound material. The differences between materials, as indicated by results of tests for the Liquid Limit and Plasticity Index, have been compared with

vloestofgrens en plastisiteitsindeks, is met klimaats-toestande in die somer-reënvalstreke van die land vergelyk.

Uitvoerige klimaatsondersoeke is aanvanklik onderneem vir die Oranje-Vrystaat, maar is nou uitgebrei om die hele Unie te dek behalwe die winter-reënvalstreke. Die resultate vir die Oranje-Vrystaat het die bestaan van 'n klimaatsgrens aangetoon wat verskillende toestande van die materiaal verdeel wat ooreenstem met die bekende grens in werkverrigting van die dolerietgruis, en wat ook verband toon met die streeksverspreiding van die verskillende soorte grondkleimineraal. Die klimaatsondersoeke het o.a. bestaan uit 'n studie van neerslag, verdamping van 'n vrywateroppervlak, die verhouding van verdamping tot neerslag, relatiewe voggehalte, temperatuur en windsnelheid. Die gegewens vir Januarie en Julie is apart oorweeg. Die klimaatstoestande gedurende die nag is ook bestudeer aangesien die invloed van water op die verandering van rotse meer betekenisvol sou kan wees by vermindering van verdamping. Al hierdie studies het aan die lig gebring dat daar 'n grenslyn is wat strek vanaf die kus naby Port Alfred, deur Bloemfontein en Rustenburg, en wat onduidelik word in sy noordelike verlenging na Messina.

Volgens alle bronne het dit verder duidelik geblyk dat slegs die klimaatsfaktore wat betrekking het op water, en ook slegs dié wat direk saamhang met die reënseisoen (waardes vir Januarie) ooreengestem het met die grenslyn wat empiries vasgestel is volgens die „goeie” of „swak” tegniese werkverrigting van dolerietgruis. Om 'n sekere kwalitatiewe verdeling te verkry, is die drie faktore verdamping, neerslag en die *verdamping*-verhouding neerslag vir die nag vir Januarie en Julie afsonderlik behandel. Aan hierdie faktore is sekere kritiese grense toegeskryf en 'n numeriese waarde van 1 is aangeneem toe daar gemeen is dat die toestand 'n merkbare invloed op verwerking sou hê, en 'n waarde van 0 toe daar gemeen is dat potensieel goeie toestande verwag kan word. Deur hierdie waardes op te tel, kon enige totaal van 0 tot 6 vasgestel word vir enige plek in die Unie en daar is gevind dat hoe hoër die syfer was, hoe groter was die ongunstige invloed van klimaat op dolerietmateriaal en hoe duideliker die chemiese verwerking. Die verspreiding van hierdie waardes word in Figuur 7 aangetoon en die klimaatsgrens word aangedui deur die gebied van die waarde 3. Die oostelike grens van die winterreënvalstreek in die Kaap word ook aangetoon maar die betekenis van hierdie waarde in verhouding met dié van die somerreënvalstreek is tot nog toe onseker.

Parallel met hierdie streekstudies, is 'n ondersoek begin om vars en verweerde dolerietmonsters onder die mikroskoop te bestudeer. Figuur 7 toon die lyne aan waarlangs rotsmonsters versamel is. Die uiterlike- indruk van „vars” of „verweerd” skyn deur verskeie verhoudings gestaaf te word wat uit die persentasies

climatic conditions in the summer rainfall areas of the country.

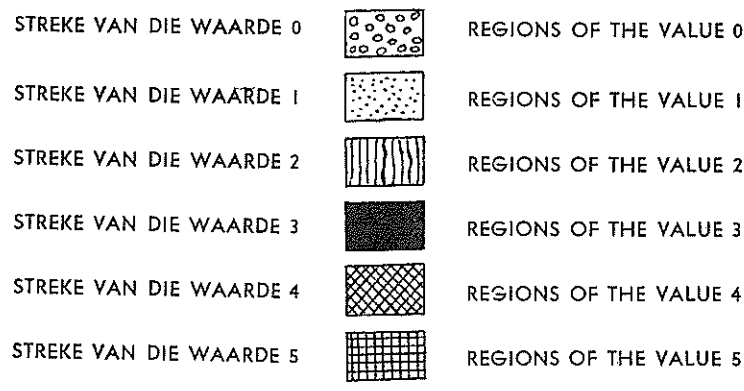
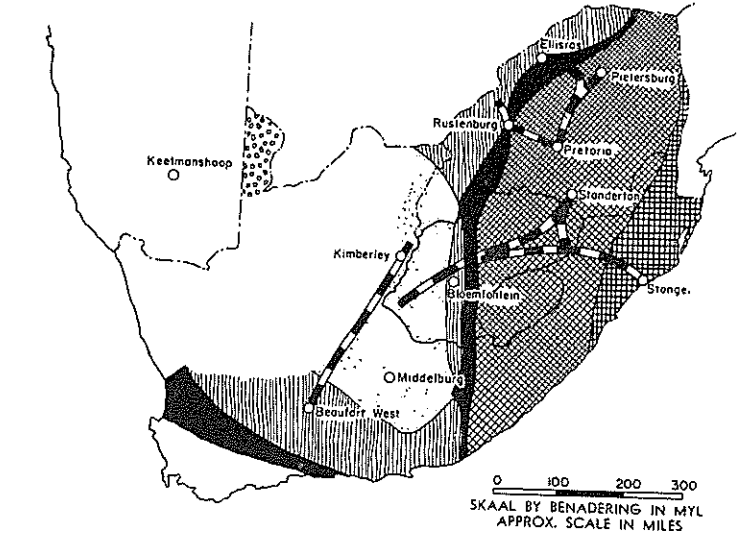
Detailed climatic investigations were undertaken initially for the Orange Free State, but are now being extended to cover the whole Union except for the winter rainfall areas. The results for the Orange Free State have shown the existence of a climatic boundary separating different conditions of the material which coincides with the known difference in performance of the dolerite gravels, as well as showing a relationship with the regional distribution of the various types of soil clay minerals. The climatic investigations involved study of precipitation, evaporation from a free-water surface, the ratio of evaporation to precipitation, relative humidity, temperature and wind speed. Data for January and July were considered separately. The climatic conditions during darkness were also studied since the influence of water on the alteration of rocks might be more significant if evaporation was reduced. All these studies pointed to a boundary extending from the coast near Port Alfred, through Bloemfontein and Rustenburg and becoming ill-defined in its northern continuation towards Messina.

Further, the indication from all sources showed clearly that only climatic factors concerned with water, and only those directly connected with the rainy season (January values), agreed with the boundary determined by experience of the “good” or “bad” engineering performance of dolerite gravels. To obtain some qualitative division, the three factors of evaporation, precipitation and evaporation/precipitation ratio during darkness were considered separately for January and July. Certain critical limits were ascribed to these factors and a numerical value of 1 was allocated when it was thought that the condition would have a marked influence on weathering, and a value of 0 when it was thought that potentially good conditions could be expected. Adding these values, any total from 0 to 6 could be determined for any place in the Union—the higher the figure, the greater the unfavourable effect of climate on doleritic material and the more pronounced the chemical weathering. The distribution of these values is shown in Figure 7 and the climatic boundary is represented by the region of the value 3. The eastern boundary of the winter rainfall area in the Cape is also shown up but the significance of this value in comparison with that in the summer rainfall area is uncertain as yet.

Parallel with these regional studies, an investigation has been initiated to study fresh and weathered dolerite samples under the microscope. Figure 7 indicates the lines along which rock samples have been collected. The visual impression of “fresh” or “weathered” seems to be supported by several ratios calculated from the percentages of primary minerals, such as plagioclase,

primêre minerale, soos plagioklaas, amfibool, pirokseen en olivien, en sekondêre elemente soos serpentyn, chloriet en kleiminerale bereken is. 'n Doleriet gee byvoorbeeld die indruk dat dit vars is as die persentasie sekondêre minerale nie ongeveer 25 persent oorskry nie en as die som van die persentasies mafiese minerale hoër as die persentasies sekondêre minerale is.

amphibole, pyroxene and olivine, and secondary constituents such as serpentine, chlorite and clay minerals. For instance, a dolerite gives the impression of being fresh if the percentage of secondary minerals does not exceed about 25 per cent and if the sum of the percentages of mafic minerals is higher than the percentages of secondary minerals.



LYNE WAARLANGS ROTSMONSTERS VERSAMEL IS



LINES ALONG WHICH ROCK SAMPLES WERE COLLECTED

FIGUUR 7
Berekening van neerslag, verdamping en die verdamping/neerslagverhouding gedurende die nag

FIGURE 7
Evaluation of precipitation, evaporation and evaporation/precipitation ratios during the night hours

Studies in verband met Vog onder Paaie

Die voorspelling van voglobeweging onder strukture is veral belangrik in hierdie land waar sulke groot dele grond as gevolg van die algemeen droë klimaat in die beginstadium van uitdroging verkeer. 'n Verandering in voginhoud sal 'n verandering in die sterkte van die grondlae in 'n padfondament beteken, of moontlik 'n verandering in volume van die onderliggende kleisoorte wat sulke groot gebiede van die Unie dek. Hierdie uitsettende kleisoorte kan ernstige skade aan geboue veroorsaak en kan ook tot ernstige barsing van paaie lei deur oppervlakkbewegings teweeg te bring.

Verskeie veldterreine is gekies in gebiede waar dit bekend is dat uitsettende klei bestaan. Die vertikale bewegings van rondpuntpenne in die grondoppervlak is met tussenposes van twee maande met behulp van 'n waterpas wat tot 1/100 cm. noukeurig afgelees kan word, waargeneem. In die hoëveldstreek met somerreënval stem die padbewegingspatroon grootliks ooreen met dié van huise en dit skyn asof daar 'n aanhoudende uitsetting plaasvind met 'n effense seisoensvariasie tot dat die ewewig bereik is. Geleidelike natwording van die grondprofiel onder 'n bedekte gebied vind plaas. Die totale vertikale beweging kan meer as 7 cm. beloop. In 'n winterreënvalstreek soos bv. Kaapstad, verloop die beweging in die vorm van 'n seisoensiklus met 'n totale beweging van ongeveer 2.5 cm., sonder 'n neiging om 'n finale ewewigstoestand te bereik.

Die soort werkverrigting wat genoem is, het in die hoëveld ernstige probleme in verband met die onderhoud van paaie veroorsaak en in baie gevalle moes duikerpype verwyder en op 'n laer vlak teruggeplaas word aangesien dit die verkeer belemmer het. 'n Eksperiment met voorbenatting van die grondprofiel tot 'n sekere diepte by 'n duikwegpunt, is voordat die pad gebou word, op een plek in die Oranje-Vrystaat onderneem. Boorgate is by 5 vt. sentrums oor die pad geboor en met water gevul gehou, terwyl oppervlaktes met tussenpose waargeneem is, soos in Figuur 8 aangetoon word. Met hierdie werk word beoog om die versnelling van die tempo van ewewigsbereiking te verhaas voordat daar met die finale bouwerkzaamhede begin word. Meer fundamentele werk in hierdie verband is aan die gang.

Werkverrigting van nie-versadigde Grondsoorte onder Spanning

In die studie in verband met die skuifsterkte van nie-versadigde grondsoorte is laboratoriumtoetse uitgevoer om die samehang te bepaal tussen die negatiewe porieëdruk, soos gedefinieer deur 'n effektiewe spanningsvergelyking, en die vogopsuiging van die grond. In die geval van sliksand is daar gevind dat 'n maksimum

Studies of Moisture under Roads

The prediction of moisture movement under structures is particularly important in this country where such large areas of soil are initially in a desiccated condition, owing to the generally dry climate. A change in moisture content will mean a change in strength of the soil layers in a road foundation, or perhaps a change in volume of the underlying clays which cover such large areas of the Union. These expansive clays can cause severe damage to buildings and can also lead to severe cracking of roads by producing differential movements.

Several field sites have been selected in areas where expansive clay is known to exist and the vertical movements of round-headed pegs in the road surface have been observed at two-monthly intervals with the aid of a precise level reading to 1/100 cm. In the highveld area with summer rainfall, the pattern of movement is very similar to that of houses and there appears to be a continual heave with very slight seasonal variation until an equilibrium is reached. A gradual wetting up of the soil profile under a covered area takes place. The total vertical movement may amount to over 7 cms. In a winter rainfall area, Cape Town, the type of movement is in the form of a seasonal cycle with a total movement of about 2.5 cms., with no tendency to give a final equilibrium condition.

The type of behaviour mentioned in the highveld has caused serious maintenance problems on roads and in many cases pipe culverts have had to be removed and replaced at a lower level because of the obstruction caused to traffic. An experiment in pre-wetting the soil profile to some depth at a culvert site, prior to construction of the road, was undertaken at one locality in the Orange Free State. Auger holes were drilled at 5 ft. centres across the roadway and kept filled with water while levels were observed at intervals, as indicated in Figure 8. This work is aimed at acceleration of the rate of attainment of equilibrium prior to final construction and further more fundamental work is in progress.

Behaviour of Non-saturated Soils under Stress

In the study of the shear strength of non-saturated soils, laboratory tests have been carried out to find the relationship between the negative pore pressure, as defined by an effective stress equation, and the soil moisture suction. For the case of silty sands it was

waarde van negatiewe porieëdruk verkry is en dat gevolglik slegs 'n sekere speelruimte van sterkte moontlik is met hierdie materiale.

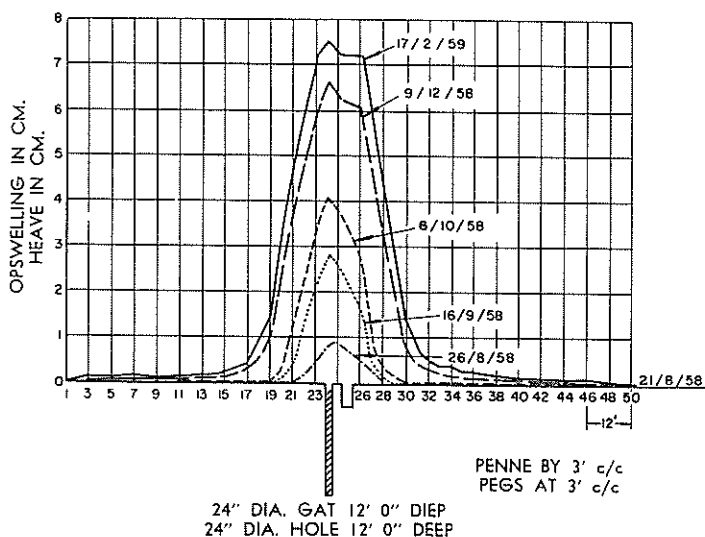
Grondstabilisasie

Navorsing op 'n klein skaal is nou begin in verband met die stabilisasie van grondsoorte deur die byvoeging van sekere materiale soos sement, kalk, vlieg-as of

found that a maximum value of negative pore pressure was obtained and consequently only a certain range of strength is possible with these materials.

Soil Stabilization

Some research has now been started in connection with the stabilisation of soils by the addition of such materials as cement, lime, fly-ash or bitumen. Initial



FIGUUR 8

Opswelling as gevolg van vooraf-benetting van die vloedwaterpyp-omgewing by Merino, O.V.S.

FIGURE 8

Heave resulting from pre-wetting of culvert site at Merino, O.F.S.

bitumen. Werk is aanvanklik in die laboratorium gedoen om verdigtingseienskappe en drawaardes te bestudeer; sterkte- en veldtoetse word nou beplan.

Grondkartering met behulp van Lugfotos

'n Projek waarby grondkaarte met behulp van lugfotos gemaak word, is in samewerking met die Landmetingsdepartement van die Universiteit van die Witwatersrand en 'n firma van konsultingenieurs-engeoloë onderneem. 'n Begin is gemaak met die voorbereiding van 'n ingenieursgrondkaart van 'n 20 myl lange streek tussen Howick en Nottingham Road. 'n Topografiese kaart van die gebied word tans geteken en die lugfotos word geologies geïnterpreteer deur gebruik te maak van 'n bespiedingstereoskoop; die finale kaart sal op 'n skaal van 1:18,000 wees. Daar

work has been done in the laboratory to study compaction characteristics and bearing values, strength tests and field tests are now being planned.

Soil Mapping from Air Photos

A project involving soil mapping from air photos has been undertaken with the assistance of the Survey Department of the University of the Witwatersrand and a firm of consulting engineers and geologists. A start has been made on the preparation of an engineering soil map of a 20 mile stretch of country between Howick and Nottingham Road. The preparation of a topographical map of the area and the geological interpretation of the air photos, using a scanning stereoscope, are now being done to produce a final map to a scale

word gehoop dat die inligting gebruik sal kan word vir die bepaling van die ligging van die nuwe pad, vir die keuse van geskikte fondamentmateriale en vir die ontwerp van die fondament.

SPESIALE PROBLEME EN TEGNIEKE

Visko-elastiese Eienskappe van Bitumens

Terwyl dit algemeen bekend is dat bitumeneuse bindlae ten gevolge van brosheid en meganiese faktore in 'n pad swig onder snelle verkeersbelastingstoestande en veral by lae padtemperatuur, word die meganisme van hierdie brosswigting nog nie goed begryp nie. Aangesien die bepaling van die viskosititeit by konstante skuifsnelheid van verweerde bindstowwe nie die verlangde resultate gegee het nie, is 'n ondersoek 'n paar jaar gelede begin om die elastiese eienskappe van bitumens onder snelbelastingstoestande te bepaal. Die einddoel hiervan was om die elastiese en visko-elastiese eienskappe uiteindelik met die swigting van die materiaal in verband te bring.

'n Metode om die elastiese modulus sowel as die samehangende dempingsviskosititeit van 'n klein monster bitumen onder vibrasietoestande te bepaal, is met sukses ontwikkel. Die toets bestaan uit die vibrasie van 'n ingeklemde staaiveertjie waarop 'n dun laagie toetsmateriaal aangebring is. Met behulp van hierdie apparaat kon bepalinge oor 'n frekwensiegebied van 30 Hz tot 1000 Hz gedoen word by temperature tussen -5°C en 30°C . Die veer wat die toetslaag dra, is met behulp van 'n sinusgolfosillator in gedwonge trilling aangedryf. Van die resonante frekwensie en die wydte van die resonansiekurve kan die twee komponente (E_1 en E_2) van die visko-elastiese modulus bereken word. Die komplekse modulus (E^*) van 'n bitumen kan by 'n gegewe temperatuur en frekwensie soos volg voorgestel word:

$$E^* = E_1 + iE_2$$

waar E_1 en E_2 in die algemeen beide van frekwensie en temperatuur afhanklik is. E_1 is die gewone modulus van Young van die bitumen en $E_2 = \omega\eta$ is die ooreenstemmende dissipasiemodulus waarby die hoekfrekwensie en η die dempingsviskosititeit is.

Waardes van die twee parameters E_1 en E_2 is oor 'n frekwensie- en temperatuurgebied bepaal vir sewe verskillende tipiese bitumeneuse bindstowwe, insluitende 'n verweerde materiaal wat uit 'n padbolaag verkry is. Hierdie resultate, tesame met 'n omvattende weergawe van die teorie en die eksperimentele tegniek van die metode is onlangs gepubliseer en 'n voorlopige meritiesyfer vir 'n bindstof is as 'n funksie van E_1 en E_2 voorgestel. Meritiesyferresultate vir verskillende bitumens en tere word in Figuur 9 aangetoon. Aangesien

of 1:18,000. It is hoped that the information will be of use for the location of the new road, for the selection of suitable foundation materials, and for the design of the foundation.

SPECIAL PROBLEMS AND TECHNIQUES

Visco-elastic Properties of Bitumens

While it is generally known that mechanical or brittle failure of binder films in service on the road occurs under the rapid loading imposed by moving traffic, and especially at low road temperatures, the mechanism of this brittle failure is still not properly understood. As measurements of ordinary static viscosity of weathered binders did not prove very useful, an investigation was started some years ago into the elastic properties of bitumens under rapid loading on the assumption that elastic and visco-elastic properties could later be related to the conditions for fracture of the material.

A method of measuring the elastic modulus and associated damping viscosity of a small sample of a bitumen or tan under vibration has been developed successfully and consists of supporting a film of the test material on a thin steel blade which is vibrated as a cantilever. The apparatus permits measurements to be made over a frequency range of 30 to 1000 cycles/sec. and a temperature range of -5° to 30°C . The blade carrying the test film is driven in forced vibration by an electromagnetic driver operating from a sinusoidal signal generator and, from the resonant frequency and spread of the resonance curve, the two components (E_1 and E_2) of the visco-elastic modulus can be calculated. The complex modulus (E^*) of a bitumen can be represented at a given temperature and frequency by:

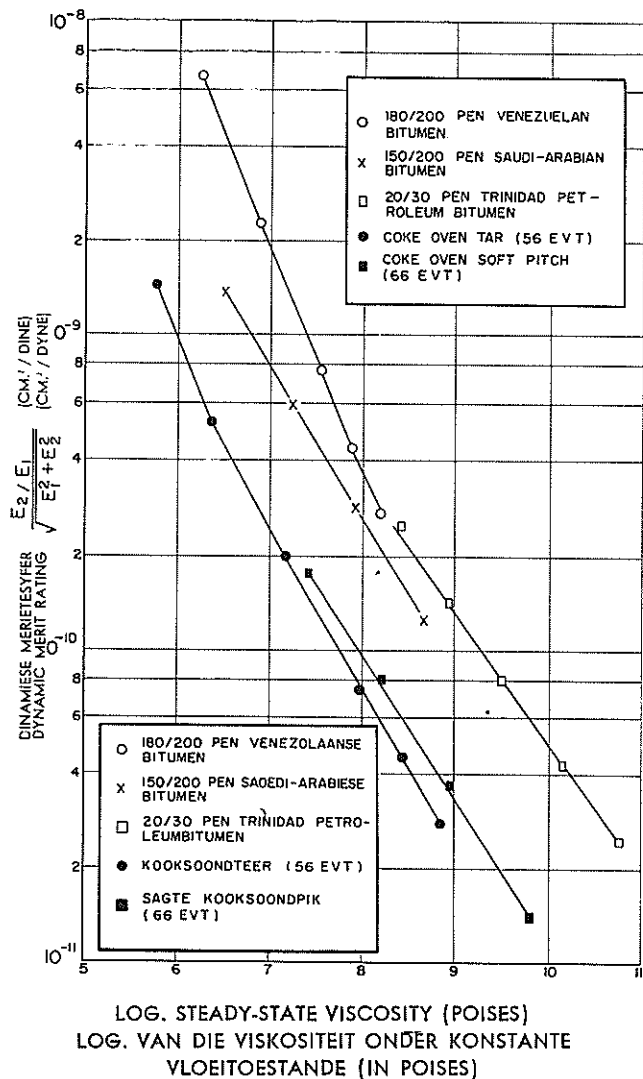
$$E^* = E_1 + iE_2$$

where E_1 and E_2 are generally both frequency and temperature dependent. E_1 is the ordinary Young's Modulus of the bitumen and $E_2 = \omega\eta$ is an associated dissipative modulus where ω is the (circular) frequency and η the damping viscosity.

Values of the two parameters E_1 and E_2 have been determined over a range of frequency and temperature for seven different typical bituminous binders, including a weathered material extracted from a road surface. These results together with a detailed account of the theory of the method and of the experimental procedure have been recently published and a tentative "merit rating" of a binder as a function of E_1 and E_2 has been suggested. Figure 9 gives some results obtained for this merit rating for various bitumens and

die merietesfer op sigself 'n funksie van penetrasie en viskositeit is, word die gegewens as 'n funksie van die viskositeit by konstante skuifnelheid aangegee met die doel om die intrinsieke verskille tussen die verskillende klasse van materiale aan te toon.

tars. Since the merit rating is itself a function of the penetration or viscosity grade of the binder, the data presented is shown plotted against the ordinary static viscosity of the materials so as to reveal intrinsic differences between different classes of material.



FIGUUR 9

Grafiek van die dinamiese merietesfer gebaseer op die visko-elastiese eienskappe van verskillende tere en bitumens

FIGURE 9

Graph of tentative merit rating based on visco-elastic properties of various tars and bitumens

Vog- en digtheidsbepalings met Isotope

By die beheer van die bou van paaie sowel as in ander bouwerkzaamhede bestaan daar 'n behoefte vir 'n betroubare en snelle metode vir die bepaling van die

Moisture and Density Determinations with Isotopes

In the control of road construction, as well as in other civil engineering works, there is a need for a rapid and reliable method for the determination of the moisture

voggehalte en digtheid van gronde en ander padbou-materiale. So 'n tegniek kan aansienlike besparings in die beheer van padbou teweegbring, afgesien van die beter beheer wat verkry kan word. In samewerking met 'n kommersiële firma is 'n draagbare instrument ontwikkel wat vir hierdie doel gebruik kan word. Die eerste prototipemodel wat voltooi is, word tans in betroubaarheids- en kalibrasietoetse gebruik. Wanneer hierdie ondersoek met sukses voltooi is, sal die apparaat komersiële beskikbaar gestel word. Die beginsel van die tegniek is nie oorspronklik nie en soortgelyke apparaat kan ook wel van oorsese firmas verkry word. Laasgenoemde apparate voldoen egter nie aan die behoeftes van Suid-Afrikaanse ingenieurs nie, veral wat betref hulle kragverbruik en draagbaarheid vir veldwerk.

In die bepaling van die hoeveelheid vog in 'n gegewe volume grond, bestaan die tegniek uit die telling van die aantal stadige neutrone wat na 'n geskikte telbuis teruggekaats word wanneer die grond deur 'n bron van vinnige neutrone bestraal word. Die waterstof-atome in die materiaal, wat, sover dit boumateriale betref, hoofsaaklik in water voorkom, vertraag die vinnige neutrone en kaats hulle na die telbuis terug in verhouding tot die waterstofkonsentrasie. Deur kalibrasie word die verhouding tussen die aantal stadige neutrone per eenheidstyd en die voggehalte van die toetsmateriaal vasgestel.

Die totale digtheid van die grond word verkry deur die hoeveelheid gammastrale, wat deur die grond vanaf 'n Kobalt 60-bron na 'n geskikte telbuis teruggekaats word, te meet. In die praktiese digtheidsgebied word gammastrale omgekeerd eweredig aan die digtheid teruggekaats en deur kalibrasie kan die werklike verhouding weer vasgestel word.

Die apparaat bestaan hoofsaaklik uit verskillende sondes, waarmee bepalinge sowel op die oppervlakte asook op dieptes van 'n grondlaag gemaak kan word, en 'n klein draagbare, getransistoriseerde teller met 'n ingeboude 6 volt kragbron. Die vogsonde, wat vir beide oppervlakte- en dieptebepalinge gebruik kan word, bestaan uit 'n staalbuis, 30 duim lank en 1.75 duim in deursnee, wat 'n 10 millicurie radium-beryllium bron, 'n verrykte Boron-trifluoriede telbuis en 'n getransistoriseerde voorversterker bevat. Die digtheidsonde vir bepalinge op die oppervlakte bestaan uit 'n metaalkissie 7" x 14" x 3½" wat ongeveer 30 lb. weeg. Dit bevat aan die een end 'n 15 millicurie Kobalt 60-bron wat deur middel van 'n loodskerm van 'n Geiger-Muller telbuis aan die ander kant beskerm word. Die digtheidsonde vir bepalinge by diepte bestaan uit 'n staalbuis, 24" lank en 1.75" in deursnee. Dieselfde Kobalt 60-bron kan weer aan die een end geïnstalleer word en word dan weer deur 'n loodskerm van die Geiger-Muller telbuis aan die ander end beskerm. Die uitgangsimpulse van beide die vog-

content and density of soils and other road-making materials. Such a method could result in substantial savings in the cost of the control of road building and should also enable better control to be achieved. In collaboration with a commercial firm a portable instrument has been developed which can be used for this purpose. A first prototype model has been completed and is now being used in various tests to establish its field reliability as well as its calibration characteristics. On the successful completion of these investigations the apparatus will be made available commercially. The principle employed is not new and, in fact, apparatus can be purchased overseas but does not meet all the requirements of road engineers in South Africa, particularly in respect of power requirements and portability for field use.

For the determination of the amount of moisture in a given volume of soil the technique consists of counting the number of slow neutrons which are back-scattered to a suitable counter tube when the soil is irradiated by a source of fast neutrons. The hydrogen atoms in the material, which in most civil engineering materials occur almost entirely in water, moderate the fast neutrons and scatter these back to the counter tube in proportion to their concentration. By calibration a relationship can be established between the slow neutron count per unit time and the moisture content of the material under test.

The total density of the soil, on the other hand, is measured by the quantity of gamma-rays which are backscattered by the soil from a cobalt 60 gamma-ray source to a suitable detector. In the practical range of density, gamma-rays are backscattered inversely proportionately to the density, calibration again establishing the actual relationship.

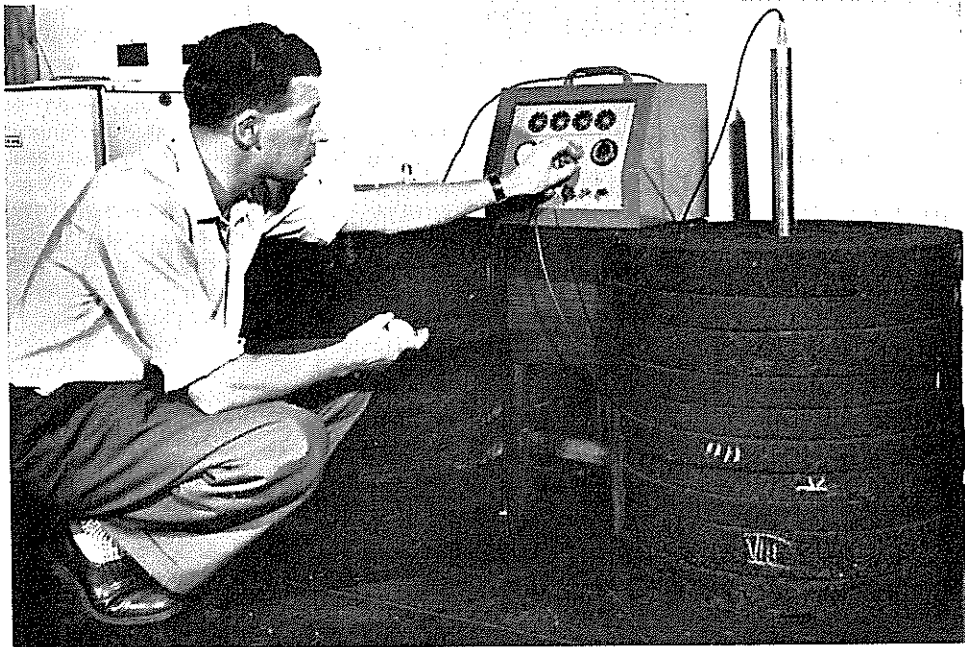
The equipment consists essentially of various probes for measurements on the surface of a soil layer and at depth, and a small portable transistorised counter operating from a self-contained 6 volt power supply. The moisture probe, which can be used both for surface and depth measurements, consists of a steel cylinder 30 inches long and 1.75 inches diameter, containing a 10 millicurie radium-beryllium source, an enriched Boron trifluoride counter tube, and a transistorised pre-amplifier. The surface density probe consists of a metal box measuring 7 in. x 14 in. x 3½ in. weighing about 30 lbs. and containing at one end a 15 millicurie cobalt 60 source, screened by a lead shield from a Geiger Muller counter tube which is transversely attached at the other end. The density probe for depth measurements is housed in a steel cylinder 24 inches long and 1.75 inches diameter accommodating the same cobalt 60 source at one end. A lead plug shields a Geiger Muller counter tube at the other end of the cylinder. The output pulses from the density and

digtheidsondes is van dieselfde orde grootte en word direk in die impulseteller gevoer.

Die teller bestaan uit 'n enkelstapversterker (versterkingsfaktor omtrent 100), 'n impulsonderskeier met veranderbare amplitude, 'n impulsversterker, 'n vyfeenheiddekatronteller en 'n kragbron wat vanaf 'n 6 volt battery gevoer word. Met uitsondering van die dekatroneenhede is die hele teller getransistoriseerd. Die kragbron verskaf al die verlangde potensiale wat in die verskillende afdelings van die apparaat verlang word en gebruik net 1.2 ampère by 6 volts (7.2 watt). Figuur 10 gee 'n algemene indruk van die apparaat.

moisture probes are arranged to be of the same order of amplitude and are fed directly to the pulse counter unit.

The counter consists of a single-stage amplifier (gain approx. 100), a variable amplitude pulse discriminator, a pulse amplifier, a five-stage decatron counter and a power supply fed from a 6 volt battery. With the exception of the decatron units, all the stages in the counter are transistorised. The power supply generates all the necessary voltages for the different parts of the apparatus and requires only 1.2 amps. at 6 volts (7.2 watts). Figure 10 gives a general view of the apparatus.



FIGUUR 10

'n Apparaat wat gebruik maak van radio-isotope om die voginhoud en digtheid van materiale te meet. Die monsters wat in die foto getoon word, is vir verskillende digthede en waterstofinhoude saamgestel en vir kalibrasie gebruik

FIGURE 10

Apparatus using radio isotopes for measuring the moisture content and density of materials. The samples shown in the photograph were made up to different densities and hydrogen content and were used for calibration

Hierdie apparaat word tans in 'n stelselmatige ondersoek gebruik om die afhanklikheid van die volume materiaal te bepaal wat tot die vog- en digtheidstellings bydra, wanneer hulle tussen die praktiese grense gewissel word.

Kragte tussen 'n Motorband en die Pad

As deel van 'n langtermynstudie op die meganisme van die uitrafeling van bitumineuse slytlae, is 'n paar jaar gelede 'n ondersoek begin i.v.m. die oorgangskragte wat deur verkeer op die padoppervlakte uit-

The instrument is at present being used in a systematic investigation of the dependence of the volume of material contributing to the counts on the moisture content and density when these are varied over the full range encountered in practice.

Stresses Between Tyre and Road

As part of a long-term study on the mechanism of ravelling of bituminous wearing surfaces, an investigation was started a few years ago on the transient forces imposed on a road surface by the wheels of moving

ge oefen word. Die bestek van die ondersoek behels die bepaling van die drie kragkomponente (vertikaal, oorlangs en dwars) wat deur die bande van 'n bewegende wiel op 'n geriffelde, ronde, plat knop, 1 vk. duim groot, in die padoppervlakte uitgeoefen word, soos aangetoon in Fig. 11.

Die invloed van verskillende faktore, soos die spoed en versnelling van die voertuig, die bandlugdruk, die wielbelasting en die hoogte van die knop bo die padoppervlakte, is met betrekking tot hierdie kragkomponente bestudeer.

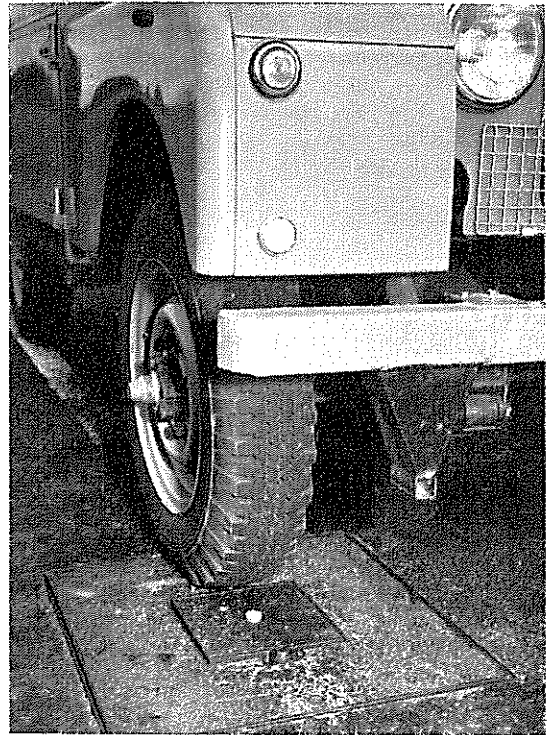
Altesaam is sewe verskillende voertuie gebruik wat dit moontlik gemaak het om die wielbelasting tussen 275 en 5,600 lb. te wissel. Die spoed van die voertuie is tussen 5 en 50 myl per uur gewissel, die bandlugdruk tussen 25 en 100 lb. per vk. dm. en die knophoogte bo die padoppervlakte tussen 0 en 0.22 dm.

Die apparaat bestaan hoofsaaklik uit 'n kis wat in die pad geïnstalleer is en waarmee die kragte geregistreer word, en fotografiese en elektroniese aparate wat in 'n mobiele laboratorium gehuisves is. Die aanwending van statiese of dinamiese kragte op die meetknop in die pad het tot die defleksie van die meganiese veerstelsels wat die meetknop ondersteun, gelei en dié is vervolgens weer in elektriese seine omgesit wat op 'n ossiloskoop-skerm gefotografeer kon word.

Terwyl die vertikale kragkomponent altyd afwaarts gerig is, is die golvorm en seinsterkte van die oorlangse kragkomponent grotendeels afhanklik van die bewegingstoestand van die voertuig. By konstante spoed het laasgenoemde golvorm in die algemeen drie pieke gehad. Die eerste en derde hiervan was altyd teenoor-gestel aan, terwyl die tweede meerendeels in die bewegingsrigting van die voertuig gerig was. Gedurende versnelling van die voertuig het hierdie patroon verander tot een oorwegende piek wat in die tweede helfte van die kragtyd-diagram voorgekom het en wat teenoor-gestel aan die bewegingsrigting van die voertuig gerig was. In die geval van voertuigvertraging was die teenoorgestelde van toepassing. 'n Paar tipiese ossiloskoop-registrasies word in Figuur 12 aangetoon.

Hier volg sommige van die gevolgtrekkings wat uit hierdie werk verkry is:

Die vertikale kragkomponent word hoofsaaklik deur die bandlugdruk beïnvloed, deur die afstand tussen die middellyn van die bandloopvlak en meetknop en deur die hoogte bo die padoppervlakte van die meetknop.



FIGUUR 11

Naby aansig van 'n meetapparaat wat in die pad aan-gebring is om die kragte veroorsaak deur bewegende voer-tuie aan te teken

FIGURE 11

Close-up view of installation in the road to record the forces exerted by moving vehicles

vehicles. The scope of the investigation comprised the measurement of the three force components exerted by the tyre of a moving wheel on a circular serrated flat stud, one square inch in area in the road surface as shown in Figure 11.

The influence on these force components of various factors such as the speed and acceleration of the vehicle, the tyre inflation pressure, the wheel load and the effect of the height to which the stud projected above the road surface was examined.

In all, seven different vehicles were used enabling the wheel load to be varied from 275 lbs. to 5600 lbs. Vehicle speed was varied between 5 and 50 miles per hour, inflation pressure between 25 and 100 lbs./sq. inch and the stud height above the road surface between 0 and 0.22 in.

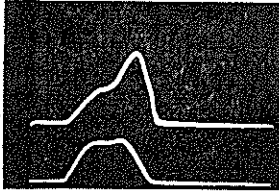
The apparatus consisted essentially of a force recorder box installed in the road and electronic and photographic apparatus housed in a mobile laboratory. The application of static or dynamic forces to the measuring

FIGUUR 12

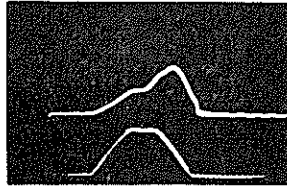
Kenmerkende kragopnames van die agterwiel van 'n middelslag kar. In elke diagram verteenwoordig die boonste traseerlyn die oorlangse kragkomponent terwyl die onderste traseerlyn die loodregte kragkomponent verteenwoordig

FIGURE 12

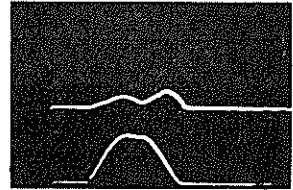
Typical force recordings of the rear wheel of a medium-sized car. In every diagram the upper trace represents the longitudinal force component, the lower trace the vertical force component



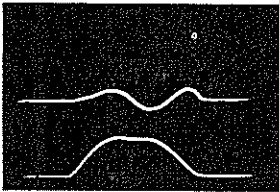
A



B

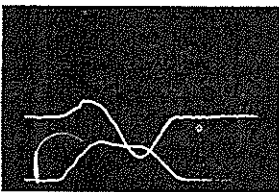


C

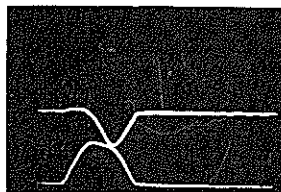


D

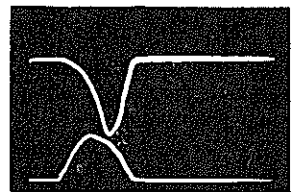
A, B EN C : VERSNELLING
 D EN E : KONSTANTE SNELHEID
 F EN G : VERLANGSAMING
 A, B AND C : ACCELERATION
 D AND E : CONSTANT SPEED
 F AND G : DECELERATION



E



F



G

Kenmerkende kragopnames van die agterwiel van 'n middelslag kar. In elke diagram verteenwoordig die boonste traseerlyn die oorlangse dwarskomponent terwyl die onderste traseerlyn die hoodregte kragkomponent verteenwoordig

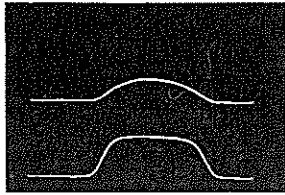
Typical force recordings of the rear wheel of a medium-sized car. In every diagram the upper trace represents the transverse component, the lower trace the vertical force component

FIGUUR 12—vervolg

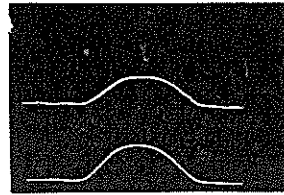
FIGURE 12—continued

A EN B : KONSTANTE SNELHEID VAN 10 M.P.U.

A AND B : CONSTANT SPEED OF 10 M.P.H.



A



B

Die oorlangse kragkomponent word hoofsaaklik deur die draaimoment op die wiel en die hoogte bo die padoppervlakte van die meetknop beïnvloed.

Die dwars kragkomponent word hoofsaaklik deur die afstand tussen die middellyn van die bandloopvlak en die meetknop sowel as deur die hoogte van die meetknop beïnvloed.

Spoeed het geen noemenswaardige invloed op enige van die kragkomponente binne die spoedreeks wat bestudeer is nie.

Die maksimum vertikale krag by die middellyn van die bandloopvlak was in die omtrek van:—

- 1.0—1.6 maal die bandlugdruk by 'n meetknophoogte van nul.
- 3.0—5.5 maal die bandlugdruk by 'n meetknophoogte van 0.1 duim.

Die maksimum oorlangse kragte by konstante spoed was soveel as 11 lb. per vk. duim (vir motorbande) en 22 lb. per vk. duim (vir vragmotorbande) by 'n meetknophoogte van nul, en 22 lb. per vk. duim (vir motorbande) en 33 lb. per vk. duim (vir vragmotorbande) by 'n meetknophoogte van 0.1 duim.

Maksimum oorlangse kragte by versnellings en vertragings van 0.4 g was tot 40 lb. per vk. duim by 'n meetknophoogte van nul en tot 110 lb. per vk. duim by 'n meetknophoogte van 0.22 duim.

stud resulted in deflections of the mechanical spring systems supporting the stud, which were converted into electrical signals and photographed on an oscilloscope screen.

While the vertical force component was always in a downwards direction, the shape and magnitude of the longitudinal force component depended very much on the condition of motion of the vehicle. At constant speed it had, in most cases, three peaks, the first and third always being directed opposite to the direction of motion of the vehicle, the second peak being mostly in the direction of motion. During acceleration this pattern changed to one predominant peak in the latter half of the force-time recording directed opposite to the direction of motion and in the direction of motion for deceleration. Some typical oscilloscope records are shown in Figure 12.

A few of the conclusions drawn from this work are as follows:—

The vertical force component is mainly influenced by the inflation pressure, the distance between the centre lines of the stud and tyre, and by the stud height.

The longitudinal force component is mainly influenced by the torque applied to the wheel and the stud height.

The transverse force component is mainly influenced by the distance between the centre lines of the stud and tyre and the stud height.

Within the range studied speed, itself, has no significant effect on any of the force components measured.

The vertical peak force at the tyre centre line was in the range of:—

- 1.0—1.6 times the inflation pressure at zero stud height.
- 3.0—5.5 times the inflation pressure at 0.1 in. stud height.

Uit 'n ontleding van die verhoudings van krag: tyd van die drie kragkomponente is gevind dat die resulterende krag by 'n punt op die padoppervlakte by benadering 'n halwe sinusgolf is. Vir 'n tipiese bandkontaklengte by die middellyn en teen 'n spoed van 50 myl per uur is gevind dat die ooreenstemmende ononderbroke frekwensie ongeveer 62 Hz is, wat op 'n belastings tyd van omtrent 0.008 sekondes neerkom.

Seismiese Bodemonderzoek

Werk is voortgesit op hierdie projek, wat gemik is op die ontwikkeling van 'n tegniek en 'n apparaat vir die vastelling van benedevlakse grond- en rotsprofiel met betrekking tot die fondamenttoestande vir paaie en ander strukture. Veldwerk is gedoen om die voortplantingseisenskappe van drukgolwe onder verskeie omstandighede te ondersoek terwyl daar ook heelwat tyd bestee is aan die ontwikkeling van 'n klein getransistoriseerde instrument wat in die bepaling gebruik kan word.

Die algemene tegniek bestaan uit die opwekking van skokgolwe met behulp van 'n 10 lb.-voorhamer op gegewe afstande vanaf 'n seismiese opteller en die bepaling van die golfvoortplantings tyd, van die drukgolf tussen die opwekkingspunt en die opteller met behulp van elektroniese metodes. Deur die afstand tussen die opwekkingspunt en die opteller te verander, is dit moontlik om die drukgolfsnelhede te bepaal om sodoende die diepte van die verskillende lae vas te stel en ook 'n aanduiding te gee van die fisiese eienskappe van hierdie lae.

Deur gebruik te maak van 'n „neon-vergelyker” en die soogenaamde „Hammer elektroniese Seismiese Instrument” is voorlopige toetse op verskillende plekke, waarvan die geologiese profiele bekend is, uitgevoer, om faktore soos die frekwensieverspreiding van die opgewekte golwe, die invloed van die grond tipe op die golffrekwensie en die effek van voortplantingsafstand op die frekwensie van die drukgolwe te bestudeer.

Voorlopige bepalinge van die frekwensies van normale agtergrondgeraas is ook gedoen.

Aansienlike vooruitgang is gemaak met die ontwikkeling van 'n draagbare instrument met lae kragverbruik wat die meer omslagtige instrumente wat tot nog toe gebruik was, vervang. Dit bestaan uit 'n seinversterker, 'n impulsopwekker, 'n elektroniese deurlaatbaan en teller wat almal getransistoriseerd is.

The longitudinal peak forces at constant speed were up to 11 lbs./sq.in. (Car tyres) and 22 lbs./sq.in. (Truck tyres) at zero stud height, and 22 lbs./sq.in. (Car tyres) and 33 lbs./sq.in. (Truck tyres) at 0.10 in. stud height.

Longitudinal peak forces at accelerations and decelerations of 0.4 g were up to 40 lbs./sq. in. at zero stud height, and up to 110 lbs./sq.in. at 0.22 in. stud height.

From an analysis of the force-time relationships of the three force components it was found that the resultant force on a point in a road surface is approximately equivalent to a half sine wave. For a typical contact length at the centre line of a car tyre and at 50 miles per hour the equivalent steady-state frequency is about 62 cycles per second giving a loading time of about 0.008 seconds.

Seismic Soil Exploration

This project, which is aimed at the development of a technique and an instrument for the exploration of subsurface soil and rock profiles in connection with foundation conditions for roads and other structures, has been continued. Some field work was done to investigate the propagation characteristics of compressional waves under various conditions while considerable time was also spent in the development of a small transistorised instrument which could be used in the determinations. The general technique consists of generating a shock wave by means of a 10 pound sledge hammer at a known distance from a seismic pickup and, by electronic means, measuring the wave travel-time of the compressional wave between the point of excitation and the pickup. By varying the distance between the pickup and the point of excitation, values of compressional wave velocity can be found which permit the calculation of the depths of different layers and also give some indication of the physical properties of these layers.

Using a neon comparator as well as the Hammer electronic Seismic instrument for time measurements, preliminary tests were carried out on various sites with known geological profiles to study such factors as the frequency distribution waves generated by the hammer, the influence of the type of soil on the frequency of the waves and the effect of travel distance on the frequency of the compressional wave. Some preliminary measurements were also made of the frequencies of normally occurring background noise.

Considerable progress has been made in the development of a portable instrument with low power consumption to replace the more cumbersome instruments used so far. This consists of a signal amplifier, time generator, electronic gate and a counter, all of which are fully transistorised.

Deur voorlopige veldtoetse is vasgestel dat hierdie instrument definitiewe voordele bied bo die apparaat wat vroeër gebruik is, veral wat gebruiksgemak betref.

Dinamiese Toetsing van Paaie

Hierdie langtermynprojek is gemik op die ontwikkeling van 'n toetsmetode vir die verbeterde ontwerp van padstrukture sowel as die snelle bepaling van die eienskappe van grondlae. 'n Ondersoek is gedoen van die faktore wat die resonanstoestand van 'n grondstruktuur onder vibrasiebelasting beïnvloed met die doel om die werklike resonansies van die struktuur te isoleer. 'n Studie van apparaatresonanse is ook gemaak sowel as van hulle effek op die bepaling van die kragte op die struktuur en die gevolglike defleksies.

BEDRYFSEKONOMIESE AFDELING

Aangesien die Bedryfsekonomiese Afdeling maar relatief onlangs in hierdie Instituut gestig is, volg hier eers 'n kort uiteensetting van die doel en aanvangsstudies van die Afdeling, alvorens verslag gedoen word van die Afdeling se werksaamhede gedurende die verslagtydperk.

Die doel van die studies wat deur hierdie Afdeling (onder leiding van die Bedryfsekonomiese Afdeling van die W.N.N.R.) onderneem word, is om padowerhede van metodes te voorsien waarvolgens die moontlike ekonomiese gevolge van alternatiewe beleidsbeslissings op alle vlakke bepaal kan word en om bystand te verleen by die bepaling van die rigting en prioriteite van tegniese navorsing deur die moontlike ekonomiese gevolge van navorsingsalternatiewe te bestudeer.

Ten einde die spesifieke rigting te bepaal wat die Afdeling in sy werk behoort te volg is die bou van 'n pad (in die breëre sin) in drie afsonderlike en kronologiese stadiums beskou, nl. die „voorontwerp-“, die „ontwerp-“ en die „bou-“ stadiums.

Alhoewel ekonomiese oorwegings in al drie stadiums van wesentlike belang is, leen die probleme waarmee in die „voorontwerp-“ stadium te doen gekry word, hulle in die algemeen nie tot kwantitatiewe ekonomiese waardering nie nl. ten opsigte van watter paaie gebou moet word en waar, met inagneming van die moontlike ekonomiese gevolge van elke alternatief, met ander woorde, prioriteitsbepalings op 'n nasionale en streeksvlak. In elke geval word die besluite wat in hierdie stadium geneem word, gewoonlik eerder deur politieke as deur ekonomiese oorwegings gemotiveer. Die probleme waarmee egter in die „ontwerp-“ en „bou-“ stadiums te doen gekry word, leen hulle in die algemeen meer tot 'n kwantitatiewe waardering van die ekonomiese gevolge van verskillende alternatiewe, terwyl die politieke aspek 'n baie kleiner of miskien geen rol, speel. Die hoofdoel van ekonomiese studies in die „ontwerp-“ stadium is die keuse uit die tegniese

Preliminary field trials have shown that the instrument has definite advantages over the equipment previously used, especially in ease of operation.

Dynamic Testing of Roads

This long-term project is aimed at the development of a test method for the improved design of road structures, as well as the rapid determination of the properties of soil layers. An investigation has been made of the factors affecting the resonance condition of a soil structure under sustained vibrational loading with the object of isolating the true resonances of the structure. A study was also made of apparatus resonances and their effect on the measurement of the force acting on the structure and the resultant deformation.

ECONOMIC STUDIES

In view of the relatively recent establishment of an Industrial Economics Section in this Institute a brief description of its objects and initial studies precedes the description of its activities during the period under review.

The object of the studies undertaken by this Section (under the guidance of the Industrial Economics Division of the C.S.I.R.) is to provide road authorities with methods for evaluating the probable economic consequences of alternative policy decisions at all levels and to assist in the direction and priority determination of technical research by studying the probable economic consequence of research alternatives.

For the purpose of deciding on the particular direction which the Section's efforts should take, the construction of a road (in the broad sense) was considered in three separate and chronological stages i.e. the "pre-design", the "design" and the "construction" stages.

Although economic considerations are of consequence in all three stages, problems encountered in the "pre-design" stage generally do not lend themselves to quantitative economic appraisal (what roads should be constructed and where, in relation to the economic consequences of each alternative i.e. priority determination at national and regional level). In any event the decisions taken in this stage are usually motivated by political rather than economic considerations. In the "design" and "construction" stages, the problems encountered generally permit a more quantitative appraisal of the economic consequences of the various alternatives, while the political aspect is also of considerably less, if any, consequence. The primary object of economic studies in the "design" stage is the selection, from the technical alternatives allowed by expected

alternatiewe wat hulle uit die verwagte verkeersdigtheid en asladings, en die besondere heersende geologiese en klimatologiese omstandighede voordoen, van die mees ekonomiese ontwerp wat aan die vereistes soos in die „voor-ontwerp-“ stadium bepaal voldoen. In die „bou-“ stadium is hierdie doel die bepaling van die „ideaal“-georganiseerde konstruksie-eenheid wat die bou van 'n pad teen die laagsmoontlike koste sal bewerkstellig, ooreenkomstig die vereistes waarvoor daar in die „ontwerp-“ stadium besluit is.

Met die oog op bogenoemde oorwegings is derhalwe gevoel dat die Afdeling ten minste aanvanklik 'n groter bydrae kan lewer deur die probleme te bestudeer wat in die „ontwerp“- en „konstruksie-“ stadiums voorkom, eerder as dié wat in die „voor-ontwerp“- stadium voorkom. Aangesien 'n kennis van die koste van konstruksie 'n voorvereiste is vir „ontwerp“- stadium studies, was dit ook duidelik dat die studies van die „ontwerp“- stadium voorafgegaan moet word deur die studies van die „konstruksie-“ stadium.

Die „konstruksie-“ stadium studies bestaan uit twee afsonderlike fases. In die eerste fase is daar 'n algemene feiteversamelingsopname van die koste van padkonstruksie en instandhoudingswerkzaamhede in die algemeen gemaak. In die tweede fase word die inligting wat gedurende die loop van die eerste fase versamel is, gebruik by die bepaling van „optimum-kombinasies“ (in terme van koste) in die beplanning, organisering en uitvoering van padkonstruksie en instandhouding.

Die Afdeling het reeds sy algemene feiteversamelings-ondersoeke voltooi, wat daarop gemik was om bekend te raak met die tegniese en organisatoriese metodes in gebruik op hierdie gebied, en dit het hom ook toegelê op die bepaling en ontwikkeling van algemene koste (beide voor- en naberekening), beplannings en organisasie-metodes. As gevolg van die belangrikheid van masjienkoste in padkonstruksiewerkzaamhede is besondere aandag aan hierdie aspek bestee en daar is metodes ondersoek wat aangewend kan word vir die bepaling van masjienkapasiteit en masjienbenutting. Gedurende hierdie voorbereidende studies het dit ook duidelik geword dat hierdie Afdeling 'n aansienlike bydrae kan lewer tot die ontwikkeling van 'n statistiese benadering tot baie van die probleme verbonde aan padontwerp en padkonstruksie.

Gedurende die verslagtydperk is die volgende studies onderneem of voltooi: die ontwikkeling van metodes wat aangewend kan word om masjienkapasiteit en masjienbenutting te bepaal (reeds voltooi); die ontwikkeling van 'n statistiese monstermetode vir verdigtings-beheer nog aan die gang; en 'n stelselmatige studie van masjienvervangingskriteria (nog aan die gang).

Die studie oor die ontwikkeling van praktiese metodes ter bepaling van masjienkapasiteit en masjienbenutting

traffic density and axle loads and the particular geological and climatological conditions pertaining, of the most economic design which satisfies the requirements determined during the “pre-design” stage. In the “construction” stage this object is to determine the “ideally” organised construction unit which will enable the construction of a road at least cost, given the requirements decided upon during the “design” stage.

In view of the abovementioned considerations it was therefore felt that the Section could, at least initially, make a more valuable contribution by studying problems in the “design” and “construction” rather than in the “pre-design” stage. Since a knowledge of the costs of construction is a necessary pre-requisite for “design” stage studies, it was also clear that studies of the “construction” stage would have to precede those of the “design” stage.

The “construction” stage studies involve two separate phases. The first phase has been concerned with a general fact-finding survey of the costs of road construction and maintenance operations generally. In the second phase the information collected during the course of the fact-finding survey will be used in the study of “optimum combinations” (in terms of cost) in planning, organizing and carrying out road construction and maintenance operations.

The Section has now completed its general fact-finding studies which were aimed initially at becoming acquainted with current technical and organizational methods in this field and later were concerned with the study and development of general costing (both pre- and post-calculation), planning and organizational methods. Because of the importance of plant costs in road construction operations, particular attention was devoted to this aspect and studies of methods for determining plant capacity and utilization were undertaken. During the course of these initial studies it also became evident that a considerable contribution could be made by the Section in the development of a statistical approach to many problems related to road design and construction operations.

During the period under review the following studies have been commenced or completed: the development of methods for the determination of plant capacity and utilization (completed); a systematic study of plant replacement criteria (in progress); the development of a statistical sampling method for compaction control (in progress).

is onderneem as 'n onderdeel van die meer algemene doelwit, nl. die ontwikkeling van 'n bruikbare stelsel vir die voor- en naberekening van die koste aan padkonstruksie verbonde. Die kapasiteitsstudies was gemik op die vasstelling van geskikte maateenhede waarin die werkverrigting van verskillende tipes padmasjiene uitgedruk kon word en die bepaling van die produksiekapasiteite van hierdie masjienerie. Die benuttingstudies het ook ten doel gehad die daarstelling van 'n basis vir verdere studie gemik op die verhoging van masjienbenuttings en het die ontwikkeling van 'n metode, gebaseer op die beginsels van statistiese monsterneming, vir die bepaling van benutting, omvat. Hierdie metode is later op 'n plaaslike konstruksieprojek uitgetoets. 'n Program word tans opgestel vir die verdere studies wat nog in verband met al die aspekte van die benuttingsprobleem onderneem gaan word. Huidige beleide ten opsigte van die vervanging van masjienerie verskil aansienlik tussen die verskillende padowerhede en die studie van masjienvervangingskriteria het as doel die ontwikkeling van 'n algemeen aanneemlike ekonomiese basis vir so 'n beleid.

Bestaande maatstawwe vir die aanname of verwerping van die verdigtingsgraad wat in 'n grondlaag behaal is, kan nog heelwat verbeter word en met die oog op die aansienlike koste wat verkeerde besluite kan veroorsaak, is 'n studie onderneem om vas te stel wat die praktiese moontlikhede van 'n statistiese monsternemingsmetode is om sodoende 'n algemeen aanvaarbare ekonomiese grondslag vir so 'n beleid te skep. Voorlopige studies het 'n hele aantal variasies getoon in die droë digtheid van grondsoorte wat onderhewig was aan min of meer dieselfde verdigtingsintensiteit. 'n Standaardafwyking van ongeveer 3% (droë digtheid) is in die besondere monsterresultate wat tot dusver bestudeer is, gevind. 'n Mens sal die betekenis van hierdie wisseling beter besef as in gedagte gehou word dat die droë digtheid van onverdigte grond ongeveer 70%—80% bedra, terwyl die gespesifiseerde droë digtheid gewoonlik tussen 92% en 97% lê. Die vereiste verandering in die digtheid is dus ongeveer 20 eenhede en 'n standaardafwyking van omtrent 3 eenhede verteenwoordig gevolglik 'n persentasieafwyking van omtrent 15% in die verdigtingsproses.

PADONGELUKSTATISTIEKE

Tydverspreiding van Padongelukke

Met die doel om besondere aspekte van die padongeluksposisie in Suid-Afrika as navorsingsprobleem te bepaal, is 'n analise van beide plattelandse en stedelike ongeluksgegewens vir die hele land gemaak met betrekking tot die tyd wanneer die ongelukke plaasgevind het gedurende die jare 1947 tot 1955. Meeste van die gegewens gebruik is van die Buro vir Sensus en Statistieke verkry. Verskeie statistiese toetse is op die gegewens toegepas om moontlike betekenisvolle ver-

The study concerned with the development of methods for the determination of plant capacity and utilization was undertaken as part of the more general objective of developing an acceptable system for the pre- and post-calculation of the costs of road construction. The capacity studies were concerned with the establishment of suitable units of measurement for expressing the activity of various types of road plant and the determination of the output capacities of this plant. The utilization studies were also intended to provide a basis for future studies aimed at increasing plant utilization and involved the development of a method, based on statistical sampling principles, for determining utilization. This method was subsequently tested on a local construction project. A programme for the further study of all aspects of the utilization problem is at present being prepared. Present policies for the replacement of plant vary considerably between the various road authorities and the study of plant replacement criteria has as object the development of a generally acceptable economic basis for such a policy.

Current criteria for the acceptance or rejection of the degree of compaction of a soil layer could with advantage be improved and, in view of the important cost consequences of wrong decisions, a study has been undertaken to investigate the practical possibilities of using statistical sampling methods to provide a more objective and reliable basis for this decision. Preliminary studies have indicated quite considerable variations in the dry densities of soils subjected to approximately equivalent compactive efforts. A standard deviation of $\pm 3\%$ (dry density) has been found in the particular sample of data so far studied. The significance of this variation is apparent if it is remembered that the process of densification of soil by compaction is normally to bring the relative density from the initial region of 70 to 80 per cent up to a value in the region of 93 to 97 per cent. The required change in density is, therefore, of the order of only 20 units and a standard deviation of ± 3 units on this represents a percentage variation in the densification process of $\pm 15\%$.

ACCIDENT STATISTICS

Time Distribution of Road Accidents

To help in defining particular aspects of the accident situation in South Africa which should be investigated as research problems, an analysis of both rural and urban accident data for the whole country has been made with respect to time of occurrence of the accidents for the years 1947 to 1955. Most of the data used was obtained from the Bureau of Census and Statistics. Various statistical tests were applied to the data to determine significant differences, if any, in the time

skille, in die tydsverspreiding van ongelukke op verskillende dae vas te stel. Hier volg 'n paar tipiese bevindings vir stedelike gebiede:—

Werkdae, Maandag tot Vrydag, ingeslote—geen noemenswaardige verskille nie.

Sondae en openbare vakansiedae—geen noemenswaardige verskille nie.

Sondae verskil noemenswaardig van alle ander dae.

Saterdag verskil noemenswaardig van alle ander dae.

distribution of accidents on different days. Some of these findings for urban areas are as follows:—

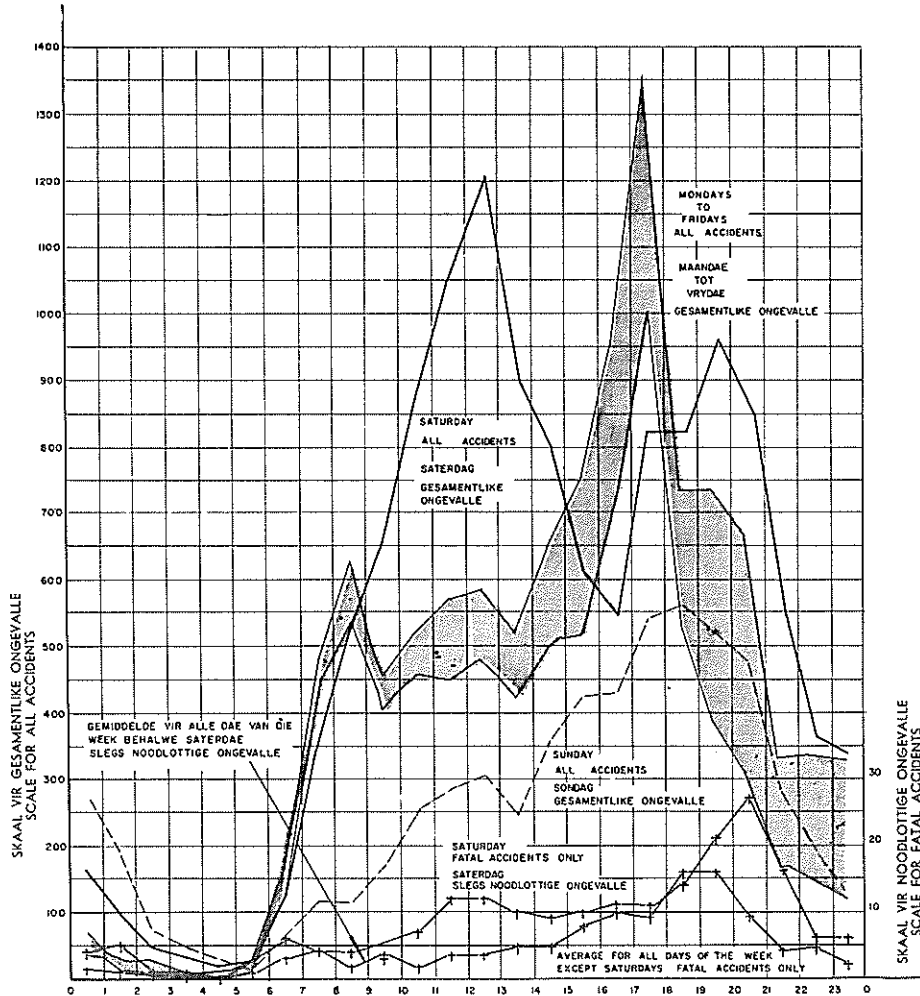
Weekdays, Monday to Friday inclusive, do not differ significantly.

Sundays and public holidays do not differ significantly.

Sundays differ significantly from all other days.

Saturdays differ significantly from all other days.

For rural accidents the pattern is rather different and, to a first approximation, the various days fall into only



FIGUUR 13

Uurlike verspreiding van noodlottige padongelukke en gesamentlike padongelukke vir die jaar 1955 in stedelike gebiede in die Unie

FIGURE 13

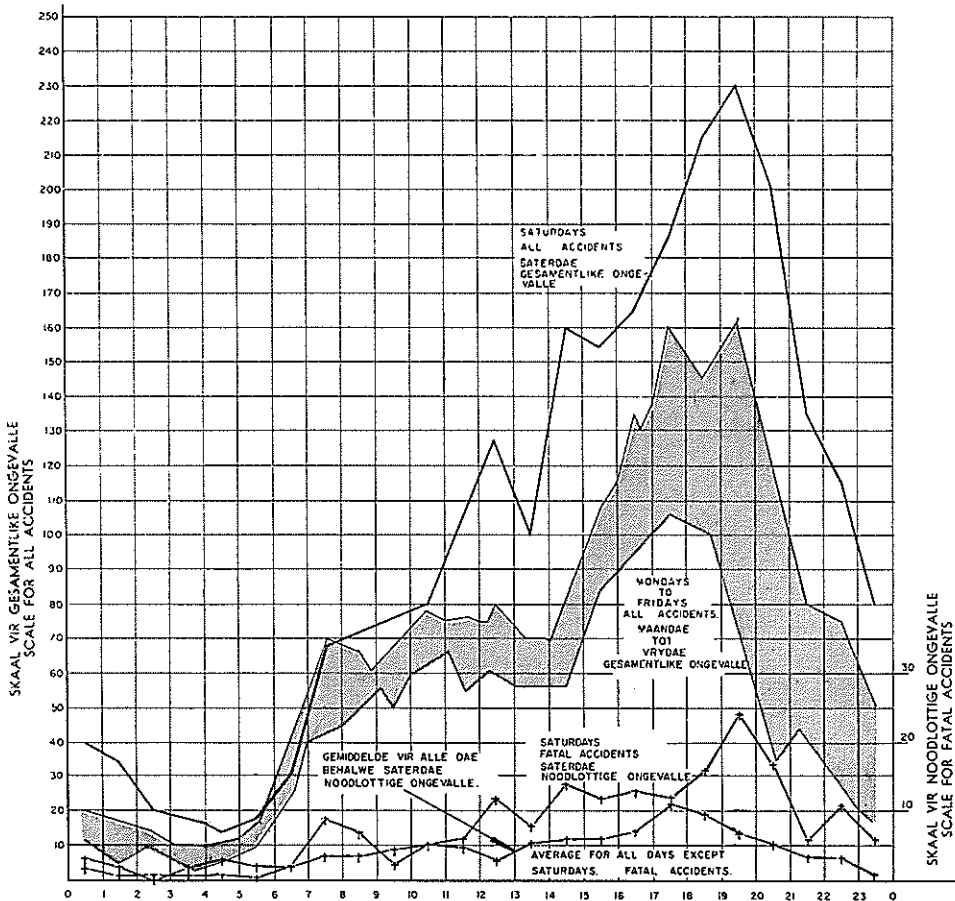
Hourly distribution of fatal road accidents and all road accidents for the year 1955 in urban areas of the Union

In die geval van plattelandse ongelukke is die patroon ietwat verskillend en, grofweg benader, val die verskillende dae in slegs twee groepe nl. Sondag tot Donderdag, en Vrydag en Saterdag. Hierdie twee groepe verskil

two groups, namely, Sunday through to Thursday and Friday and Saturday. These two groups differ significantly from each other. An example of the patterns found is given in Figure 13 which shows the accident

aanmerklik van mekaar. 'n Voorbeeld van die resultate word in Figuur 13 aangegee met die ongeluksverspreiding ten opsigte van die tydstip van die dag waarop beide noodlottige en die totale aantal ongelukke gedurende 1955 in stedelike gebiede van die Unie plaasgevind het. Die Figuur illustreer die heeltemal

distribution with respect to time of day of both fatal and total road accidents for the year 1955 in urban areas of the Union. This illustrates the quite different pattern given by Monday to Friday, Saturday and Sunday. A similar plot of the rural pattern is given in Figure 14.



FIGUUR 14

Uurlike verspreiding van noodlottige padongevalle vir die jaar 1955 in plattelandse gebiede in die Unie

FIGURE 14

Hourly distribution of fatal road accidents and all road accidents for the year 1955 in rural areas in the Union

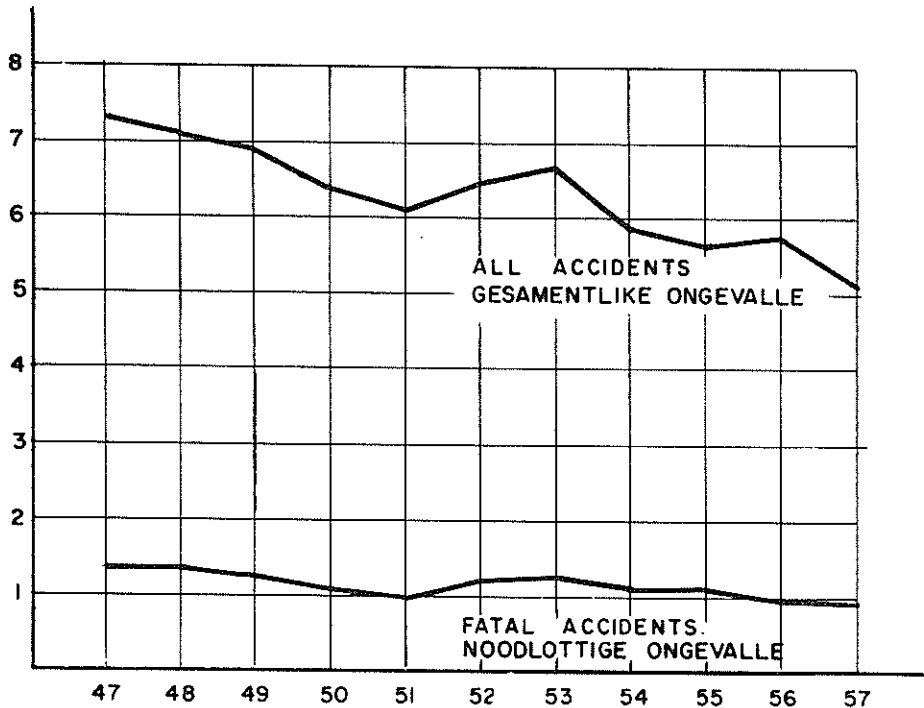
verskillende patrone vir Maandag tot Vrydag en vir Saterdag en Sondag. 'n Soortgelyke grafiek van die plattelandse patroon word in Figuur 14 aangegee.

Terwyl die totale aantal plattelandse ongelukke heelwat kleiner is as die totale aantal stedelike ongelukke,

While the total number of rural accidents is much smaller than the total number of urban accidents, the trend since 1947 has been for the number of rural accidents to increase much faster than urban accidents, so that the ratio of urban to rural accidents has been

is die neiging sedert 1947 dat die aantal plattelandse ongelukke vinniger vermeerder as stedelike ongelukke sodat die verhouding van stedelike tot plattelandse

falling steadily, as shown in Figure 15. Similarly the number of rural fatal accidents has also increased faster than the urban fatal accidents, though these changes are



FIGUUR 15

Verhouding Stedelike | Plattelandse Ongevallen vir die jare 1947 tot 1957 in die Unie van Suid-Afrika

FIGURE 15

Ratio urban/rural accidents for the years 1947 to 1957 for the Union of South Africa

ongelukke jaarliks verminder, soos aangedui in Figuur 15. Op 'n soortgelyke manier het die aantal noodlottige plattelandse ongelukke ook vinniger vermeerder as die noodlottige stedelike ongelukke, alhoewel hierdie neigings minder merkbaar is, soos aangetoon in die onderste kurwe van Figuur 15.

'n Verdere bevinding wat uit hierdie analise voortvloei, is die neiging van die persentasie noodlottige ongelukke om gedurende die week, d.w.s. van Maandag na Sondag, toe te neem, soos aangedui in Figuur 16. Dit geld vir beide plattelandse sowel as stedelike gebiede, en daar kan gesien word dat die persentasie noodlottige ongelukke in plattelandse gebiede 'n paar keer hoër is as die persentasie vir stedelike gebiede.

Sommige gegewens oor verkeersdigtheid gedurende druk verkeer soggens en smiddags is van die stads-ingenieurs van Johannesburg, Pretoria en Durban

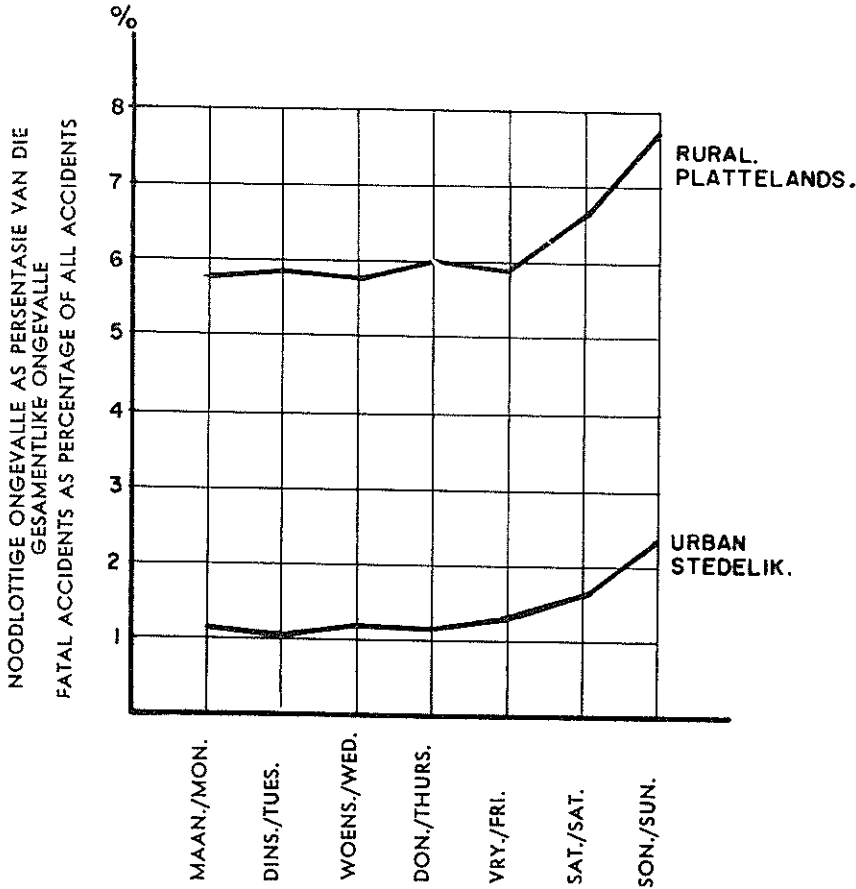
less marked, as will be seen in the lower curve of Figure 15.

Another result noted in this analysis is the tendency for the percentage of fatal accidents to increase through the week from Monday to Sunday, as shown in Figure 16. This is true for both rural and urban areas, and it will be noted that the percentage of fatal accidents in rural areas is several times as high as the percentage for urban areas.

Some information on traffic density during the morning and the evening peak hours was obtained from the city engineers of Johannesburg, Pretoria and Durban. From previous traffic surveys carried out in these cities

verkry. Van vorige verkeersopnames in hierdie stede wil dit voorkom asof die verkeershoogtepunt soggens omtrent van 80 tot 90% van die aand se verkeershoogtepunt bedra. Die aantal verkeersongelukke gedurende die aand se hoogtepunt is egter omtrent twee maal soveel as dié gedurende die oggend se hoogtepunt.

it appears that the morning traffic peak amounts to approximately 80 to 90% of the evening peak. The number of traffic accidents occurring during the evening peak hour, however, is about twice that during the morning peak hour (see Figure 13). It appears, therefore, that there are other factors besides the traffic



FIGUUR 16

Noodlottige ongevallen as persentasie van die gesamentlike ongevallen in stedelike en plattelandse gebiede vir verskillende dae van die week in die Unie van Suid-Afrika gedurende 1955

FIGURE 16

Fatal accidents as a percentage of all accidents in urban and rural areas for different days of the week in the Union of South Africa 1955

(Sien Figuur 13.) Dit lyk derhalwe of daar ander faktore buite verkeersdigtheid is wat baie tot die aantal ongelukke bydra wat gedurende die aand se hoogtepunt voorkom, en dit kan aangeneem word dat baie bestuurders na 'n dag se werk meer tot ongelukke op besige stadspaaie geneig is as in die oggend.

density which contribute strongly to the number of accidents occurring during the evening rush hour, and it can be assumed that many drivers are more prone to accidents on crowded city roads after a day's work than in the morning.

Aantal Ongelukke en Mylafstand Afgelê

Om betekenisvolle statistiese vertolkings uit ongeluksyfers te maak, is dit noodsaaklik om die blootstelling aan risiko te weet sodat die aantal ongelukke met die mylafstand afgelê, vergelyk kan word. Die mylafstandsnorm wat gewoonlik gebruik word om ongeluksverhoudings uit te druk, is óf 'n miljoen óf 'n 100 miljoen voertuigmyle.

'n Poging is aangewend om die jaarlikse mylafstand deur motorvoertuie in Suid-Afrika afgelê, uit petrolverbruiksgegewens te bepaal. Om dit te doen, is die verhouding tussen voertuiggewig en petrolverbruik (gellings/100 myl) vir beide motorkarre en kommersiële voertuie vasgestel. Uit gegewens wat die Goewernmentsgarage oor ongeveer 14,000 regeringsvoertuie hou, is 'n steekproef geneem, en hiervan is empiriese formules opgestel wat die verhouding tussen petrolverbruik en voertuiggewig van beide motorkarre en kommersiële voertuie aandui. Aangesien petrolverkope in die verskillende Provinsies slegs bekend is vir motorkarre en kommersiële voertuie saam, was dit ook nodig om sekere korreksiefaktore, wat afhang van die relatiewe aantal voertuie in die verskillende gewigsgroepe en die relatiewe aantal motorkarre en kommersiële voertuie in die verskillende Provinsies, in te sluit. Die resultate word in Tabel 4 opgesom:—

Accident Frequency and Mileage Travelled

To obtain meaningful statistical interpretations of accident figures it is necessary to know the exposure to risk so that numbers of accidents can be related to mileage travelled. The unit of distance travelled commonly used in expressing accident rates is either a million or a 100 million vehicle miles.

An attempt has been made to estimate the annual mileage travelled by motor vehicles in South Africa from petrol consumption data. To do this a relation was first found between vehicle weight and fuel consumption (gallons/100 miles) for both motor cars and commercial vehicles. From records kept by the Government Garage of some 14,000 government vehicles a random sample was taken for study, and, from this, empirical formulae were established relating petrol consumption to vehicle weight for both motor cars and commercial vehicles. As petrol sales in different provinces are only known for cars and commercial vehicles combined it was also necessary to make certain correction factors depending on the relative numbers of vehicles in different weight groups and the relative numbers of cars and commercial vehicles in the different provinces. The results obtained are summarized in Table 4:—

TABEL 4/TABLE 4

Skatting van mylafstand afgelê deur motorkarre en petrolaangedrewe kommersiële voertuie in 1956
Estimation of miles travelled by motor cars and petrol-driven commercial vehicles in 1956

| Gebied/Area | Geskatte belaste gemiddelde gel. per 100 myl. Estimated weighted mean gall. per 100 miles | *Petrol verbruik *Petrol consumed | Voertuigmyle Vehicle miles | Goewernments garage mylafstand Government Garage mileage | Totale mylafstand Total miles |
|-----------------------|--|--------------------------------------|-------------------------------|---|----------------------------------|
| | | '000 gel./gall. | '000,000 | | '000,000 |
| Unie/Union | 6.297 | 386,078 | 6,136 | 62 | 6,198 |
| Kaapprov./Cape | 6.277 | 112,992 | 1,800 | 22 | 1,822 |
| Natal | 6.232 | 52,134 | 837 | 7 | 844 |
| Transvaal | 6.333 | 175,099 | 2,765 | 27 | 2,792 |
| O.V.S./O.F.S. | 6.248 | 45,853 | 734 | 6 | 740 |
| S.W. Afrika/Africa | 6.854 | 9,327 | 136 | + | 136 |

*Uitgeslote Goewernmentsgarage, motorfiets, busse en trekkers.
 +Mylafstand vir Suidwes-Afrika is by Kimberley ingesluit vir 1956

*Excluding Government Garage, motor cycles, buses and tractors.
 +Miles for South West Africa were included under Kimberley in 1956.

Bogenoemde totale syfers sluit busse, dieselveertuie en motorfietse uit. Skattings van mylafstand deur hierdie voertuie in 1956 afgelê, is soos volg:—

| | 1,000,000 myl |
|----------------------------|-------------------------|
| Busse | 162 |
| Kommersiële dieselveertuie | 488 |
| Motorfietse..... | 257 |
| Totaal | 907,000,000 myl. |

Hierdie syfers is skattings van gegewens wat van Spesiale Verslag, No. 216, Statistiek van Motorvoertuie vir 1956, verkry is en bykomstige statistieke is van die „Motor Transport Owners' Association of South Africa" verkry. Die skatting van die mylafstand deur motorfietse afgelê, is op 'n ondersoek wat deur die Nasionale Personeelnavorsingsinstituut uitgevoer is, gebaseer. Van hierdie syfers is die gemiddelde mylafstand in 1956 afgelê, verkry en in Tabel 5 vergelyk met sekere gegewens wat van Wes-Duitsland en Brittanje verkry is.

TABEL 5

Skatting van mylafstand per voertuig afgele vir verskillende klasse voertuie in 1956

| Voertuig | Jaarlikse mylafstand afgele | | |
|--------------------------|-----------------------------|---------------|-----------|
| | Suid-Afrika | Wes-Duitsland | Brittanje |
| Motorfietse .. | 6,000 | 5,240 | 3,400 |
| Busse | 26,500 | 28,600 | 29,000 |
| Motorkarre .. | 8,100 | 17,120 | 7,800 |
| Kommersiële voertuie.... | | 17,950 | 11,000 |

Sommige ongeluksverhoudings is met behulp van skattings van totale mylafstand in die Unie afgelê, en in die Provinsies afsonderlik bereken en met sekere gegewens van ander lande vergelyk. Die resultate word in Tabel 6 aangegee:

The above total excludes buses, diesel vehicles and motor cycles. Estimates of mileage travelled by these vehicles in 1956 are as follows:—

| | 1,000,000 miles |
|-------------------------------|--------------------------|
| Buses | 162 |
| Diesel commercial vehicles .. | 488 |
| Motor cycles | 257 |
| Total | 907,000,000 miles |

These figures were estimated from information obtained from Special Report No. 216, Motor Vehicle Statistics for the year 1956, and additional information

TABLE 5

Estimates of miles travelled per vehicle for different classes of vehicle in 1956

| Vehicle | Annual mileage travelled | | |
|---------------------|--------------------------|-----------------|---------------|
| | South Africa | Western Germany | Great Britain |
| Motor cycles | 6,000 | 5,240 | 3,400 |
| Buses | 26,500 | 28,600 | 29,000 |
| Motor cars | 8,100 | 17,120 | 7,800 |
| Commercial vehicles | — | 17,950 | 11,000 |

obtained from the Motor Transport Owners' Union of South Africa. The estimate of the mileage covered by motor cycles was based on an investigation carried out by the National Personnel Research Institute. From the above figures the average mileages travelled in 1956 were obtained and are given in Table 5 in comparison with some data from Western Germany and Great Britain.

Using the estimates of total mileage travelled in the Union as a whole and in the provinces separately, some accident rate data have been calculated and compared with some data from other countries. The results are given in Table 6:

TABEL 6

Skatting van ongeluksverhoudings in Suid-Afrika

| | Ongelukke per 10 ⁶ voertuigmyle | | Ongelukstergevalle per 10 ⁸ voertuigmyle | Jaar |
|-----------------------------|--|-----------------------|---|----------------------------------|
| | Totaal | Persoonlike beserings | | |
| Unie | 11.3 | 3.9 | 27 | 1956 |
| Kaapprovinsie | 11.4 | 4.0 | 24 | |
| Natal | 14.2 | 3.7 | 28 | |
| Transvaal .. | 12.0 | 4.3 | 31 | |
| Oranje Vrystaat .. | 5.1 | 1.9 | 15 | |
| Brittanje .. | — | 4.7 | 10 | 1954 |
| Verenigde State van Amerika | 14.8 | 2.2* | 6.4 | 1956 |
| Duitse Federale Republiek | 6.9 | 4.2 | 37 | Gemiddelde vir verskillende jare |

Vergelykings van ongeluksverhoudings tussen verskillende lande is altyd 'n bietjie moeilik omdat die manier waarop ongelukke aangeteken word, verskil en aangesien die definisies van padnoodlottighede ook heelwat verskil. Uit Tabel 6 sal gemerk word dat die persoonlike beseringsverhouding in die Unie vergelykbaar is met die syfers vir Brittanje en Duitsland, maar hoër is as die Amerikaanse syfer. Die Unie se sterfteverhouding is egter hoog in vergelyking met die Britse en Amerikaanse syfers.

Verkeersteekproef in Johannesburg

Vir statistiese doeleindes moet, soos alreeds hierbo aangedui, die ongeluksgegevens met die gegewens oor verkeersstroom in verband gebring word. Ongelukkig is daar 'n tekort aan geskikte gegewens oor die verkeerspatroon in beide plattelandse en stedelike gebiede in die Unie. 'n Begin is in Johannesburg gemaak om

TABLE 6

Estimates of accident rates in South Africa

| | Accidents per 10 ⁶ vehicle miles | | Fatalities per 10 ⁸ vehicle miles | Year |
|---------------------------|---|-------------------|--|-----------------------------|
| | Total | Personal injuries | | |
| Union | 11.3 | 3.9 | 27 | 1956 |
| Cape | 11.4 | 4.0 | 24 | |
| Natal | 14.2 | 3.7 | 28 | |
| Transvaal .. | 12.0 | 4.3 | 31 | |
| Orange Free State | 5.1 | 1.9 | 15 | |
| Great Britain | — | 4.7 | 10 | 1954 |
| United States of America | 14.8 | 2.2* | 6.4 | 1956 |
| German Federal Republic | 6.9 | 4.2 | 37 | average for different years |

Comparisons of accident rate data between different countries are always a little difficult to make because methods of reporting accidents vary and definitions of a traffic fatality also vary considerably. In Table 6 it will be seen that the personal injury rate for the Union is comparable with the figures for Britain and Germany though higher than the American figure. The Union's fatality rate is, however, high in comparison with the British and American figures.

Sample Traffic Survey in Johannesburg

As has already been pointed out above, accident data must be matched to data on traffic flow for the purpose of statistical studies. There is, unfortunately, a shortage of suitable data on the pattern of traffic in both rural and urban areas in the Union. A start has been made in Johannesburg to establish the pattern of traffic with

*Ongeskik vir werk die dag na die ongeluk.

*Disabled after the day of accident.

die verkeerspatroon ten opsigte van die tyd van die dag en die dag van die week vas te stel. Gedurende Oktober 1954 is 'n „kordontelling” in 30 strate deur die Stadsowerhede gemaak, maar slegs vir een dag. Een van die oogmerke van die jongste verkeersteekproef is om uit te vind watter veranderings gedurende die daaropvolgende 4 jaar plaasgevind het en om gegewens oor die verskillende dae van die week in te samel. Om mannekrag te bespaar, is 'n statistiese steekproefmetode ontwikkel sodat 'n klein span, wat vir 'n paar weke aanhoudend werk, 'n groot aantal monsterplekke kan dek. Die opname is deur 'n paar outomatiese tellers in belangrike strate in die middestad aangevul.

Die opname is met behulp van en in samewerking met die Stadsingenieur se Departement deur die Instituut se personeel gemaak en het van 14 Oktober tot 16 November 1958 geduur. Handtellings is van 7.00 v.m. tot 7.00 nm. gemaak. Die groot hoeveelheid gegewens word nog ontleed. Een besondere aangeleentheid wat aandag geniet, is die gebruik van meervoudige regressie-analise om uit te vind of 'n kennis van die verkeerspatroon per tyd van die dag en dag van die week in 'n besondere straat gebruik kan word om die totale tydsverspreiding van verkeer in die stad te skat.

Ontwikkeling van Outomatiese Verkeersregistreertoerusting

Outomatiese verkeersregistreertoerusting is noodsaaklik vir enige stelselmatige verkeersstudies wat noodwendig van aansienlike tydsduur is. 'n Teller wat die syfers druk, is gebou om die aantal asse wat elke kwartier verbygaan en die totale telling vir 24 uur vir beide verkeersrigting op 'n straat, aan te stip. Hierdie instrument werk van 'n elektriese sein van 'n pneumatiese buis en 'n drukskakelaar of van 'n direkte aanrakingskussing.

'n Aanvang is ook gemaak met die ontwikkeling van 'n outomatiese spoedregistreerder waarin die seine van twee aanrakingskussings wat omtrent 2 voet vanmekaar op die pad geplaas word, verwerk word. Die instrument pons 'n kodeletter of -nommer op 'n standaard „Telex”-ponsmasjien. Met hierdie metode word die snelhede van voertuie in 'n aantal groepe geklassifiseer.

'n Meer ingewikkelde apparaatprototipe word tans in samewerking met die Instituut deur die Nasionale Fisiese Navorsingslaboratorium ontwerp en gebou. In dié apparaat word deur middel van seine van 'n spesiale padkussing die tyd, die aantal asse, spoedgroepeklasifikasies en asgewig (in 6 groepe) op 'n papierband gepons. Die doel is om hierdie gegewens so te rangskik dat dit teen 'n hoë spoed deur die outomatiese syferrekenmasjien (Zebra) in die Nasionale Fisiese Navorsingslaboratorium verwerk kan word.

Vir lys van publikasies, blaai asseblief om.

respect to time of day and day of week. In October, 1954, a “cordon count” survey on 30 streets was done by the City authorities but for one day only, and one of the objects of the new sample survey has been to find what changes have occurred during the subsequent four years and to obtain the data for various days of the week. To save on manpower, a statistical sampling method was evolved whereby a small team, working continuously for several weeks, could cover in turn a large number of sampling points. The survey was also supplemented by the use of several automatic counters installed on important streets in the central area.

The survey was conducted by Institute staff with the assistance and collaboration of the City Engineer's Department and lasted from 14th October to 16th November, 1958. Manual counts were made from 7.0 a.m. to 7.0 p.m. The large amount of data obtained is still being analysed. One particular point receiving attention is the use of multiple regression analysis to find whether a knowledge of the traffic pattern per time of day and day of week on a single street can be used to estimate the total time distribution of traffic in the city.

Development of Automatic Traffic Recording Equipment

Automatic traffic recording equipment is essential for any systematic traffic studies involving, as they must, considerable periods of time. A “print out” counter has been built to record the number of axles passing in each quarter of an hour and the total 24 hours count for both directions of traffic flow on a street. This instrument will operate from an electrical signal provided by a pneumatic tube and pressure switch device or a direct contact pad.

A start has also been made with the development of an automatic speed recorder in which the signals from two contact pads on the road about 2 feet apart are processed and made to punch a coded letter or figure on a standard reperforating machine of the ‘Telex’ type. In this method the speeds of vehicles are classified into a number of groups.

A more elaborate prototype apparatus is now being designed and built by the National Physical Research Laboratory in collaboration with the Institute in which signals from a special pad on the road will record on punched paper tape the time, axle count, speed group classification and axle weight classified into six groups. The intention is to arrange that the data so recorded can be processed at high speed by the automatic digital computer (Zebra) in the National Physical Research Laboratory.

For list of publications please turn over.

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DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL XI

NATIONALE INSTITUUT
VIR WATERNAVORSING

PART XI

NATIONAL INSTITUTE
FOR WATER RESEARCH

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. Box 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)



*Proefinstallering om die verwerking van munisipale afval
in kompos te bestudeer*

*Pilot plant to study the conversion of municipal wastes
into compost*

NASIONALE INSTITUUT VIR WATERNAVORSING

Direkteur: DR. G. J. STANDER

Die belangrikste ontwikkeling was die reorganisasie van die Instituut se navorsingswerk nadat dit op 1 April 1958 as nasionale instituut ingestel is. Voor die tyd was dit tien jaar lank 'n Afdeling van die Nasionale Chemiese Navorsingslaboratorium. In die tien jaar is ondervinding opgedoen van nagenoeg alle hoofrigtings in waternavorsing.

Die Instituut is onder andere belas met navorsing op die gebied van die skeikunde, die hidrobiologie en die bakteriologie van die land se waterbronne boponds en ondergronds, die suiwing en behandeling van water vir huis en nywerheid, die besoedeling van oppervlak- en grondwater en die suiwing van staats- en nywerheidsuitvloeiing om dit weer te kan gebruik en vir uitstort in riviere of in die see.

Die Instituut het bevoegde personeel vir skeikunde, chemiese en siviele ingenieurswese, bakteriologie en biologie.

VAALRIVIEROPNAME

Die Vaalrivier is een van die belangrikste waterbronne in Suid-Afrika vir huishoudelike gebruik, die nywerheid en die landbou. Vanselfsprekend het dit dus aan die orde gekom vir 'n hidrobiologiese opname. Die Vaalrivier en sy takke vloei oor die hoëveldstreek wat die grootste gedeelte van sentrale Suid-Afrika uitmaak. Min was bekend van die hidrobiologie daarvan. Die rivier het 'n groot stroomgebied, daarom is besluit om dit in afsonderlike streke te verdeel, wat dan apart bestudeer kan word. Die eerste gedeelte wat opgeneem is, is die van die Vaaldam stroomaf tot omtrent vyf myl onderkant die Vaalstudam, terwyl die ander gedeelte die toeloop van die Vaaldam self is.

Die Vaalrivier van die Vaaldam af stroomaf

Hierdie gedeelte van die rivierloop het eers uit 'n reeks lang, diep poele bestaan, geskei deur korter stroomversnellings. Toe is 'n groot studam oor die rivier omtrent 35 myl onderkant die Vaaldam gebou, met die gevolg dat die water opstoot en nou soos 'n lang kanaal lê amper tot by die Vaaldam self. Die water is hier selde vlakker as 15 voet. Die Vaalrivier voer baie slik af, en 'n groot gedeelte daarvan het in hierdie stadig vloeiende gedeelte besink. Die besinking is grootliks bevorder deur die hoë konsentrasies sulfate uit die takriviere wat deur goudmynstreek vloei. Hoë banke nuwe slik is dikwels net onder die samevloeiing van hierdie strome met die hoofstroom gevind.

NATIONAL INSTITUTE FOR WATER RESEARCH

Director: DR. G. J. STANDER

The most significant development was the reorganization of the Institute's research activities following its establishment as a national Institute on the 1st April, 1958. As a former Division of the National Chemical Research Laboratory, ten years experience was built up in most of the more important aspects of water research.

The Institute has amongst its terms of reference the provision of chemical, hydrobiological and bacteriological research in respect of the country's surface and underground water resources; the purification and treatment of water for domestic and industrial purposes; pollution of surface and underground waters, and purification of sewage and industrial effluents for re-use and for discharge into rivers or the sea.

The Institute carries staff qualified in chemistry, chemical engineering, civil engineering, bacteriology and biology.

VAAL RIVER SURVEY

The Vaal River is one of the most important sources of domestic, industrial and irrigation water in South Africa and was, therefore, an obvious subject for a hydrobiological survey. The Vaal and its tributaries drain the elevated Highveld region which forms most of central South Africa and where little was known of the hydrobiology. Because of its size, it was decided that the river basin should be divided up into regions which could be studied separately. The first part of the river to be surveyed was the reach downstream from the Vaal Dam to about five miles below the Vaal Barrage and the second region was the catchment area of the Vaal Dam itself.

The Vaal River downstream from the Vaal Dam

This reach originally consisted of a series of long, deep pools separated by shorter rapids. However, a large barrage was built across the river about 35 miles below the Vaal Dam and this banked up the water and formed a canal-like stretch extending back nearly to the dam itself. The depth in this stretch is seldom less than 15 feet. The Vaal River carried much silt and a large amount was deposited in this slow-flowing stretch. This deposition was actually accelerated by high concentrations of sulphates brought in by tributaries flowing from gold-mining areas and deep banks of freshly deposited silt were frequently found below the confluence with these streams.

Oor die algemeen is die bodemdiererelewe swak. Dit bestaan meestal uit Turbificidae en klein nematodes. Die klein getalle diertjies en soorte word toegeskryf aan die smoorwerking van die kleiagtige slik. Die dierelewe in die randstrook wat deur oewer- en waterplante begroei is, is taamlik ryk, hoewel die begroeiing deur waterplante soos *Potamogeton* en *Myriophyllum* beperk is weens die troebelheid van die water. Soöplankton ontwikkel in tye van stadige vloei, veral onmiddellik bokant die studam, waar die water helderder is omdat die meeste slik dan al besink het. Elders is soöplankton hoofsaaklik op beskutte plekke, soos onder randplante, aangetref. Die samestelling wissel selfs op kort afstande.

Onderkant die Studam maak die rivier 'n reeks lang poele en stroomversnellings met 'n paar kliplope tussenin. Die dierelewe op die kliplope onmiddellik onderkant die Studam was van 'n besonder eienaardige samestelling wat blykbaar verband hou met die groot hoeveelheid plankton in die water. Digte konsentrasies planktonvoerders, hoofsaaklik Hydropsychidae en Macronematidae, is aangetref. Binne omtrent vyf myl is geen plankton meer gevind nie en was die bevolking van die kliplope anders.

Uit die opname het geblyk dat die besoedeling in die streke Vereeniging en Vanderbijlpark betreklik gering is. Uitvloeiwatervat voedingstowwe bevat, het egter onmiddellik bokant die Studam in die Loch Vaal gekom, wat ongetwyfeld tot die digte planktongroei bygedra het wat daar dikwels voorkom. Volgens metings kan die hoeveelheid soöplankton wat onder die Studam deurgaans, tot 12 metrieke ton (droëgewig) per dag of 75 diertjies per liter bedra.

Vaaldamtoeloop

'n Voorlopige opname is in die strome van die Vaaldam se toeloop en in die bolope van die Vaalrivier gedoen. Hierdie streek is van groot belang, aangesien dit die vernaamste waterbron vir die nywerheids- en goudmyngedebied van die Witwatersrand en vir belangrike besproeiingskemas is. Daarom moet die gehalte van die water sorgvuldige aandag geniet. Hidrobiologiese en chemiese werk is op tou gesit om 'n helder beeld te verkry van die verwagte toestand in die verskillende soorte strome van hierdie Hoëveldstreek, om besoedelingsbronne vas te stel, die uitwerking daarvan na te spoor en te bepaal in watter mate elke soort stroom selfsuiwerend is.

Uit die vroeë resultate blyk dit dat die strome in die toeloop baie troebel is en groot hoeveelhede slik meevoer van plase wat op 'n wyse bewerk word wat nie by die grond en die klimaat pas nie. Die slik van die Wilgerivier bevat meer sand as dié van die Vaalrivier, omdat die grond in sy toeloop sanderiger is. Die hoofstrome in die streek is besonder uiteenlopend in profiel. Party ontspring in berge en het tipiese bergfauna langs

The bottom fauna was poor on the whole and consisted mainly of Tubificidae and small nematodes. The small numbers and paucity of species were attributed to the smothering effects of the clay-like silt. The fauna of the marginal fringe of bank plants and of aquatic plants were fairly rich though the growth of aquatic plants, such as *Potamogeton* and *Myriophyllum*, was restricted because of the turbidity of the water. Zooplankton developed during periods of slow flow, particularly immediately above the Barrage where the water was clearer because most of the silt had already been deposited. Elsewhere zooplankton was mainly found in sheltered spots, such as among marginal vegetation. The composition varied even in closely adjacent localities.

Below the Barrage the river consists of a series of long pools and rapids with some stony runs. The faunal community in the stony runs immediately below the Barrage had a most distinctive composition which appeared to be related to the large amount of plankton in the water. Dense concentrations of plankton feeders, mainly Hydropsychidae and Macronematidae, were found. The Plankton disappeared within about five miles and the population of the stony runs changed.

The survey showed that pollution in the areas of Vereeniging and Vanderbijlpark was relatively mild. However, effluents containing nutrients were discharged into the Loch Vaal section immediately above the Barrage, which undoubtedly encouraged the dense plankton growth which often developed there. Measurements showed that the quantity of zooplankton passing under the Barrage could amount to over 12 metric tons per day (dry weight) or 75 animals per litre.

Vaal Dam Catchment Region

A preliminary survey was carried out on the streams in the catchment of the Vaal Dam, including the upper Vaal River. This region is of great importance as it forms the main water supply for the Witwatersrand industrial and gold mining area and for important irrigation schemes. The water quality, therefore, has to be carefully guarded. Hydrobiological and chemical work was started so as to establish a clear picture of conditions to be expected in the different types of stream in this Highveld region, to locate sources of pollution, to trace its effect and evaluate the self-purification capacity of the different types of stream.

Early results showed that the streams in the catchment were very turbid and carried much silt which originated from farming practices unsuited to the climate and soil. The silt of the Wilge River contained more sand than that of the Vaal because the soils in its catchment area are more sandy. The main streams in the region have very diverse profiles. Some rise in mountains and have typical mountain fauna in their

hulle bolope, terwyl ander, soos die Vaal self, hulle oorsprong tussen heuwels het waar bergsoorte nie aangetref word nie. Die profiel van die meeste strome word betreklik gou vlak, behalwe dié van die Kliprivier, wat byna in sy hele loop steil bly. Dit is glad nie verbasend dat verskeie soorte in dié rivier aangetref is wat nie in ander voorkom nie. 'n Ontleding is gemaak van die grootte van die deeltjies in die bodembesinking oor die hele toeloop. Die voorlopige resultate dui op 'n taamlike noue korrelasie tussen die sliksamestelling en dierelewe.

'n Uitvoerige algemene chemiese ontleding van die toeloop bokant die studam is nou na drie jaar voltooi. 'n Voorlopige ontleding van die gegewens bewys dat vroeëtydige maatreëls teen besoedeling nodig is. Die gegewens wat tot dusver ingesamel is, lewer genoeg fundamentele inligting op om die S.A.B.S. in staat te stel om standaardspesifikasies vir uitvloeiewater ooreenkomstig die Waterwet (54 van 1956) op te stel.

DIE JUKSKEI-KROKODILRIVIERNET EN DIE HARTBESPOORTDAM

Die ekologiese studie van hierdie rivierenet en die Hartbeespoortdam is voltooi. Die volgende algemene gevolgtrekkings is uit 'n ontleding van die gegewens gemaak.

Die Rivierenet

Die water van die hoof-Jukskeirivier en sy besoedelde takke is sterk gemineraliseer, veral deur ammonium- en niraatsoute. Die mineralisasie is veroorsaak deur riooluitvloeiewater en water uit chemiese fabriek. Afloopwater van landerye en oorbeweide en gebrande veld het die mineraalkonsentrasie nog verder verhoog.

Die riooluitvloeisel het stroomaf nie 'n lineêre suurstofval veroorsaak nie, maar wisselinge in die gehalte en hoeveelheid van hierdie uitvloeisel in die winter is weerspieël deur 'n daaglikse suurstofval, wat 'n uitbreiding is van normale suurstofpuls in skoon strome.

Selfsuiwering in die gewone sin van die woord het nie in die bolope van die hoofstroom plaasgevind nie, terwyl verminderde konsentrasies van eutrofe stowwe hoofsaaklik deur verdunning teweeggebring is.

Die fauna van die randbegroeiing bestaan meestal uit Tubificidae en Chironomidae in die hoofstroom. Na die samevloeiing van hierdie stroom met die Krokodil- en Hennopsrivier is die Chironomidae en die eendagsvlieg (Ephemeroptera) oorwegend onder die fauna. Die fauna van die klippe in die stroom van die Jukskeirivier is baie beperk; slegs soorte van die Oligochaeta en die Orthoclaadiinae kom veelvuldig voor. Die enigste eendagsvlieg wat in die rivier gevind is, was 'n *Baetis harrisoni*. Die fauna van hierdie twee biotoppe in die skoon stroom was van baie groter verskeidenheid.

upper reaches, while others, such as the Vaal itself, rise in hills where mountain species were not found. The profiles of most of the streams flatten out fairly rapidly except that of the Klip River which is fairly steep for most of its course. It was not surprising that several species found in this river did not occur in the others. Particle size analysis was carried out on bottom sediments from all over the catchment area and preliminary results indicated that there was a fairly close correlation between their composition and their fauna.

A detailed chemical survey of the catchment area above the barrage has been in progress for the past three years. This general chemical survey was completed and a preliminary analysis of the data indicated that early measures for controlling pollution were necessary; the data thus far collected provides sufficient basic information to assist the S.A.B.S. in the specification of standards for effluents in terms of Water Act No. 54 of 1956.

THE JUKSKEI-CROCODILE RIVER SYSTEM AND HARTBESPOORT DAM

The ecological study of this river system and Hartbeespoort Dam was completed. The following general conclusions were drawn from analysis of the data.

The River System

The waters of the main Jukskei River and polluted tributaries were highly mineralized, especially by ammonium and nitrate salts. This mineralization was caused by sewage effluents and chemical factory effluents. Drainage from crop farming and overgrazed and burnt veld added further to the mineral concentration.

The sewage effluent outfall did not cause a linear oxygen sag downstream but variations in quality and volume of this outfall during winter were reflected by a diurnal oxygen sag which is an extension of normal oxygen pulses found in clean streams.

Self-purification in its normally accepted sense did not occur in the upper reaches of the main stream and reduction in concentrations of eutrophic substances was mainly brought about by dilution.

The fauna of the marginal vegetation was mainly composed of Tubificidae and Chironomidae in the main stream. After confluence of this stream with the Crocodile and Hennops Rivers the Chironomidae and Mayflies (Ephemeroptera) were mainly predominant in the fauna. The fauna of the stones in current in the Jukskei River was very restricted and only species of the Oligochaeta and Orthoclaadiinae predominated. The only mayfly found in this River was *Baetis harrisoni*. The fauna of these two biotopes in the clean streams was far more varied. The absence of particular species

Die afwesigheid van bepaalde soorte in die hoofstroom en die oorwig van ander is 'n duidelike bewys van die uitwerking wat hierdie besoedeling het op die biota van strome. Gevolglik was dit moontlik om fauna- en floraverbande op te stel wat afsonderlik of gesamentlik 'n doeltreffende maatstaf van hierdie soort besoedeling uitmaak.

Hartbeespoortdam

Die limnologiese ondersoek van hierdie dam is die eerste van sy soort in die Unie van Suid-Afrika. Die ondersoek was voorlopig van aard, en slegs die vernameeste limnologiese eienskappe is daarby betrek. Hulle is: wisselinge in opgeloste suurstof, veral met betrekking tot die vertikale verspreiding; seisoenswisselinge in die temperatuur, veral met betrekking tot die vorming van die termoklien; die skeikunde van die strook vrylopende water in algemene trekke; en die fisiese en chemiese eienskappe van die bodembesinsel.

Uit 'n ontleding van die gegewens uit hierdie studies blyk heeltemal duidelik dat die Dam eutroof is, met *Microcystis*-soorte as kenmerkende alge. Hulle dryf dig op die wateroppervlak in die somer. Die vernameeste oorsaak van die eutrofering is die eutroferende bestanddele van die Jukskei-Krokodilnet. As gevolg van hierdie besoedeling het die dam in die somer 'n volledig gedeoksigeneerde hipolimnion op 11 meter diepte. Gedurende die winter is die water van die dam volkome geoksigeneer. Die herfskentering vind gedurende Maart en April plaas.

Uit bestudering van die bodembesinsel blyk dat die Dam se besinsel in die somer anaeroobies is, wat 'n verdere bewys is van termokliene-uitbreiding.

TUGELARIVIER

'n Hidrobiologiese opname van die Tugelarivier in Natal is voltooi. Die doel was die beskrywing van die huidige fisiese, chemiese en biologiese gesteldheid van die rivier, die uitwerking van veranderende omstandighede in die nywerheid en die landbou op lewensvorme in die stroom, die bronne van besoedeling en die biologiese veranderings wat daarmee gepaard gaan.

Chemiese en biologiese eksemplare is oor twee tot drie jaar by 30 plekke versamel. Die resultate toon dat die rivier vir die meeste doeleindes in drie hoofstreeke verdeel kan word: die boonste of bergstreek, 18 myl lank, met 'n steil profiel; 'n middelstreek, 175 myl lank, met wisselende profiel; en 'n onderste streek, waar die profiel taamlik egalig uitvlak na die monding toe. In die boonste gedeelte van die middelstreek begin die profiel uitvlak sodra die rivier by die uitlopers van die berge verby is, maar dan volg daar 'n verjongingstreek waar die rivier sy weg deur laer geologiese formasies baan. Kliplope met vinnig vloeiende water kom hier

in the main stream and the predominance of others was a clear indication of the effect of this particular type of pollution on the biota of streams. As a result it was possible to draw up fauna and flora associations which, separately or together, become an efficient measure of pollution of this type.

Hartbeespoort Dam

The limnological investigation of this dam was the first of its kind in the Union of South Africa. The investigation was of a preliminary nature and only the main limnological characteristics were investigated. These were: variations in dissolved oxygen with special reference to the vertical distribution; seasonal variations in Temperature with special reference to the formation of the Thermocline; general features of the chemistry of the free water zone; and physical and chemical characteristics of the bottom sediments.

Analysis of the data obtained from these studies indicated quite clearly that the Dam was eutrophic and its characteristic alga *Microcystis* spp., which occurred during the summer in very dense blooms. The main cause of this eutrophication was the eutrophying components of the Jukskei-Crocodile system. As a result of this pollution the dam during summer possessed a completely deoxygenated hypolimnion at a depth of 11 meters. During winter the waters of the Dam were fully oxygenated and the autumnal turn-over was found to take place during March and April.

Bottom sediments studies revealed that during summer the Dam sediments were anaerobic which was further proof of thermocline extension.

TUGELA RIVER

A hydrobiological survey of the Tugela River in Natal was completed. This work aimed at describing the present physical, chemical and biological conditions in the river, the effects of changing industrial and agricultural conditions on stream life and the sources of pollution and the biological changes associated with it.

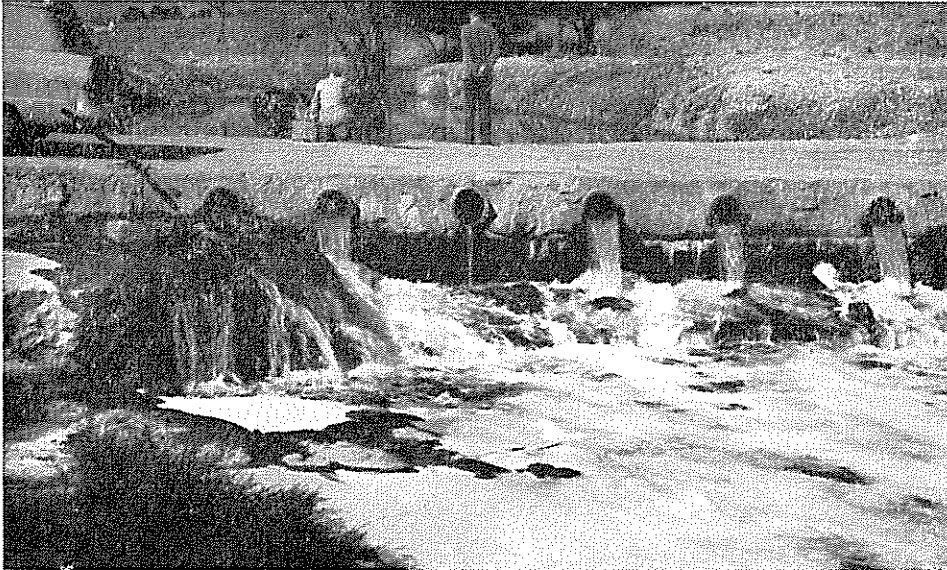
Chemical and biological samples were collected over periods of two to three years from thirty stations. The results showed that, for most purposes, the river could be divided into three main regions: the upper, mountain regions, 18 miles long, with a steep profile; a middle region, 175 miles long with a variable profile; and a lower region where the profile flattens out fairly regularly to the mouth. In the upper part of the middle region, the profile begins to flatten out as the river leaves the mountain foot hills, but there follows a zone of rejuvenation where it cuts into lower geological formations. Stony runs in fast-flowing water reappear

weer voor, maar die fauna daarvan verskil baie sterk van dié in die bergstreek daarbokant, waarskynlik weens die verskil in temperatuur en slikgelhalte. Die fauna van die laer streek word gekenmerk deur die voorkoms van subtropiese soorte.

Uit 'n vergelyking met ander riviere wil dit voorkom asof die biologiese patroon wat in die Tugela waargeneem is, tipies is van ander riviere in Natal.

in this region but their fauna is very different from that of the mountain region above, probably because of changes in temperature and silt content. The fauna of the lower region is characterized by the appearance of sub-tropical species.

Comparison with other rivers suggested that the biological pattern observed in the Tugela was typical of other rivers in Natal.



Aanduidings van rivierbesoedeling deur sintetiese reinigingsmiddels veroorsaak, en skuimvorming

Indications of river pollution caused by synthetic detergents and the formation of foam

Hoewel ernstige besoedeling in party takriviere vasgestel is, was die hoofrivier feitlik onbesoedel, behalwe op 'n paar plekke waar geringe organiese besoedeling voorgekom het. Kenmerkende veranderinge in die fauna is op dié plekke waargeneem, maar die toestand het gou weer normaal geword, wat dui op vinnige herstel. Die chemiese ontledings het hierdie bevindings gestaaf. Die minerale samestelling van die water is ook oor die hele loop van die rivier goed bevind. Opgeloste stowwe het nêrens meer as 145 dele per miljoen, selfs in die droë tyd, bedra nie.

'n Spesiale studie is van die slikgdrag van die rivier gemaak, waaruit blyk dat 478,000 ton gedurende die somer van 1955/56 by Bergville in die middelstreek verbygegaan het.

Although some tributaries were found to be badly polluted, the main river was virtually uncontaminated except for a few limited localities where mild organic pollution occurred. Characteristic faunal changes occurred near the actual sites, but the fauna soon reverted to normal, indicating rapid recovery. The chemical analyses supported these findings. The mineral quality of the water was also found to be good over the whole length of the river and dissolved matter did not exceed 145 parts per million anywhere, even in the dry season.

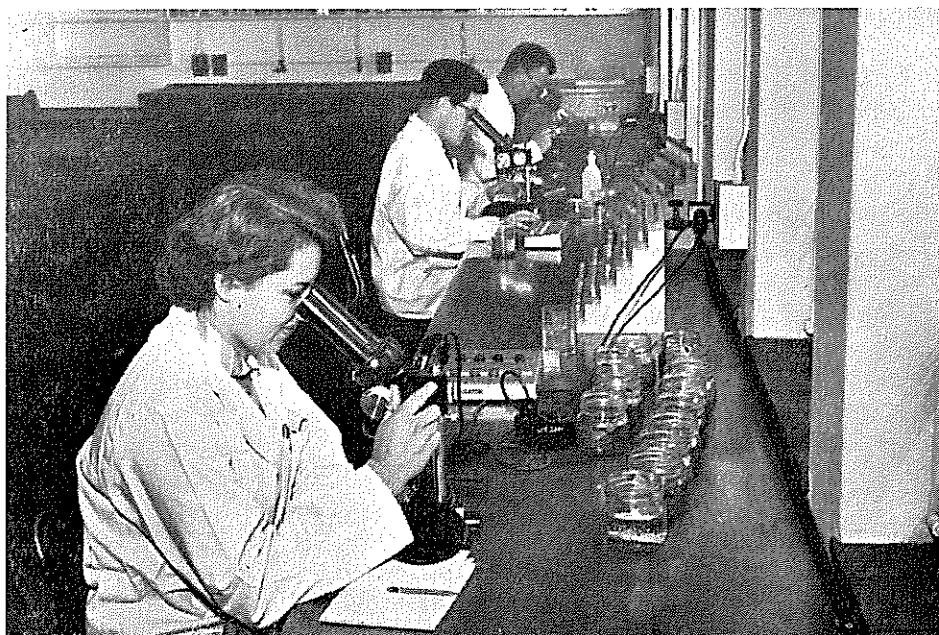
A special study was carried out on the silt loads in the river and these showed that 478,000 tons of silt passed Bergville, in the middle region, during the summer of 1955/56.

SWARTKOPSRIVIER, PORT-ELIZABETH

Klagtes oor ernstige besoedeling van die Swartkopsrivier het aanleiding gegee tot 'n beperkte spesiale opname van hierdie stroom. 'n Biologiese, chemiese en bakteriologiese studie is onderneem. Dit is in meer

SWARTKOPS RIVER, PORT ELIZABETH

Complaints of serious pollution of the Swartkops River led to a limited, special survey of this stream which included biological, chemical and bacteriological studies. The stream proved interesting in a number of



Die identifisering van insektelewe in rivierwaters

The identification of insect life in river waters

as een opsig 'n interessante rivier. Die rivier ontspring in die Tafelbergreeks, en die mineraalgehalte van die water is taamlik laag. 'n Kort entjie bokant Uitenhage loop die rivier egter deur seelae. Daarvandaan styg die konsentrasie opgeloste vaste stowwe (hoofsaaklik natriumchloried) vinnig tot 2000 en selfs 3000 dele per miljoen net bokant die estuariese loop. Daar is plekke waar ernstige organiese besoedeling plaasgevind het. Op een plek is die volgende opgeteken: biochemiese suurstofvereiste (Biochemical Oxygen Demand, B.O.D.) 14.6 en 13.1 dele per miljoen, nitraat-stikstof 15 dele per miljoen, ammoniakstikstof 12 dele per miljoen. Selfsuiwering was baie vinnig, sodat 'n normale toestand twee myl laeraf gevind is. Hierdie veranderings is toegeskryf aan die digte vergroeiing met draadveselrige alge en diatome in die bedding wat altyd met digte

ways; the headwaters rise in Table Mountain series formations and the mineral content of the water was found to be fairly low. A short distance above Uitenhage, however, the stream runs through marine beds and the concentration of dissolved solids (mainly sodium chloride) was found to rise sharply to values between 2,000 and 3,000 parts per million just above the estuarine reach. There were places where serious organic pollution took place and at one spot the following were recorded: Biochemical Oxygen Demand 14.6 and 13.1 parts per million, nitrate nitrogen 15 parts per million, ammonia nitrogen 12 parts per million. Selfpurification was very rapid and normal figures were obtained two miles lower down. These changes were attributed to heavy growths of filamentous algae and diatoms in the bed associated with dense fauna.

fauna gepaard gaan. Ernstige besoedeling met fekale bakterieë is in dieselfde trajek gevind, maar dis net so vinnig verstrooi. Dit was 'n interessante verskynsel dat die selfsuiweringsvermoë van hierdie rivier nie verminder is deur die hoë mineraalgehalte van die water nie.

Serious faecal bacterial pollution was detected in the same stretch but this was dissipated with equal rapidity. It was interesting to note that the self-purification power of this stream was not adversely affected by the high mineral content of the water.

UITWERKING VAN RIOOLWATERSUIWERING OP FEKALE BAKTERIEË

'n Bepaalde hoeveelheid rioolslyk is deur al die stadiums van 'n konvensionele rioolsuiweringsinstallasie gevolg. Tabel I gee 'n verteenwoordigende beeld van die algemene tendense wat in die aanvangstadiums van die ondersoek vasgestel is.

EFFECT OF SEWAGE PURIFICATION ON FAECAL BACTERIA

A specific batch of sewage was followed through all the various stages of a conventional sewage purification plant. Table I is representative of the general tendency found during the initial stages of the experiment.

TABEL I/TABLE I

| Stadium in proses/Process Stage | Fekale streptococci Faecal Streptococci | | Fekale coli Faecal coli | |
|---|---|---|--------------------------------|---|
| | Waarskynlike getal (W.G. per ml.) Probable number M.P.N. per ml. | % Vermindering gebaseer op besinkte rioolwater % Reduction based on settled sewage | W.G. per ml. M.P.N. per ml. | % Vermindering gebaseer op besinkte rioolwater % Reduction based on settled sewage |
| Rou rioolwater/Raw sewage | 45,000 | | 110,000 | |
| Besinkte rioolwater/Settled sewage | 33,000 | | 130,000 | |
| Primêre biologiese sypelbeddings (12 vt.)/Primary Biological filters (12 ft.) | 4,900 | | 22,000 | |
| Primêre humustenk/Promary Humus Tank | 3,300 | | 17,000 | |
| Sekondêre biologiese sypelbeddings (12 vt.)/Secondary Biological filters (12 ft.) | 78 | 99.76 | 700 | 99.46 |
| Sekondêre humustenk / Secondary Humus Tank | 330 | 98.78 | 2,400 | 98.15 |

Omdat die monsters van die rou rioolwater nie altyd so verteenwoordigend was as wat 'n mens kan verwag nie, is die berekende persentasiewe vermindering gebaseer op syfers vir besinkte rioolwater.

Gedurende die besinking in die sekondêre humustenk het die aantal fekale bakterieë toegeneem. Dit was ook die geval met die coliform groep bakterieë en die aerogenesbakterieë.

DIE VOORKOMS VAN FEKALE BAKTERIEË IN 'N RIVIER WAT DEUR 'N BEVOLKTE GEBIED LOOP

Weens die skraalheid van die gegewens op dié terrein

Owing to the fact that the raw sewage samples were not always as representative as could be expected, the percentage reduction calculated was based on figures for settled sewage.

During the sedimentation in the secondary humus tank an increase took place in the number of faecal bacteria. This also occurred with the total coliform group of bacteria, and the aerogenes types of bacteria.

THE OCCURRENCE OF FAECAL BACTERIA IN A RIVER FLOWING THROUGH A POPULATED AREA

Due to the paucity of information on this aspect,

is opnames gedoen in 'n stadsgebied met 'n verskeidenheid van bevolking en nywerheidswerkzaamhede. Die toestand by droë sowel as nat weer is ondersoek.

surveys were undertaken in a city area which comprised various types of populations and industrial activity; conditions being studied in both dry and wet weather.

Blanke Woongebied

Prakties het die bestudeerde drie tipes van blanke woongebied by droë weer tot dieselfde fekale besoedeling van die rivier bygedra. Die volgende tabel gee besonderhede van die verteenwoordigende bakteriologiese samestelling van die rivierwater in die drie gebiede gedurende 'n droë tydperk van drie weke.

European Residential Area

For all practical purposes the three types of European residential areas studied during dry weather conditions contributed the same faecal pollution to the river. The following table details the representative bacteriological composition of river water in the three areas covering a dry period of three weeks.

TABEL II / TABLE II

| | Totale plaattelling per ml. Total plate count per ml. | Fekale streptococci W.G. per ml. Faecal Streptococci M.P.N. per ml. | Fekale coli W.G. per ml. Faecal coli M.P.N. per ml. |
|--------------------------|--|--|--|
| 1ste week/1st week | 950,000 | 49 | 13 |
| 2de week/2nd week | 195,000 | 33 | 79 |
| 3de week/3rd week | 135,000 | 17 | 130 |

Vir die bestudering van die toestand by nat weer is daar een dag na 'n neerslag van 5½ dm. reën op dieselfde plekke monsters geneem.

In order to cover wet weather conditions samples were taken from the same points on a day following a rainfall in these areas of 5½ inches.

TABEL III / TABLE III

| Soort gebied/Type of Area | Totale plaattelling per ml. Total plate count per ml. | Fekale streptococci W.G. per ml. Faecal Streptococci M.P.N. per ml. | Fekale coli W.G. per ml. Faecal coli M.P.N. per ml. |
|--|--|--|--|
| Blanke woongebied/European residential area | 55,000 | 150 | 110 |
| Blanke woongebied/European residential area | 100,000 | 68 | 330 |
| Blanke woon- en besigheidsgebied/European residential and business area .. | 250,000 | 400 | 4,600 |
| Riooluitvloei in die rivier uitgestort/ Sewage works effluent discharged into the river | 500,000 | 4,500 | 49,000 |

Die invloed van reënwater in die rioolstelsel moet die oorsaak wees vir hierdie afname in totale telling en die toename in fekale streptococci- en fekale coli-bakterieë.

Flooding of the sewerage system by rain water seepage was considered to be the cause for this decrease in total count and increase in faecal *streptococci* and faecal *coli* bacteria.

Asiate- en Bantoewoongebiede

Die bydrae tot die fekale besoedeling van 'n tak van die hoofrivier wat deur hierdie streke loop, was omtrent dieselfde as by die blanke woongebied. Die dag na die reën is egter die volgende aangeteken.

Asiatic and Bantu Residential Areas

The contribution to the faecal pollution by a tributary of the main river system draining these areas during dry weather was of the same order as for the European residential area. The day after the rain, however, the following results were recorded.

TABEL IV / TABLE IV

| Soort gebied/Type of Area | Totale plaattelling per ml. Total plate count per ml. | Fekale streptococci W.G. per ml. Faecal Streptococci M.P.N. per ml. | Fekale coli W.G. per ml. Faecal coli M.P.N. per ml. |
|---|--|--|--|
| Asiatewoongebied/Asiatic residential area | 300,000 | 790 | 1,300 |
| Ongeorganiseerde Bantoeokasie / Unorganised Bantu location..... | 150,000 | 700 | 330 |
| Riooluitvloeiing in die rivier uitgestort/ Sewage works effluent discharged into the river | 500,000 | 4,500 | 49,000 |

Die resultate was waarskynlik gunstig weens die klein afloopgebied en die terreingesteldheid, wat 'n vinnige dreinerings bevorder.

The results were probably favourable because of the small drainage area and of the topography which was conducive to rapid drainage.

Rioolwatersuiweringsinstallasie

Die bydrae van die rioolwatersuiweringswerke is bepaal deur 'n monsteringsplek net bokant en 'n ander een net onder die uitvloeiingsmond in die rivier te kies. Hierdeur sou die ergste toestand blootgelê word, aangesien selfsuiwering dan nog nie plaasgevind het nie.

Sewage Purification Plant

The contribution from the sewage purification works was determined by having one sampling station just above and another immediately below the effluent entry into the river. This would reveal the worst conditions since self-purification had not come into operation as yet.

Die bakteriologiese samestelling van die rivierwater word in die volgende tabel gegee.

Bacteriological composition of river water is given in the following table.

TABEL V / TABLE V

| Studietyd/Period of Study | Fekale streptococci Faecal Streptococci | W.G. per ml. M.P.N. per ml. | Fekale coli Faecal coli | W.G. per ml. M.P.N. per ml. |
|---------------------------|--|--|---|--|
| | Bokant rioolwerk Above sewage works | Onderkant rioolwerk Below sewage works | Bokant rioolwerk Above sewage works | Onderkant rioolwerk Below sewage works |
| 1ste week/1st week | 130 | 1,700 (7,900) | 350 | 4,900 (17,000) |
| 2de week/2nd week | 490 | 4,500 (2,000) | 16,000 | 49,000 (130,000) |
| 3de week/3rd week | 14 | 1,100 (130) | 27 | 1,700 (5,300) |

Met die oog op vergelyking word tussen hakies die bakteriologiese gegewens vir die droë tyd verstrek vir 'n ander tak van die hoofrivier wat deur 'n gemengde gebied loop met nywerhede en met blanke en Bantobewoning. By geleentheid het hierdie tak meer fekale besoedeling bygedra as die rioolwerkkuitvloei.

BIOLOGIESE OKSIDASIE VAN ORGANIESE STOWWE

Die geografiese omstandighede van Suid-Afrika bring mee dat uitvloeiwatervloei doeltreffend gesuiver moet word vir hergebruik en storting in riviere. Daarom het dit nodig geword om diepgaande studie te maak van die doeltreffendheid van rioolsuiveringsprosesse, van behandeling in verouderingsdamme en van die proses van selfsuivering in die biologiese afbraak van organiese verbindings in rioolwater, nywerheidsafvalwater en besoedelde afloopwater.

Die huidige metodes om die graad van biologiese afbraak te bepaal deur middel van die toetse van biochemiese suurstofvereiste (Biochemical Oxygen Demand) en geabsorbeerde suurstof (Oxygen Absorbed), slaag nie daarin om sekere organiese stowwe kwantitatief te bespeur wat bekende verslegters van waterbronne is en wat gewoonlik in uitvloeiels en besoedelde afloopwater voorkom nie. Die studie is in hoofsaak beperk tot bepaalde verbindings wat reeds in rioolwater geïdentifiseer is. Spesiale toestelle vir geaktiveerde slyk is hiervoor gebou.

Om die verloop van die ontbinding van organiese verbindings noukeurig te kan volg, moes spesiale analitiese metodes en tegnieke ontwerp word. Vir die bepaling van afsonderlike aminosure en purienbasisse is chromatografiese tegnieke toegepas. Voorlopige resultate volgens die tweedimensionale tegniek, waarby butanol-asynsuur en pikolien as oplosmiddels gebruik word, dui op die teenwoordigheid van arginien, leusien, lisien, fenielalanien, sistien, treonien, valien en tirosien in besinkte rioolwater. In die uitvloeiels uit die biologiese sypelbedding kan klein hoeveelhede sistien, arginien, valien en leusien bespeur word, terwyl treonien in sterk konsentrasie aanwesig was.

Die chromatografiese tegniek met gas-vloeistofkolom is vir die bepaling van afsonderlike vetsure toegepas.

Reduserende suikers is chemies sowel as deur middel van papierchromatografie bepaal.

By wyse van ekstra vasstelling van bepaalde ontbindingsprosesse is sekere ensiemgroepe soos dehidrogenases en ureases kwantitatief bepaal.

For comparative purposes, the bacteriological figures are given in parentheses for another tributary of the main river system draining a mixed industrial, European and Bantu residential area during the dry period. On occasions this tributary contributed more faecal pollution than the sewage works effluent.

BIOLOGICAL OXIDATION OF ORGANIC SUBSTANCES

Geographic conditions in South Africa require the efficient purification of effluents for re-use and discharge into streams. It has therefore become essential to commence detailed studies of the efficiency of sewage purification processes, of maturation pond treatment and of the process of self-purification in the biological degradation of organic compounds found in sewage, industrial waste and polluted run-off water.

The present methods of assessing the degree of biological degradation by the Biochemical Oxygen Demand and Oxygen absorbed tests fail to detect quantitatively certain organic compounds which are known to be deleterious to water supplies and which commonly occur in effluents and polluted run-off water. Studies were confined mainly to specific compounds which were previously identified in sewage. Special activated sludge units were constructed for these studies.

In order to follow the actual course of decomposition of organic compounds, suitable analytical methods and techniques had to be developed. For the determination of individual amino-acids and purine bases, chromatographic techniques were used. Preliminary results obtained by the two-dimensional technique using butanol-acetic acid and α -picoline as solvents tentatively indicated the presence in settled sewage of arginine, leucine, lysine, phenylalanine, cystine, threonine, valine and tyrosine. In the biological filter effluent, small concentrations of cystine, arginine, valine and leucine could be detected, while threonine was present in high concentration.

The Gas-liquid-column chromatographic technique was used for the determination of individual fatty acids.

Reducing sugars were determined both chemically and by paper chromatography.

As an additional means of assessing specific breakdown processes, certain enzyme groups such as dehydrogenases and urases were determined quantitatively.

VOEDINGSVEREISTES BY BIOLOGIESE OKSIDASIEPROSESSE

Studies is onderneem na die voedingsvereistes van die biologiese oksidasieprosesse wat teëgekomp word by rioolwatersuiwering, na verouderingsdambehandeling, na selfsuiwering in riviere en na denitrifikasie. Die beduidendheid van stikstof, fosfor- en koolstofvereistes is kwantitatief bestudeer, terwyl fisiese faktore soos pH, rH en konsentrasie in die soliede fase in beperkte mate aan die begin van die ondersoek oorweeg is.

Die manometriese tegniek van Warburg vir die bepaling van die asemnelheid is toegepas om biologiese suurstofopname te meet. Daar is 'n statistiese verband tussen die slykkonsentrasie volgens gewig en die asemnelheid van die geaktiveerde slykmedium vasgestel. 'n Metode om die konkordansie tussen die asemnelheid en die totale plaattelling te bepaal, is ontwerp en op die proefresultate toegepas. 'n Definitiewe verband tussen asemnelheid en totale plaattelling het geblyk. Die verband met die faunabevolking van die aktiewe slyk was kwalitatief, maar verdere studie kan 'n kwantitatiewe verhouding bewys.

Metodes is ontwerp om ensiemwerking te bestudeer as ekstra middel om metaboliese werkinge te bepaal.

ADSORPSIE- EN ABSORPSIESTUDIES OOR RIVIERBODEMBESINKSELS

Organiese stowwe, minerale water en bakterieë uit riooluitvloeielsels, die afloop uit beboude gebiede en uit vuilhope, huïsvuil en landbougebiede beland uiteindelik in riviere sowel in droë as in nat tye. Party hiervan versamel in rivierbeddings en damme en vorm die bodemmodder. In hierdie modder vind daar 'n kragtige biologiese en biochemiese werksaamheid plaas. Dit speel dus 'n belangrike rol in die selfsuiweringproses.

'n Uitvoerige ondersoek na bodemmodder is op tou gesit om kwantitatief die rol vas te stel wat dit speel in die ontbinding van besoedelende materiaal. 'n Kolomtegniek is ontwerp om die adsorpsievermoë van kation, anione en amfoteriese stowwe direk te bestudeer. Daar is vasgestel dat die besinksels wat tipies is van riviere in die toeloop van die Jukskeirivier 'n definitiewe organiese en anorganiese kationadsorpsievermoë van 4 m.e. (milli-ekwivalent) per 100 gr. het.

VEROUDELING VAN GESUIWERDE RIOOLUITVLOEISEL

Hoewel bevind is dat die uitvloeisel van 'n rioolwatersuiweringstallasie wat deur 'n sandbedding gesypel het,

NUTRITIONAL REQUIREMENTS OF BIOLOGICAL OXIDATION PROCESSES

Studies were commenced of the nutritional requirements of biological oxidation processes encountered in sewage purification, of maturation pond treatment, of self-purification in rivers and of denitrification. The significance of nitrogen, phosphorus, and carbon requirements was studied qualitatively and physical factors such as pH, rH and solid phase concentration were considered to a limited extent at this initial stage of the investigation.

The Warburg manometric technique for the determination of the respiration rate was applied in order to measure biological oxygen uptake. It was found that there was a statistical relationship between the sludge concentration by weight and the respiration rate of the activated sludge medium. A method for evaluating the concordance between the respiration rate and the total plate count was developed and applied to the experimental results. It was shown that there was a definite relationship between respiration rate and total plate count. The relationship with the fauna population of the active sludge was qualitative but further studies may prove a quantitative relationship.

Methods were developed to study enzyme activities to serve as an additional means of assessing metabolic activities.

ADSORPTION AND ABSORPTION STUDIES ON RIVER BOTTOM SEDIMENTS

Organic material, mineral matter and bacteria from sewage effluents, drainage from built up areas and rubbish dumps, household refuse and from agricultural areas eventually find their way into river courses, during both dry and rainy periods. Some of these collect in river beds and dams to form bottom muds; these muds are zones of active biological and bio-chemical activity and thus play an important rôle in the process of self-purification.

Comprehensive investigations of these bottom muds were commenced in order to evaluate quantitatively their rôle in decomposing polluting material. A suitable column technique was developed to study the adsorption capacity for cation, anions and amphoteric substances, directly. It was established that sediments typical for rivers of the Jukskei River Catchment area possessed a definite organic and inorganic cation adsorption capacity of the order of 4 m.e. per 100 g.

MATURATION OF PURIFIED SEWAGE EFFLUENT

Although sand filtered effluent from a sewage purification plant has been found to be of good bacteriological

bakteriologies goed is volgens die konsentrasie fekale *E. coli*, kan dit slegs in 'n beperkte aantal gevalle sonder meer as water gebruik word. Vir onbeperkte hergebruik en vir uitstorting in riviere waarvan die water vir huishoudelike gebruik bedoel is, moet verdere biologiese suiwering gedoen word om die water bakteriologies en organies die gelyke van oppervlakwater te maak.

Onderzoek is volgens twee aparte stelsels gedoen na die behandeling van uitvloeisel uit biologiese sypelbeddings.

Stelsel A

Dit het bestaan uit eenhede in die volgende orde: grasbeddings—verouderingsdam No. 1 (26" diep)—vlak algbeddings ($\frac{1}{2}$ "– $\frac{3}{4}$ " diep)—verouderingsdam No. 2 (24" diep).

Die stroming deur die eenheid het aan die grasbeddings 'n belasting van 7 gelling per vierkante voet per dag gegee. Twee grasbeddings is ingerig. Onderwyl die een aanhoudend gelaai is, het die ander een gerus en is sy gras gesny en sy versamelde humus verwyder. Ten spyte van die geringe belasting en die feit dat die grasbeddings rustye gehad het, was die gras in albei beddings na drie maande vernietig.

Van die vier eenhede in hierdie stelsel was die grasbeddings die swakste verwyderaars van coliforme organismes. Die syfers vir geabsorbeerde suurstof is bevredigend verlaag, maar daar het baie min vermindering van stikstof in watter vorm ook al in die grasbeddings plaasgevind. Die gevolgtrekking was dat grasbeddings nie geskik beskou kan word vir die behandeling van hierdie uitvloeiels nie weens die hoë humusgehalte van die uitvloeisel uit biologiese sypelbeddings.

Stelsel B

Dit het bestaan uit eenhede in die volgende orde: verouderingsdam No. 1 (26" diep)—vlak algbeddings ($\frac{1}{2}$ "– $\frac{3}{4}$ " diep)—verouderingsdam No. 2 (24" diep).

Terwyl die twee verouderingsdamme die gewone groen kleur weens die aanwesigheid van chlorofilhoudende planktonorganismes getoon het, het die vlak algbeddings vol geraak van 'n min of meer onbeweeglike bruin massa mikroorganismes. Die uitvloeisel uit die eerste verouderingsdam het blykbaar deur hierdie massa organismes gesyfer. Die uitvloeisel uit die algbeddings was byna deurgaans kleurloos. Net partykeer is 'n groen verkleuring opgemerk.

Uit 'n tegniese oogpunt is die toevoer- en afvoersnelheid van die drie eenhede ten opsigte van biochemiese suurstofvereiste (Biochemical Oxygen Demand) nogal beduidend, soos uit tabel VI blyk.

quality as measured by the concentration of Faecal *E. coli*, it can be used as a directly available source of water supply, for only a limited number of uses. For unrestricted re-use and discharge into rivers used for domestic supplies, further biological purification is necessary to render the water bacteriologically and organically indistinguishable from surface water supplies.

Investigations were conducted on the treatment of biological filter effluent in two separate systems.

System A

This consisted of units in the following sequence: Grassbeds-Maturation Pond No. 1 (26" deep)—shallow algae beds ($\frac{1}{2}$ "– $\frac{3}{4}$ " deep)—Maturation Pond No. 2 (24" deep).

The flow through the system gave a loading to the grassbeds of 7 gallons per square foot per day. Two grassbeds were provided while one was being dosed continuously, the second one was rested, the grass cut and the accumulated humus removed. In spite of the low loading and resting of the grassbeds, the grass in both beds was destroyed after three months.

Of the four units in this system, the grassbeds were the least efficient removers of coliform organisms. The oxygen absorbed figures were reduced satisfactorily but very little reduction of nitrogen in any form took place in the grassbeds. It was concluded that owing to the high humus content of biological filter effluents, grassbeds could not be considered suitable for the treatment of these effluents.

System B

This consisted of units in the following sequence: Maturation Pond No. 1 (26" deep)—shallow Algae beds ($\frac{1}{2}$ "– $\frac{3}{4}$ " deep)—Maturation Pond No. 2 (24" deep).

Whereas the appearance of the two maturation ponds showed the usual green colour due to chlorophyll containing plankton organisms, the shallow Algae beds became filled with a more or less stationary brown mass of micro-organisms. The effluent from the first maturation pond seemed to be percolating through this mass of organisms. The effluent from the Algae beds was for the most of the time colourless although sometimes a green colouration was also observed.

From a technical point of view, Biochemical Oxygen Demand loading and removal rates of the 3 units as shown in Table VI were rather revealing.

Die albeddings was doeltreffender vir die afvoer van biochemiese suurstofverbruik as die een of die ander dam. Dit is opmerklik, aangesien die afvoer van die biochemiese suurstofvereiste (B.O.D.) in 'n deurvloeyd van 3½ uur voltooi is, teenoor 6 en 10 dae onderskeidelik in die twee verouderingsdamme.

Vir die verwydering van organismes van fekale herkoms was albeddings nie so doeltreffend as die een of die ander dam nie. Die uiteindelige uitvloeisel van die drie eenhede in serie het egter 'n vermindering van 99.9% met die mees waarskynlike getal (M.W.G.) fekale organismes getoon.

Die ontleding van die biochemiese suurstofverbruik van Dam No. 1 (tabel VI) het ook getoon dat die doeltreffendheid van 'n verouderingsdam vir die verwydering van biochemiese suurstofverbruik belemmer word deur hoë toevoer van biochemiese suurstofverbruik. Die bevindings van buitelandse navorsers stem hiermee ooreen.

The algae beds were more effective for the removal of Biochemical Oxygen Demand than was either pond. This was remarkable considering that the Biochemical Oxygen Demand removal was accomplished in a 3½ hours retention period as against six and ten days in the maturation ponds respectively.

In the removal of organisms of faecal origin, algae beds were not as effective as either of the ponds. The final effluent, however, of the three units in series, showed a reduction of 99.9% in the most probable numbers of faecal organisms.

The Biochemical Oxygen Demand analyses of pond No. 1 (Table VI) also showed that the efficiency of a maturation pond in removing Biochemical Oxygen Demand was impaired by high Biochemical Oxygen Demand loading rates, which corroborated the findings of overseas research workers.

TABEL VI / TABLE VI

*Toevoer- en Afvoersnelheid van Biochemiese Suurstofverbruik: Maandgemiddeldes van Weeklikse Ontledings
Biochemical Oxygen Demand Loadings and Removal Rates: Monthly Averages of Weekly Analyses*

| | | Januarie/ January 1958 | Februarie/ February 1958 | Maart/ March 1958 |
|----------------------------|--|------------------------------|--------------------------------|-------------------------|
| | Uitvloeisel uit biologiese sypelbedding: B.O.D. d.p.m./Biological Filter Effluent B.O.D. ppm. | 63.35 | 56.3 | 86.8 |
| Dam Nr. 1/ Pond No. 1 | Uitvloeisel B.O.D. d.p.m./Effluent B.O.D. ppm. | 40.8 | 56.1 | 76.8 |
| | Toevoersnelheid B.O.D. lb. B.O.D./acre/dag / B.O.D. Loading Rate lb. B.O.D./acre/day | 63 | 56.2 | 86 |
| | Afvoersnelheid B.O.D. lb. B.O.D./acre/dag / B.O.D. Removal Rate lb. B.O.D./acre/day | 22.5 | 0.2 | 10 |
| | Deurvloeyd, dae/Retention Time, Days | 6.1 | 6.1 | 6.1 |
| Algebeddings Algae Beds | Uitvloeisel B.O.D. d.p.m./Effluent B.O.D. ppm. | 14.4 | 22.0 | 47.1 |
| | Toevoersnelheid B.O.D. lb. B.O.D./acre/dag / B.O.D. Loading Rate lb. B.O.D./acre/day | 62 | 85 | 117 |
| | Afvoersnelheid B.O.D. lb. B.O.D./acre/dag / B.O.D. Removal Rate lb. B.O.D./acre/day | 40.3 | 51.5 | 45.3 |
| | Deurvloeyd, dae/Retention Time, Days | 0.14 | 0.14 | 0.14 |
| Dam Nr. 2/ Pond No. 2 | Uitvloeisel B.O.D. d.p.m./Effluent B.O.D. ppm. | 16.9 | 23.8 | 30.9 |
| | Toevoersnelheid B.O.D. lb. B.O.D./acre/dag / B.O.D. Loading Rate lb. B.O.D./acre/day | 9.8 | 12.1 | 25.9 |
| | Afvoersnelheid B.O.D. lb. B.O.D./acre/dag / B.O.D. Removal Rate lb. B.O.D./acre/day | toename increase | toename increase | 8.8 |
| | Deurvloeyd, dae/Retention Time, Days | 9.8 | 9.8 | 9.8 |

Die vermindering van die totale stikstof in al drie eenhede was omtrent van dieselfde orde, maar dit kan nie as bevredigend beskou word nie.

Nog 'n interessante punt is dat daar in die damme baie min aanduiding gevind is van die oksidasie van ammoniak tot nitraat. In die algeddings is egter vermeerderings van 1.5 d.p.m. nitraat as N teëgekom. Nitriete uitgedruk as N het in al drie eenhede effens toegeneem. Die vermeerdering was van 0.0 tot 0.6 d.p.m.

Verdere proewe is in damme uitgevoer waar omstandighede geskep is om die vestiging van bentoniese organismes soos hulle in bogenoemde algeddings voorkom, te bevorder.

DIE PRODUKSIE VAN KOMPOS UIT RIOOLSLYK

Die produksie van kompos het 'n tweeledige doel. Dit kan die oplossing van die huisvuilprobleem wees en dit kan die middel wees om nagvuil en rioolslak nuttig aan te wend.

'n Proefeenheid bestaan uit 'n eenvoudige roterende silinder, voorsien van toestelle om kunsmatige ventilasie te gee as dit nodig sou blyk vir die biologiese werking wat met komposproduksie saamgaan. Bybehore word verskaf vir die voorbehandeling van afval net om die fyn as te verwyder. Verder word dubbele sifting toegepas om organiese materiaal en anorganiese stowwe wat nie tot kompos verwerk kan word nie, te skei wanneer die biologies gestabiliseerde stowwe na drie tot vyf dae uit die eenheid voortkom. Daarna word die organiese bestanddeel in die buitelig gelaat om te verouder.

Aan die begin van die ondersoek is net droë, asvry afval in die installasie gevoer. Die proses het heeltemal normaal verloop, selfs sonder kunsmatige ventilasie. Uit die resultate het geblyk dat gewone afval sonder meer opmerklik goed reageer. Die biologiese werking in die draaiende trommel was bo verwagting kragtig, met 'n gemiddelde temperatuur van 58°C. Hierdie biologiese werking het onder die veroudering van die kompos in hope voortgeduur, terwyl die swamgroei opmerklik was.

AFVOER VAN UITVLOEISELS NA DIE SEE

Die Unie se kusstreke ontwikkel meer en meer as vakansieoorde. Die afvoer van rioolwater na die see is gevolglik 'n ernstige saak, wat nog ingewikkelder gemaak word deur die toenemende uitvloeiselbelasting wat die gevolg is van die intensiewe industrialisering van stede en dorpe aan die kus.

Reductions of total nitrogen in all three units were of the same order but could not be considered as satisfactory.

A further point of interest was the fact that, in the ponds, very little evidence was found of the oxidation of Ammonia to nitrate. In the algae beds, however, increases of the order of 1.5 ppm. Nitrate as N were encountered. Nitrites expressed as N increased slightly in all three units; these increases varied between 0.0 and 0.6 ppm.

Further experiments were conducted in ponds where conditions were created to stimulate the establishment of benthic organisms as they occurred in the above algae beds.

COMPOST PRODUCTION FROM SEWAGE SLUDGE

The production of compost has a two-fold purpose. It can solve the household refuse disposal problem and it provides a means of utilizing night soil and sewage sludge.

An experimental unit embodies a plain rotating cylinder which is equipped with suitable devices to provide artificial ventilation should this prove necessary for the biological activity associated with compost production. Accessories are provided for pretreatment of refuse to remove fine ash only. Further, when the biologically stabilized materials emerge from the unit after three to five days they are given double screening to separate organic and uncompostable inorganic items. Thereafter the organic component is left in the open for maturation.

In the initial stages of the investigations the plant was fed with dry, ash-free refuse only and it was found that the process proceeded quite normally, even without artificial ventilation. Results indicated that ordinary refuse on its own responded remarkably well. Biological activity in the rotating drum was unexpectedly high, the average temperature being 58°C. This biological activity continued during maturation of the compost in heaps and the spontaneous development of fungal growths was remarkable.

DISPOSAL OF EFFLUENTS INTO THE SEA

The Union's coastal areas are being increasingly developed as holiday resorts. The disposal of sewage into the sea is consequently a serious problem. This is complicated by the increasing industrial effluent load which arises from the intensive industrialization of the coastal cities and towns.

Sonder uitsondering word riool- en nywerheids-uitvloeisels op die oomblik taamlik onbesorgd in die brandingstreek gelos. Die gevaar van besoedeling van die baaistrande word verder verhoog deur die riviere wat deur digbevolkte en geïndustrialiseerde gebiede loop waar strawwe erosie voorkom.

Om die hele saak van uitvloeiselstorting in die see op 'n behoorlik georganiseerde grondslag te plaas, is 'n omvattende program van ondersoek op tou gesit. Voorlopige proewe is volgens die vlottertegniek uitgevoer. As gevolg van dié toetse is 'n volkome hersiene proefprosedure aangeneem, waarby radioaktiewe spoor materiaal by die veldproewe gebruik is en die resultate daarvan tot laboratoriummodelle uitgebrei is.

ONDERAARDSE WATER IN 'N DROË RIVIERBEDDING

Die Swakop in Suidwes-Afrika is 'n droë rivier wat net loop in die kort tydies van swaar reënval. Die rivierbedding bestaan hoofsaaklik uit 'n laag taamlike growwe sand wat van 'n paar duim tot oor die 30 voet diep op plekke is. Die intrusie van klei- en rotsformasies kom op verskeie plekke in die rivierbedding voor.

Daar is 'n onderaardse waterstroom in die rivier. Die water is van uitmuntende minerale gehalte. Op pad see toe versleg die water egter geleidelik totdat dit uiteindelik ongeskik is vir huis, nywerheids- of landbou gebruik. Om die oorsake van hierdie verslegting en die betekenis van elkeen na te gaan, is 'n uitvoerige program van ondersoek op tou gesit.

Spesiale boor- en ontledtegnieke vir die omstandighede in die veld is ontwerp. 'n Goed uitgeruste mobiele laboratorium is hiervoor beskikbaar gestel. Die loop van die hoofstroom onder die rivierbedding en van party takke is deur middel van uitvoerige chemiese ontledings gevolg. In 'n paar belangrike gedeeltes kon die bron van die geminaliseerde water wat die vars water van die Swakop bederf, nagespeur en bepaal word.

DIENS AAN DIE DEPARTEMENT VAN WATERWESE

Die spesifikasie van standarde en die oorweging van vrystellingspermitte ten opsigte van uitvloeisels wat in riviere, riviermonde en die see gestort word, bring die noodsaaklikheid van fundamentele kennis van die land se waterbronne mee. Die Waterwet, No. 54 van 1956, het dan ook ondersoek in verskeie rigtings noodsaaklik gemaak. Rivieropnames is intensiewer gedoen en besondere klem is gelê op die tegnologiese sy van die suiwering van rioolwater, nywerheidsuitvloeisel en gewone water.

Without exception, sewage and industrial effluents are at present discharged into the surf zone on a rather haphazard basis; the risk of pollution of bathing beaches is further increased by rivers which drain densely populated and industrialized areas and which are subject to heavy erosion.

In order to put the entire matter of effluent disposal into the sea on an organized basis, a comprehensive programme of investigation was undertaken. Preliminary tests using the float technique were carried out. As a result of these tests, a completely revised experimental procedure was adopted using radio active tracer material in the field studies and extending the results to model studies in the laboratory.

SUB-TERRANEAN WATER IN A DRY RIVER BED

The Swakop river in South West Africa is a dry river which flows only during the short periods of heavy rainfall. The riverbed consists essentially of a layer of fairly coarse sand, the depth of which may vary from a few inches to over 30 feet; intrusions of clay and rock formations are encountered at a number of points along the riverbed.

There is a sub-surface flow of water in the river; this water was found to be of excellent mineral quality which, however, gradually deteriorated in its course to the sea until it eventually became entirely unfit for human consumption, industrial use or for agricultural purposes. In order to establish the specific causes for this deterioration and their relative significance, a detailed programme of investigation was undertaken.

Special drilling and analytical techniques to suit conditions in the field were developed. An elaborately equipped mobile laboratory was made available for these studies. The course of the main flow of water in the riverbed and of some of the tributaries was followed by means of detailed chemical analyses. In a few important sections it was possible to detect and assess sources of mineralized water which contaminated the fresh water of the Swakop River.

SERVICES TO THE DEPARTMENT OF WATER AFFAIRS

The specification of standards and the consideration of permits of exemption for effluents discharged into streams, estuaries and the sea require basic information on the country's water supplies. Water Act No. 54 of 1956 has therefore necessitated investigations in a number of directions. River surveys were intensified and special emphasis was placed on the technological aspects of sewage, industrial effluent and water purification.

Die diens wat die Instituut deur bemiddeling van die Suid-Afrikaanse Buro vir Standaard gelewer het, het weereens 'n swaar las op die personeel gelê. Afgesien van die fundamentele navorsing wat die Waterwet vereis, is byna 50 aansoeke om permitte oorweeg, d.w.s. 'n toename van oor die 60 persent vir die jaar. Hiervoor moes oor die 40 tegniese verslae opgestel word.

ONTWERPNORME VIR RIOOLSUIWERINGSWERKE

Rioolwatersuiwering is nie alleen van onskatbare waarde vir die gemeenskap deurdat daarmee 'n higiëniese afvalverwydering verseker word nie, maar dit word nou ook erken as 'n belangrike skakel in die waterbewaringsplan. In Suid-Afrika is hierdie faktor van soveel lewensbelang vir toekomstige ontwikkeling dat die rol van die installasies vir rioolwaterbehandeling nie genoeg beklemtoon kan word nie. 'n Behoorlik ingerigte installasie vir die suiwering van rioolwater en nywerheidsuitvloeiens is die belangrikste middel tot waterbewaring deur hergebruik.

Na 'n uitgebreide studie op die gebied van rioolwatersuiwering en die hergebruik van uitvloeisel is bevind dat daar 'n ernstige gebrek aan kennis bestaan van die grondbeginsels by die ontwerp van suiweringswerke om hoë kwaliteit by die uitvloeiens te verseker. Die Waterwet van 1956 bring ook mee dat besondere klem gelê moet word op voldoende kapasiteit van die suiweringswerke vir die behandeling van rioolwater, veral met die oog op die gehalte van die uitvloeisel.

Die Instituut het die voortou geneem met die opstel van ontwerpnorme en het later heelwat opbouwende kritiek ontvang van verskeie munisipale amptenare en rioolwaterkundiges. Die boekie „Ontwerpnorme vir Rioolsuiweringswerke” is in Maart 1959 uitgegee.

SANITASIEPROBLEME

Die omvang van die sanitasie- en rioolingsprobleme van verskeie plaaslike besture, staatsdepartemente, gesondheidsrade, afdelingsrade en klein gemeenskappies het 'n landswye opname meegebring wat met medewerking van die N.B.N.I. uitgevoer is. 'n Voorlopige ondersoekprogram wat verouderingsdamme, rioolwaterstabilisasiedamme, die behandeling en afvoer van nagvuil, septiese tenks, watergemakke en stapelriole dek, is opgestel en later goedgekeur deur verteenwoordigers van belanghebbende liggame.

The service which the Institute rendered via the South African Bureau of Standards again placed a great strain on manpower resources. Apart from the basic research necessitated by the Water Act, nearly 50 applications for permits were dealt with, an increase of over 60 per cent per annum. These involved the preparation of over 40 technical reports.

DESIGN CRITERIA FOR SEWAGE PURIFICATION PLANT

Sewage purification, apart from its inestimable benefits to the community in providing an hygienic service of waste removal, has now come to be recognised as an important link in the programme of water conservation. In South Africa, this factor is so vitally important to future development that the rôle of the sewage treatment plants cannot be sufficiently stressed. A properly designed sewage purification plant to purify sewage and industrial effluents constitutes the most constructive step in the conservation of water by re-use.

As a result of extensive activities in the field of sewage purification and effluent re-use, it was found that there was a serious lack of knowledge regarding basic plant design factors to ensure high quality effluents. The implications of the Water Act of 1956, specifically with regard to sewage effluent quality, further emphasized the need for adequate sewage treatment capacities.

The Institute took the initiative by preparing design criteria and in subsequent stages obtained considerable constructive criticism from various municipal officials and sewage consultants. The booklet: "Design Criteria for Sewage Purification Plant" was published in March, 1959.

SANITATION PROBLEMS

The magnitude of the sanitation and sewerage problems encountered by various local authorities, government departments, health boards, divisional councils and small communities necessitated a Union wide survey of these problems. This was conducted in collaboration with the N.B.R.I. A tentative research programme covering the investigation of maturation ponds, sewage stabilization ponds, night soil treatment and disposal, septic tanks, aqua privies and French drains was prepared, and subsequently approved by representatives from interested organizations.

TEGNIËSE DIENS AAN ANDER ORGANISASIES

Natalse Provinsiale Administrasie

Die Streekswaternavorsingseenheid in Natal het hom veral toegelê op navorsing oor die uitstort van rioolwater en nywerheidsuitvloeiing in die see langs die Natalse Suidkus, wat in groot mate as vakansieoord gebruik word (die toeristehandel bedra jaarliks omtrent £20 miljoen).

Studies oor die gang van besoedeling is op 'n hele paar plekke uitgevoer. Planne is opgestel vir 'n omvattende ondersoek na die uitstort van uitvloeiing in seemagings.

Die fekale besoedeling wat deur sekere riviere langs die Suidkus see toe gevoer word en die uitwerking daarvan op baastrandte het ook aandag geniet. Die riviere wat uitgesoek is, was die Illovo, die Umkomaas, die Umbogintwini en die Amanzimtoti.

Administrasie van Suidwes-Afrika

Die Streekswaternavorsingseenheid het bepaalde ondersoekrigtings ingeslaan by die bestudering van die Swakoprivier. Uit die voorlopige veldwerk is nuwe tegnieke ontwikkel om varswater streke vas te stel en om die uitwerking van die indringing van gemineraleerde water te bepaal.

'n Grondwaterkaart van Suidwes-Afrika word opgestel. Onder andere sal dit die fundamentele gegewens omtrent die gehalte van die water bevat wanneer die elektrodialitiese ontsouting van water algemeen toegepas word.

Tegniese dienste is aan die Munisipaliteit van Windhoek gelewer in verband met watervoorsiening (ook aan die kragstasie) en rioolwatersuiwering. 'n Bevoegde skeikundige is in dié rigting vir die Munisipaliteit opgelei.

TECHNICAL SERVICES TO OTHER ORGANIZATIONS

Natal Provincial Administration

The Regional Water Research Unit in Natal concentrated largely on investigating the disposal of sewage and industrial effluents into the sea along the Natal South Coast, which is used extensively as a holiday resort (tourist trade amounting to approximately £20 million per annum).

Studies on the travel of pollution have been carried out in a number of areas. Plans were prepared for a comprehensive investigation of the entire problem of effluent disposal into marine environments.

The faecal pollution carried to the sea by certain rivers along the South Coast and its effect on bathing beaches also received attention. The rivers selected were the Illovo, Umkomaas, Umbogintwini and the Amanzimtoti.

Administration of South West Africa

The Regional Water Research Unit pursued specific lines of investigation in studying the Swakop River. As a result of the preliminary field work, new techniques were developed to locate fresh water zones and to evaluate effects of intrusions of mineralized water.

A water (underground) map for South West Africa is being prepared. Inter alia, this will provide basic information with respect to the quality of water supplies when the desalting of water by electrodialysis becomes generally applicable.

Technical services were rendered to the Windhoek Municipality in connection with water supply (including that to the Power Station) and sewage purification. A qualified chemist was trained in these fields on behalf of the Municipality.

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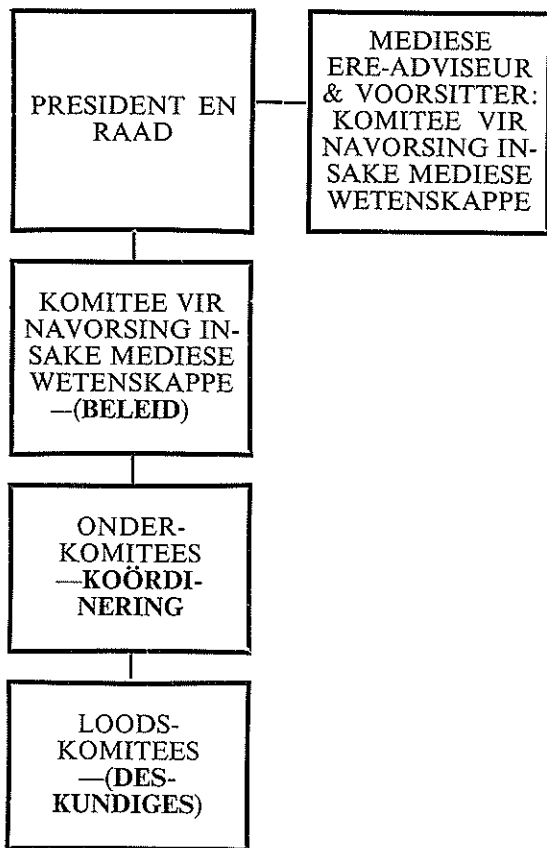
DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL XII
MEDIËSE NAVORSING

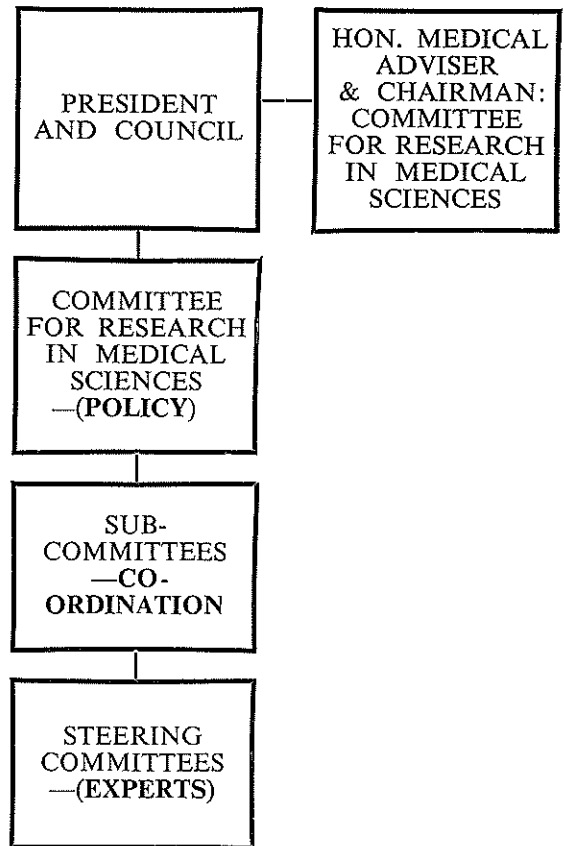
PART XII
MEDICAL RESEARCH

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
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MEDIESE NAVORSING
WAT DEUR DIE W.N.N.R.
GESTEUN WORD



MEDICAL RESEARCH
SUPPORTED BY
THE C.S.I.R.



MEDIESE NAVORSING MEDICAL RESEARCH

Adviseur: PROF. S. F. OOSTHUIZEN

Adviser: PROF. S. F. OOSTHUIZEN

Komitee

Die Raad wil sy waardering uitspreek teenor die lede van die Navorsingskomitee vir Mediese Wetenskappe en die lede van die subkomitees vir mediese navorsing vir hulle belangstelling en hulle leiding by die navorsingsprogramme van die mediese navorsingseenhede en -groepe.

Prof. J. F. Murray en H. H. Louw het aan die einde van 1958 uitgetree uit die Navorsingskomitee vir Mediese Wetenskappe en was ooreenkomstig die statute van die Komitee 'n jaar lank nie herkiesbaar nie. Prof. J. Staz van die Tandheelkundige Skool, Universiteit van die Witwatersrand, en dr. R. Elsdon-Dew is in die plek van prof. Louw en Murray aangestel. Prof. B. J. P. Becker is as sekundus vir dr. Elsdon-Dew aangestel.

Committee

The Council expresses its appreciation to the members of the Committee for Research in Medical Sciences and members of the medical research sub-committees for their interest and guidance on the research programmes of the medical research units and groups.

Prof. J. F. Murray and H. H. Louw relinquished membership of the Committee for Research in Medical Sciences at the end of 1958 and, in accordance with the Committee's constitution were for one year ineligible for re-election. Prof. J. Staz from the Dental School, University of the Witwatersrand, and Dr. R. Elsdon-Dew were appointed to replace Prof. Louw and Murray. Prof. B. J. P. Becker was appointed alternate member in place of Dr. Elsdon-Dew.



Funds

A sum of approximately £136,300 was allocated in January 1959 for medical and dental research during the financial year 1959/60, of which £19,400 was for the support of *ad hoc* grantees at universities and other institutions, £7,500 to the Research Division of the South African Institute for Medical Research and about £109,400 to medical research units and groups. These amounts do not include the provision of £120,000 for the Pneumoconiosis Research Unit whose budget is financed jointly by the Union Department of Mines and the Transvaal and O.F.S. Chamber of Mines.

Prof. S. F. Oosthuizen, Mediese Ere-Adviseur en voorsitter van die Komitee vir Navorsing insake Mediese Wetenskappe

Prof. S. F. Oosthuizen, Hon. Medical Adviser and chairman to the Committee for Research in Medical Sciences

Fondse

'n Bedrag van ongeveer £136,300 is in Januarie 1959 toegewys vir mediese en tandheelkundige navorsing gedurende die boekjaar 1959/60, waarvan £19,400 bedoel was vir geleentheidstoekennings aan universiteite en ander inrigtings, £7,500 aan die Navorsingsafdeling van die Suid-Afrikaanse Instituut vir Mediese Navorsing en omtrent £109,400 aan mediese navorsingseenhede en -groepe. By hierdie bedrae is nie die £120,000 vir die Pneumokoniosenavorsingseenheid ingesluit nie, want die geld daarvoor kom van die Department van Mynwese en van die Transvaalse en die Vrystaatse Kamer van Mynwese gesamentlik.

Skakelwerk

Dr. Robert M. Kark en dr. Graham Bull, die raad se mediese skakelbeamptes in erehoedanigheid, onderskeidelik in die Verenigde State van Amerika en die Verenigde Koninkryk, en prof. J. C. M. Shaw, die tandheelkundige skakelbeampte in erehoedanigheid in die Verenigde Koninkryk, het by voortdurende waardevolle inligting aan mediese en tandheelkundige navorsers verstrek in verband met ontwikkelings op dié gebiede in die Verenigde Koninkryk, Europa en Noord-Amerika. Aan die einde van die jaar het prof. Shaw die betrekking neergelê en na Suid-Afrika teruggekeer.

Stigting van Nuwe Groepe

- (i) Die Navorsingsgroep vir Degenerasiesiektes, onder leiding van prof. A. J. Brink van die Universiteit van Stellenbosch.
- (ii) Die Navorsingsgroep vir Bestudering van Veroudering, onder leiding van prof. T. Gillman van die Universiteit van Natal.
- (iii) Die Kardiovaskulêr - pulmonale Navorsingsgroep, onder leiding van dr. V. Schrire van die Universiteit van Kaapstad.
- (iv) Navorsingsgroep vir Bestudering van Sonuitwerking op die Huid, onder leiding van dr. G. H. Findlay van Pretoria.
- (v) Navorsingsgroep vir die Bestudering van die Biologiese Uitwerking van Ioniserende Straling, onder leiding van dr. T. Fichardt van Pretoria.

Die laaste groep is gestig en word gefinansier deur die Raad op atoomkrag, maar geniet die erkenning van die Raad as W.N.N.R.-groep.

Mediese Navorsingseenhede en -groepe

Die verslae van die hoofde van die mediese navorsingseenhede en -groepe word in die volgende rubrieke gegee.

Die bystand van staats- en provinsiale instansies, die Suid-Afrikaanse Instituut vir Mediese Navorsing, universiteite en persone wat meegehelp het, word met dank erken.

Liaison

Dr. Robert M. Kark and Dr. Graham Bull, the Council's honorary medical liaison officers in the United States of America and the United Kingdom respectively and Prof. J. C. M. Shaw, the honorary dental liaison officer in the United Kingdom, have continued to provide medical and dental research workers with valuable information on the developments in these fields in the United Kingdom, Europe and North America. Prof. Shaw relinquished his duties towards the end of the year to return to South Africa.

Establishment of New Groups

The Council established the following new medical research groups during the year:

- (i) The Degenerative Diseases Research Group under the leadership of Prof. A. J. Brink of the University of Stellenbosch.
- (ii) The Research Group for the Study of Ageing under the leadership of Prof. T. Gillman of the University of Natal.
- (iii) The Cardio-vascular Pulmonary Research Group under the leadership of Dr. V. Schrire of the University of Cape Town.
- (iv) Research Group to study Sunlight Reactions of the Skin under the leadership of Dr. G. H. Findlay of Pretoria.
- (v) Research Group to study the Biological Effects of Ionising Radiation under the leadership of Dr. T. Fichardt of Pretoria.

The last-mentioned group was established and financed by the Atomic Energy Board but has been accorded recognition by the Council as a C.S.I.R. group.

Medical Research Units and Groups

Reports by Heads of the medical research units and groups are given in the succeeding sections.

The assistance of governmental and provincial authorities, the South African Institute for Medical Research, universities and individuals who have co-operated in this work is gratefully acknowledged.

AMEBIASENAVORSINGS- EENHEID

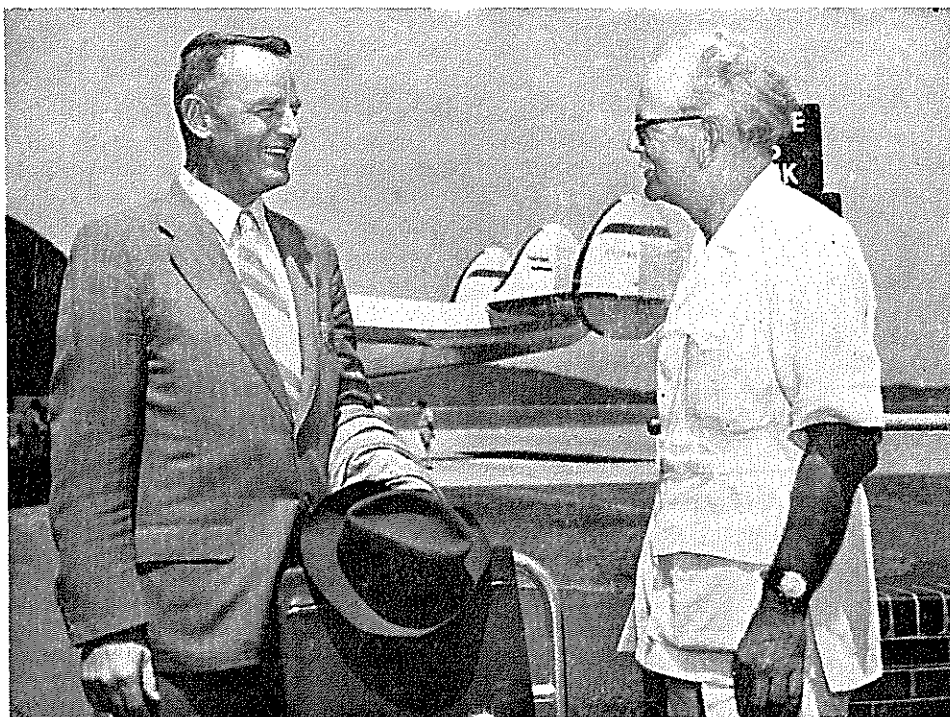
Hoof van die Eenheid: DR. R. ELSDON-DEW

Daar is 'n begin gemaak met die oprigting van die nuwe Instituut vir Parasitologie. Die gebou in Umbiloweg, Durban, is naby die Mediese Skool en die King Edward VIII-hospitaal, vanwaar die kliniese materiaal van die Eenheid verkry word. Ons hoop om teen die einde van die jaar te kan intrek.

AMOEBIASIS RESEARCH UNIT

Head of the Unit: DR. R. ELSDON-DEW

A start has been made on the erection of the new Institute of Parasitology. This building in Umbilo Road, Durban, is in close proximity to the Medical School and King Edward VIII Hospital, which houses the clinical material used by the Unit. It is hoped that occupation will be possible towards the end of the year.



Die Direkteur van die Amebiasnavorsings-eenheid, dr. R. Elsdon-Dew (regs), groet die President van die W. N. N. R., dr. S. M. Naude, op Durbanlughawe

The Director of the Amoebiasis Research Unit, Dr. R. Elsdon-Dew (right), greets the President of the C.S.I.R., Dr. S. M. Naude, at Durban airport

Die Direkteur het twee reise oorsee onderneem, die eerste na die Verenigde State van Amerika, waar hy onder andere lid was van die Amebiasegroep van die Wêreldkongres oor Gastroënterologie. Op hierdie kongres is 'n besonder interessante waarneming uit Chili berig. Dáár is naamlik 'n soortgelyke reeks artsene

The Director made two trips overseas, the first being to the United States of America where he was, *inter alia*, on the Panel on Amoebiasis of the World Congress of Gastroenterology. At this Congress a particularly interesting observation was reported from Chile where they had tested a similar series of drugs to those under

beproof as dié waarmee die Eenheid proewe doen, maar hulle het bevind dat 'n placebo ewe goed deug. Uit 'n bespreking van hulle gegewens het geblyk dat *Entamoeba hartmanni* 'n tussenkomende faktor is. Die betreklik hoë voorkoms van dié parasiet in Chili verklaar die verskil tussen hulle resultate en ons s'n.

Die tweede reis was na die Sesde Internasionale Kongres oor die Tropiese Geneeskunde en Malaria, waar die Direkteur rapporteur was van die Afdeling Amebiase. Behalwe die amptelike vergaderings was daar ook 'n informale sitting oor amebiase, bygewoon deur die baie gesaghebbendes van wêreldformaat. Uit die lewendige bespreking op hierdie byeenkoms het 'n versoek aan die Direkteur voortgevloei om 'n vraelys op te stel vir voorlegging aan die Wêreldgesondheidsorganisasie met die oog daarop om die betreklike voorkoms van die parasiet en die siekte oor die hele wêreld vas te stel.

Faktore wat *E. histolytica* in vivo beïnvloed

Die werk in verband met die werking van verskeie middels teen *E. histolytica* in die ingewande is voortgesit. Die volgende middels is getoets:

| | |
|-------------------------------|--|
| Entobex | Entamiedbensoaat |
| Portamycin | Ditiasanien |
| T 166 ('n chiniofon-derivaat) | P.A.A. 2056 |
| Entamied met ingewandskapsel | Humatien 600 m.g.m. dag tien dae lank. |

Geeneen van hierdie middels betree die kompetisiesone nie, en dit is duidelik dat die werk voortgesit sal moet word. Die volgende middels word op die oomblik getoets:

Humatien 2.5 gram per dag vir 5 dae
54 T 55 Wellcome Foundation
Mebinol

Uit die Eenheid se resultate blyk dat die byvoeging van chlorokien by die tetrasikliene 'n helpende uitwerking het. 'n Proef is ontwerp om vas te stel of die gebruik van sulke helpende middels 'n kleiner dosis van die duur antibiotikum sou meebring.

Die werk in verband met die doeltreffendheid van middels by die behandeling van lewerabses gaan ook voort. 'n Verdere reeks gevalle is getoets. Emetien en chlorokien saam teenoor 'n vergrote dosis chlorokien alleen is ook getoets. Die eerste reaksies is eenders. Daar was geen terugvalling in die groep wat met die twee middels saam behandel is nie, maar 21 persent van dié wat net chlorokien ontvang het, het binne ses maande teruggeval.

Opnames

Die enigste opname was om die voorkoms van *Trichocephalus* by Indiër- en Bantoeinders vas te stel. Dit is eenaardig dat hierdie wurm baie meer onder Indiërs as onder Bantoes voorkom.

trial by this Unit, having found, however, that a placebo worked just as well. On discussion of their figures it became apparent that *Entamoeba hartmanni* was an intervening factor and the apparent high incidence of that parasite in Chile is an explanation of the discrepancy between their results and ours.

The second trip overseas was to the Sixth International Congresses on Tropical Medicine and Malaria, where the Director was Rapporteur of the Section on Amoebiasis. In addition to the official meetings there was an informal session on amoebiasis attended by many world experts. The lively discussion at this meeting resulted in a request to the Director to prepare a Questionnaire for submission to the World Health Organization with a view to assessing the relative incidence of the parasite and the disease all over the world.

Factors influencing *E. histolytica* in vivo

The work on activity of various drugs against *E. histolytica* in the bowel has been continued and the following drugs have been tested:

| | |
|--------------------------------|-----------------------------------|
| Entobex | Entamide benzoate |
| Portamycin | Dithiazanine |
| T 166 (a chiniofon derivative) | P.A.A. 2056 |
| Enteric coated entamide | Humatin 600 mgm./day for 10 days. |

None of these drugs enter into the competitive zone and it is apparent that work will have to continue. The following drugs are, at present, under test:

Humatin 2.5 gms. per day for 5 days.
54 T 55 Wellcome Foundation
Mebinol.

The Unit's results had indicated that the addition of Chloroquine to the tetracyclines had an adjuvant effect. An experiment was devised to test whether the use of such adjuvants would permit of lower dosage of the expensive antibiotic.

The work on the efficacy of drugs in the treatment of liver abscess is also being continued and a further series of cases was tested. A combination of emetine and chloroquine as against an increased dose of chloroquine was also tested and the initial responses are similar. There were no relapses in the group on combined therapy but 21 per cent of those who received chloroquine alone relapsed within six months.

Surveys

The only survey carried out was one to assess the incidence of *Trichocephalus* in Indian and Bantu children. It is a strange feature that the incidence of this worm is much higher in Indians than it is in the Bantu.

Die belangrikheid van *Trichocephalus* as oorsaak van disenterie by kinders is deur prof. Beaver by sy besoek in 1957 onder die aandag van die Eenheid gebring. Sy opmerkings oor die onderwerp kon bevestig word. Aangesien hierdie wurm gewoonlik geen simptome wek nie en eers gemerk word wanneer die drag in die pasiënt groot is, was dit nodig om die eiers in alle moontlike eksemplare te tel. 'n Betreklik eenvoudige tegniek is hiervoor ontwerp. Die telling is des te meer nodig, aangesien die vermoede bestaan dat hierdie wurm een van die aanleidende oorsake is van die strawwe voorkoms van akute amebiese disenterie onder ons Bantoe. Die wurm staan miskien op die een of ander manier in verhouding tot die eosinofiele eksudaat en die voorkoms van die kristalle van Charcot-Leyden by amebiase.

Die vroeëre behandeling van *Trichocephalus* was deur middel van heksielresorsinol-lavemente. Dit was nie alleen minder aangenaam nie, maar heel dikwels ook ondoeltreffend. Die uitwerking van die nuwe verbinding Dithiazazine is met verbasend goeie uitslag getoets. Die Eenheid was begaan oor die voorkoms van amebiese lewerabses by kinders. 'n Reeks gevalle is ondersoek, baie meer as al dié wat voorheen aangegee is.

Laboratoriumondersoek

Die isolasie van monoksene amebes uit leweretter is nou 'n roetineprosedure. Hierdie amebes, met verskeie verwantes, word volgens die Ouchterlony-tegniek van jeldiffusie getoets. Die resultate is uiters interessant maar net so moeilik om te vertolk. 'n Fotografiese inrigting is toe gemaak om die verloop van die besinkingsverskynsels van dag tot dag te registreer. Verskeie stukke apparaat is ontwerp om die resultate te help vertolk. Dit is nie onwaarskynlik dat die amebe as haptene optree in 'n selfimmunisasië-verskynsel nie, maar hierdie bewering moet as uiters voorlopig beskou word.

Die werk van die Eenheid op die gebied van *Entamoeba hartmanni* is baie volledig in Amerika en op die Lissabonse kongres bespreek. Toe hierdie werk in verband met Burrows se werk oor die morfologie van hierdie klein amebes beskou is, was almal dit eens oor die identiteit van hierdie parasiet as soort.

Ongetwyfeld is hierdie organisme dikwels verkeerdelik vir *Entamoeba histolytica* aangesien. Dit beteken nie alleen dat baie pasiënte vir *E. histolytica* behandel is, wat hulle nie gehad het nie, maar ook dat baie vorige opnames met agterdog bejeën moet word.

Die posisie is veral moeilik, omdat *E. histolytica* in sy kommensale fase aanmerklik kleiner is as in sy indringsfase, terwyl die presiese verband tussen die twee nog duister is. Deur 'n wisseling van flora kan ons die grootte van een amebe in dié van 'n ander verander,

The importance of *Trichocephalus* as a cause of dysentery in children was brought to the attention of the Unit by Professor Beaver on his visit in 1957, and it has been possible to confirm his observations on the subject. As this worm is usually symptomless and only becomes manifest when the load carried by the patient is heavy, it proved necessary to institute the counting of ova in all possible specimens and a relatively simple technique for doing this was devised. This is all the more necessary as there is a suggestion that this worm might be one of the trigger factors in the high incidence of the acute amoebic dysentery of our Bantu. The worm might be in some way related to the eosinophilic exudate and incidence of Charcot-Leyden crystals in amebiasis.

The early method of treatment of *Trichocephalus* was by the use of Hexylresorcinol enemata, a procedure which was not only messy but not infrequently ineffective. The action of the new compound Dithiazazine was tried out with spectacular results.

The Unit was concerned at the incidence of amoebic liver abscess in infants and a series of cases were collected, outnumbering all those previously reported.

Laboratory Investigations

The isolation of monoxenic strains of amoebae from liver pus is now a routine procedure. These amoebae, with varying associates, are being tested by the Ouchterlony technique of gel-diffusion. The results are extremely interesting but are extremely difficult to interpret. To this end photographic equipment was set up to record the day-by-day progress of the precipitation phenomena and various pieces of apparatus have been devised with the object of clarifying the results. It seems not unlikely that the amoeba may be acting as a hapten in an auto-immunisation phenomena, but this suggestion must be considered as completely tentative.

The work done by the Unit on *Entamoeba hartmanni* was very fully discussed both in America and at the Lisbon Congress and when this work was taken into conjunction with that of Burrows on the morphology of these small amoebae there was general acceptance of the identity of this parasite as a species.

There is no doubt that this organism has in the past been mislabelled as *Entamoeba histolytica* on many occasions. Not only does this mean that many patients must have been treated for *E. histolytica* which they did not have but, in addition, many previous surveys must be regarded with suspicion.

The position is particularly difficult as in its commensal phase, *E. histolytica* is considerably smaller than in its invasive phase and the exact relationship between these two still remains in doubt. By the transposition of appropriate flora we are able to change the size of

maar solank ons nog nie baie uitgebreide diereproewe uitgevoer het nie. sal die vraag na die betekenis van hierdie verandering onbeantwoord moet bly.

Die moeilikheid van wiskundige segregasie as tegniek, waardeur die identiteit van hierdie parasiet vasgestel is, het tot hernude belangstelling in die morfologie en in die kleurtegnieke gelei wat nou ondersoek word.

Een van die vernaamste probleme by alle protozoïese kleurtegnieke is om die organismes op die skyfie te hou. 'n Tegniek om dit te bereik deur middel van polivinilalkohol bly suksesvol te wees. Verdere sukses lê in die ontwikkeling van die Gomori-kleuring as roetineprosedure.

DANKBETUIGING

Die Amebiasenavorsingseenheid betuig sy dank teenoor die volgende:—

The United States Public Health Service.
Die Natalse Provinsiale Administrasie.
Die personeel van die King Edward VIII-hospital.
Die Universiteit van Natal.
Die Munisipaliteit van Durban.
Die administratiewe personeel van die W.N.N.R.
Die artsnymaatskappye.
Die lede van die Eenheid.

one amoeba to that of the other but, until such time as we are able to carry out very extensive animal experiments, the question of the significance of this change must remain unanswered.

The difficulty of carrying out the mathematical segregation technique which established the identity of this parasite, has led to a renewed interest in the morphology and staining techniques which are being investigated.

One of the main problems in all protozoal staining techniques is to make the organisms adhere to the slide and a technique of doing this by the use of polyvinyl alcohol is proving successful. Further success is in the development of the Gomori stain as a routine procedure.

ACKNOWLEDGEMENTS

The Amoebiasis Research Unit records its thanks to the following:

The United States Public Health Service,
The Natal Provincial Administration,
The Staff of King Edward VIII Hospital,
The University of Natal,
The Corporation of the City of Durban,
The Administrative Staff of the C.S.I.R.,
The Drug Companies,
The members of the Unit.

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NARKOSESTERFGEVALLE- NAVORSINGSEENHEID

Hoof van die Eenheid: DR. O. V. S. KOK

Hierdie eenheid wat in Julie 1956 tot stand gekom het, het gedurende die jaar onverpoosd voortgegaan met die insameling van statistieke van sterfgevälle geassosieer met narkose en chirurgie.

Volgens die oorspronklike ooreenkoms tussen die W.N.N.R. en die Transvaalse Provinsiale Administrasie (Departement Hospitaaldiens), wat hierdie navorsing subsidieer, sou hierdie projek einde Junie 1959 ten einde geloop het; daar die eenheid egter nog nie oor genoegsame statistiese gegewens beskik om tot 'n noemenswaardige gevolgtrekking te raak nie, is besluit om die projek vir nog drie jaar aan die gang te hou.

Aan die begin van die jaar is 500 omsendbriewe aan alle openbare hospitale in Suid-Afrika en die Protektorate gestuur waarin hulle aktiewe samewerking met hierdie projek vir die volgende drie jaar gevra is. In die Transvaalse Openbare Hospitale is dit reeds verpligtend om statistieke aan te stuur—maar hoewel die aktiewe steun van die direkteure van hospitaaldienste in die ander provinsies verkry is, werk hulle hospitale nog op 'n vrywillige basis saam. Die eenheid geniet ook die samewerking van die natuurellemynhospitale in Transvaal en die Oranje-Vrystaat.

Gedurende die afgelope jaar is veral aandag geskenk aan die toestand van skielike hartstilstand op die operasietafel—wat blykbaar aan die toeneem is. Die navorsers is die mening toegedaan dat hierdie toestand dikwels vermy kan word en, deur middel van doeltreffende behandeling, ook dikwels herstel kan word.

Ten einde die oorsake en behandeling van hierdie toestand prominent onder die aandag van medici te bring, het die Ere-direkteur en dr. van der Spuy (Torakologiese-chirurgie, Universiteit van Pretoria) twee artikels in die mediese pers oor hartstilstand gepubliseer. Die Ere-direkteur het ook op uitnodiging agt sentrums gedurende die jaar besoek en lesings aan mediese praktisyns gegee oor die oorsake en behandeling van hartstilstand tydens chirurgiese operasies.

In die loop van die jaar het die eenheid die daadwerklike steun van die Departement van Justisie en die Unie-Departement van Gesondheid ontvang. Ook die Prokureur-generaal van Transvaal, wat groot belangstelling in hierdie navorsing toon, het (soos in die verlede) alle gevraagde dokumente tot ons beskikking gestel.

ANAESTHETIC DEATHS RESEARCH UNIT

Head of the Unit: DR. O. V. S. KOK

The Unit, which was established in July 1956, continued the collection of statistical data on deaths associated with anaesthetics and surgical operations.

Under the original agreement between the C.S.I.R. and the Transvaal Provincial Administration (Hospital Services Department), which subsidizes this research programme, the project would have terminated at the end of June 1959. As, however, the statistical data collected by the Unit are not sufficient to warrant conclusions of any significance it was decided to continue for another three years.

At the beginning of the year, 500 circulars were sent to all public hospitals in South Africa and the Protectorates, soliciting their active support for the project, for the ensuing three years. In the Transvaal Public Hospitals the rendering of data is compulsory, but although the active support of the directors of hospital services in the other provinces was ensured, the co-operation of these hospitals is still on a voluntary basis. The Unit also enjoys the co-operation of the Native mine hospitals in the Transvaal and Orange Free State.

During the year, special attention was given to the condition of sudden heart failure under anaesthetics, which, evidently, is on the increase. The workers are of the opinion that this condition can often be prevented, or even remedied, by suitable treatment.

In order to bring this condition prominently to the attention of practitioners the Honorary Director and Dr. van der Spuy (Thoracic Surgeon, University of Pretoria) published two articles on heart failure in the medical press. The Honorary Director was also invited to eight centres during the year and lectured to medical practitioners on the causes and treatment of heart failure during surgical operations.

In the course of the year the Unit enjoyed the active support of the Department of Justice and the Union Department of Health. The Attorney General of the Transvaal also showed great interest in the research work and, as in the past, placed all documents required at the Unit's disposal.

Ander narkoseprobleme wat gedurende die afgelope jaar die aandag van die eenheid geniet het, was:

- (1) Die bepaling van elektroliete op pasiënte wat ly aan elektrolietewanbalans;
- (2) Potensiële gevare van spierverslappers;
- (3) Die ondersoek van ventilasieprobleme gedurende algemene narkose;
- (4) Kliniese toetse op nuwe verdowingsmiddels, ver-
naamlik:
 - (a) Halotaan
 - (b) Neraval
 - (c) Viadril
 - (d) Marezine
 - (e) Rektaal Pentotal-setpille.

Nog 'n saak waaraan die navorsingseenheid aandag geskenk het, was die onderrig in narkose van interns (huisdokters). Die eenheid was van mening dat, indien interns meer doeltreffende opleiding in narkose gedurende hulle internjaar gehad het, sommige nakosesterfgevälle vermy kon geword het. As gevolg van hierdie eenheid en die Suid-Afrikaanse Vereniging van Narkotiseurs se verhoë tot die Suid-Afrikaanse Geneeskundige en Tandheelkundige Raad, is dit nou verpligtend vir die intern om ten minste vyftig algemene narkose gedurende sy internjaar onder toesig toe te dien alvorens hy as algemene praktisyn kan registreer.

Other anaesthetic problems which received attention during the year were:

- (1) The determination of the effect of electrolytes on patients suffering from electrolyte imbalance.
- (2) Potential dangers of muscle relaxants
- (3) The investigation of ventilation problems during general anaesthesia
- (4) Clinical tests of new drugs, viz.—
 - (a) Halstane
 - (b) Neraval
 - (c) Viadril
 - (d) Marezine
 - (e) Rectal Pentotal suppositories

Another matter which received attention from the Unit was the training of interns in anaesthetics. The Unit felt that if the training of interns in anaesthetics during the year of internship were more effective, a number of anaesthetic deaths could have been prevented. As a result of representations made by this Unit and the South African Society of Anaesthetists to the South African Medical and Dental Board, it is now compulsory that the intern should in his year of internship have administered general anaesthesia to at least fifty cases under supervision before being eligible for registration as a general practitioner.

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NAVORSINGSEENHEID VIR VIRUSSIEKTES DEUR ARTROPODE OORGEDRA

Hoof van die Eenheid: DR. J. H. S. GEAR

Die Eenheid het sy werksaamhede voortgesit met die gesamentlike steun van die Suid-Afrikaanse Instituut vir Mediese Navorsing, die Poliomiëlitisnavorsingstiging, die Wetenskaplike en Nywerheidsnavorsingsraad en die Rockefeller-stigting, met sterk medewerking van die Veeartsenyafdeling van die Departement van Landbou en die Uniegesondheidsdepartement.

Veldondersoeke uit 'n standplaas in die Ndumu-wildtuin is met tussenpose gedurende die hele jaar gedoen—intensiewer gedurende die seisoen van maksimum virusaktiwiteit. Nege stamme Spondweni- en een stam Pongolavirus is geïsoleer uit muskiete wat in die studiestreek gevang is. Onder die artropodegashere was daar drie soorte waaruit virus nog nooit tevore geïsoleer is nie, naamlik *Aedes (Aedimorphus) cummuni*, *Taeniorhynchus (Mansonioides) africanus* en *Eretmapodites silvestris*. Hoewel muskiete op 12 omskrewe plekke gevang is, is al die isolasies uit 4 hiervan afkomstig wat elkeen al tevore produktief was. Pogings is ook aangewend om virusse van potensieële gewerwelde gashere te isoleer, bv. siek mense, wilde voëls en knaagdiere. Drie stamme, waarvan elkeen 'n ander virustipe verteenwoordig, is uit die weefsels van voëls geïsoleer en een stam uit die bloed van 'n siek mens. Een van die voëlvirusse en die stam uit die siek man is as Wes-Nylvirus geïdentifiseer. Die teenwoordigheid van hierdie virus in die Unie, wat reeds uit die resultate van immuniteitsopnames vermoed is, is nou beslissend bewys. Die ander twee virusse wat uit voëls geïsoleer is, is waarskynlik nie vroeër bekend gewees nie. Hulle belangrikheid kan nog nie bepaal word nie.

Oordragproewe met muskiete dui daarop dat Chikungunya-virus oorgedra kan word deur die byt van *Aedes (S.) calceatus* en *Aedes (S.) aegypti*, waarvan eersgenoemde in Noord-Transvaal gevind is by 'n uitbreking van die siekte in 1956. Oordragproewe met *Aedes (O.) caballus* wys duidelik daarop dat hierdie muskiet Sinkdalkoorsvirus meganies kan oordra sonder dat 'n intrinsieke inkubasietyd nodig is. Die feit dat hierdie muskiet sy voedingstye dikwels onderbreek, versterk die vermoede dat hy 'n potensieële meganiese draer is.

Immunologiese studies en pogings tot virusisolasie rondom Germiston as middelpunt is onderneem om lig te werp op die uitbreking van koorsiekte onder mense in dié streek. Beskermingsproewe het bewys dat party van die pasiënte wat herstel het, immuun is teen

ARTHROPOD-BORNE VIRUS RESEARCH UNIT

Head of the Unit: DR. J. H. S. GEAR

This Unit continued its operations with the joint financial support of the South African Institute for Medical Research, the Poliomyelitis Research Foundation, the Council for Scientific and Industrial Research and the Rockefeller Foundation, with substantial collaboration from the Veterinary Division of the Department of Agriculture and the Union Health Department.

Field investigations based at a station in the Ndumu Game Reserve were conducted at intervals throughout the year, with intensified effort during the season of maximum virus activity. Nine strains of Spondweni and 1 of Pongola virus were isolated from mosquitoes caught in the study area. The arthropod hosts included 3 species from which virus has never before been isolated, namely: *Aedes (Aedimorphus) cummuni*, *Taeniorhynchus (Mansonioides) africanus* and *Eretmapodites silvestris*. Although mosquitoes were caught at 12 circumscribed sites, all the isolations came from 4 of these, each of which had previously been productive. Efforts were also made to isolate viruses from potential vertebrate hosts: sick human beings, feral birds, and rodents. Three strains, each representing a different viral type, were isolated from the tissues of birds, and one strain from the blood of a sick human being. One of the bird viruses, and the strain from the sick man have been identified as West Nile virus. Thus the presence of this agent in the Union, suspected from the results of immunity surveys, is now conclusively proved. The other two viruses isolated from birds are apparently hitherto unknown, but their importance cannot yet be assessed.

Mosquito transmission experiments indicate that Chikungunya virus can be transmitted by the bites of *Aedes (S.) calceatus* and *Aedes (S.) aegypti*, the former of which was found in the northern Transvaal where an outbreak of this disease occurred in 1956. Transmission experiments with *Aedes (O.) caballus* indicate clearly that this mosquito can transmit Rift Valley fever virus mechanically without necessity for an intrinsic incubation period. The fact that this mosquito often takes interrupted feeds is in favour of its potential as a mechanical vector.

Immunological studies and virus isolation attempts centred on the Germiston area were undertaken to

Sindbis-virus terwyl een pasiënt blykbaar immuun geword het teen Wes-Nyl-virus as gevolg van haar siekte, hoewel antiliggam studies geen leidraad tot die etiologie in ander gevalle opgelewer het nie.

Muskiete wat in rietbeddings langs die Germistonse Meer gevang is, het uit drie stamme bestaan wat twee virussoorte verteenwoordig, albei blykbaar tot dan toe onbekend. Een van die stamme is sedertdien uitgewys as siekteverwekker onder mense, omdat twee lede van die Eenheid daardeur besmet geraak het, waarskynlik as gevolg van blootstelling daaraan in die laboratorium.

Die rietbeddings waarin die muskiete van Germiston gevang is, is 'n liefkoosde broeiplek van voëls. Dieselfde soorte broei ook gelyktydig in Olifantsvlei ten suide van Johannesburg. 'n Muskietvangs op hierdie plek het tot die isolasie van nog 'n virussoort gelei—dié keer een wat reeds bekend is as 'n siekteverwekker onder mense in die Unie. Die isolasies by Germiston en Olifantsvlei het almal *Culex (Neoculex) rubinotus* aangewys, 'n soort wat nooit tevore as gasheer of draer van virus uitgeteen is nie. Die aandag word op hierdie gebied toegespits solank die huidige broeityd van artropode duur om te kyk of daar nie verdere gegewens ingewin kan word nie, veral met die oog op die kliniese verskynsels by besmetting deur middel van die stamme wat daar gevind is.

Studies oor die vatbaarheid van wilde knaagdiere en voëls vir virus wat deur artropode oorgedra word wat in die Unie geïsoleer is, is op tou gesit. Die resultate tot dusver dui daarop dat party hiervan hoogs belangrik kan wees ten opsigte van natuurlike kringlope van infeksie met hierdie virusse. Voëls is veral van belang weens hulle vermoë om as oordraers van virus en/of as artropodegashere te dien.

Die opname in verband met virusimmunitet deur middel van mensserum uit Mosambiek is byna klaar. Die resultate van beskermings- en hemagglutinasieproewe word tans ondersoek om die mate van korrelasie vas te stel. Die meeste virusse wat in Suid-Afrika geïsoleer is, kom blykbaar ook in Mosambiek voor, maar hulle voorkoms wissel volgens hoogte, reënval ens. Die hemagglutinasieproewe dui daarop dat een of meer virusse van groep B wat nog nie elders geïsoleer is nie in Mosambiek aanwesig kan wees.

Die verband tussen virusinfeksies wat deur artropode oorgedra word in die Unie en dié in die buurlande moet ook in 1959 ondersoek word by wyse van studies in Mosambiek, Noord-Rhodesië en Betsjoeanaland.

throw light on an outbreak of febrile illness among human beings in this region. Protection tests gave evidence that some of the recovered patients were immune to Sindbis virus, and one patient apparently became immune to West Nile virus as a result of her illness, but antibody studies failed to suggest clues to the etiology in others.

Mosquitoes caught in reed-beds along Germiston Lake yielded 3 strains representing 2 viral species, both apparently hitherto unknown. One of these strains is already known to be a human pathogen as 2 persons in the unit have suffered infections with it, probably as a result of laboratory exposure.

The reed-beds along which the Germiston mosquitoes were caught were in active use by birds as breeding grounds. The same species were also breeding simultaneously at Olifantsvlei, south of Johannesburg. A mosquito catch at this point resulted in the isolation of yet another viral species—this time an agent already known to be present as a human pathogen in the Union. The Germiston and Olifantsvlei isolations all implicated *Culex (Neoculex) rubinotus*, a species never before implicated as host or vector of virus. Attention is being centred on this area during the current arthropod-breeding season in the hope of acquiring additional information, especially with reference to clinical features of infection with the several agents shown to be there.

Studies on the susceptibility of wild rodents and birds to arthropod-borne viruses isolated in the Union were initiated. Results to date indicate that some of these may be highly important in natural cycles of infection with these viruses. Birds are of special interest owing to their potential as transporters of virus and/or arthropod hosts.

The antiviral immunity survey with human sera from Mozambique was brought near to completion and the results obtained with protection and haemagglutination tests are being examined to determine the extent of correlation. Most of the viruses isolated in South Africa appear to be prevalent in Mozambique, but their distribution varies with altitude, rainfall, etc. The haemagglutination tests indicate that one or more viruses of group B may be present in Mozambique which have not been isolated anywhere else as yet. Inquiry into this situation is planned for 1959.

The relation of arthropod-borne virus infections in the Union to those in neighbouring countries are also to be investigated in 1959 through studies in Mozambique, Northern Rhodesia and Bechuanaland.

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BILHARZIANAVORSINGS- EENHEID

Hoof van die Eenheid: DR. B. DE MEILLON

NAVORSINGSEENHEID, S.A.I.M.N.

Bewaring van schistosome stamme in kultuur: Egiptiese en Suid-Afrikaanse stamme van *S. mansoni* word in kultuur gehou. *Mastomys* word nou uitsluitlik as soogdiergasheer gebruik ter vervanging van laboratoriumwitmuise, wat onbevredigend geblyk het. Die pogings om *S. mattheei* en *S. haematobium* in kultuur te hou, het nie geslaag nie: in albei gevalle het die slakgashere (*Physopsis*) van die infeksie gevrek.

Teel van slakke: Die laboratoriumstam van *Australorbis glabratus* word nog volgehou. 'n Stam van *Biomphalarus pfeifferi bridouxiana*, oorspronklik van Sandfontein, Brits, Transvaal, is met sukses geteel in die laboratorium, in gedeïoniseerde water en in asbesementbakkies in plaas van in kraanwater en glasbakke waarin vroeër sonder sukses probeer is om hierdie slakke te teel. Pogings om *Physopsis* sp. in gedeïoniseerde water te teel, was nie te geslaagd nie. Daar is bevind dat *Australorbis glabratus* maklik in gedeïoniseerde water en asbesementbakke teel.

Toets van vatbaarheid van slakke wat in die laboratorium geteel is: Die stam *B. pfeifferi bridouxiana* wat in die laboratorium geteel is, was baie vatbaar vir infeksie met 'n Suid-Afrikaanse stam van *S. mansoni*.

BILHARZIA RESEARCH UNIT

Head of the Unit: DR. B. DEMEILLON

NATURAL HISTORY UNIT: S.A.I.M.R.

Keeping Schistosome Strains in Culture: Egyptian and South African strains of *S. mansoni* are being maintained in culture. *Mastomys* is now used exclusively as the mammalian host, replacing laboratory white mice, which have proved unsatisfactory. Unsuccessful attempts were made at maintaining *S. mattheei* and *S. haematobium* in culture: in both cases the snail hosts (*Physopsis*) did not survive exposure to infection.

Breeding of Snails: The laboratory strain of *Australorbis glabratus* is still being successfully maintained. A strain of *Biomphalaris pfeifferi bridouxiana*, originating from Sandfontein, Brits, Transvaal, was successfully bred in the laboratory, in deionised water and asbestos-cement trays instead of in the tap water and glass bowls in which earlier unsuccessful attempts at breeding these snails were made. Attempts at breeding *Physopsis* sp. in deionised water have not been very successful. *Australorbis glabratus* has been found to breed readily in deionised water and asbestos-cement trays.

Testing the Susceptibility of Lab.-bred Snails: The strain of *B. pfeifferi bridouxiana* bred in the laboratory proved to be very susceptible to infection with a South African strain of *S. mansoni*.

Proewe oor die groei van slakke: Die laboratoriumstam van *B. pfeifferi bridouxiana* is gebruik in 'n proef om die groeitempo en die vrugbaarheid van hierdie slakke in kraanwater en in gedeïoniseerde water te vergelyk, waarby albei groepe in asbessementbakke gehou word. Al om die veertien dae is die slakke gemeet, die kleintjies getel en die resultate vergelyk. Die uitkoms was nie beslissend nie. 'n Soortgelyke proef is begin waarby groeitempo en vrugbaarheid in gedeïoniseerde, kraan- en fonteinwater vergelyk word.

Swemjeksiekte by Middelburg: Die laboratorium het met dr. Patz van Middelburg, Transvaal, saamgewerk om 'n uitbreking van swemjeksiekte daar te ondersoek.

Materiaal vir serologiese studies: Die laboratorium lower gereeld besmette *Mastomys* vir die bereiding en ondersoek van schistosome antigene deur dr. Wolstenholme van dr. Gear se laboratorium.

Aktiwiteitsproef: Daar die proef van 1957 onbeslis was, is nog twee proewe, met dieselfde apparaat maar met sorgvuldiger kontrole van die toestande, uitgevoer om te sien of daar merkbare verskil is tussen die aktiwiteit van diere wat met *S. mansoni* besmet is en dié van onbesmette diere. In die eerste van hierdie nuwe proewe is weer laboratoriumwitmuise as proefdiere gebruik. Uit 'n statistiese ontleding van die resultate het geblyk dat daar geen beduidende verskil in die aktiwiteit van die twee groepe is nie. Aangesien die witmuise moontlik so min vatbaar vir bilharzia kon gewees het dat hulle aktiwiteit nie merkbaar deur infeksie aangetas kon word nie, is besluit om die proef te herhaal, dié keer met *Mastomys*. Weer kon geen beduidende verskil in aktiwiteit by die besmette en die onbesmette diere vasgestel word nie.

Proef van Hebb-Williams: Voorlopige werk is gedoen in verband met 'n proef waarby 'n Hebb-Williams-bord gebruik word om die uitwerking van bilharziabesmetting op die doolhofprestasies van *Mastomys* te toets. Proewe is uitgevoer om uit te vind hoe vinnig onbesmette muise en *Mastomys* leer om deur die doolhof te loop, wat die beste aas is om te gebruik, ens.

Die terapeutiese uitwerking van nuwe middels op bilharziase by Mastomys: Twee bilharziamiddels is in 1958 vir toets ingestuur. Die eerste, glukosamien, is vir ses weke getoets in 'n dosis van 50 mgm. per dag, deur die mond ingegee met 'n maagpyp. Die middel was blykbaar nie giftig vir die *Mastomys* nie, maar het nie die bilharziase genees nie. Die tweede, WBA/2152, berei deur Ward, Blenkinsop en Kie. Bpk., word nog getoets.

Experiments on Growth of Snails: The laboratory strain of *B. pfeifferi bridouxiana* was used in an experiment designed to compare the growth rates and fertility of these snails in tap and deionised water, both groups being kept in asbestos-cement trays. The snails were measured every two weeks, the number of young counted and the results compared. The results were not conclusive. A second experiment on similar lines has been started, comparing growth rates and fertility in deionised, tap and spring water.

Middelburg Swimmer's Itch: The laboratory collaborated with Dr. Patz of Middelburg, Transvaal, in investigating an outbreak of swimmer's itch in Middelburg.

Material for Serological Studies: The laboratory has been regularly providing infected *Mastomys* for the production and investigation of schistosomal antigens by Dr. Wolstenholme of Dr. Gear's laboratory.

Activity Experiment: As the results of the experiment of 1957 proved to be inconclusive, two further experiments, using the same apparatus but under more carefully controlled conditions, were carried out to see if there was any detectable difference in activity between animals infected with *S. mansoni* and uninfected animals. In the first of these new experiments, laboratory white mice were again used as the experimental animals. Statistical analysis of the results showed that there was no significant difference in activity between the two groups. As it was thought that the white mice might possibly have been insufficiently susceptible to bilharzia for their activity to have been noticeably affected by infection, it was decided to repeat the experiment once more, using *Mastomys* instead. Again, however, no significant difference in activity between the infected and the uninfected animals could be found.

Hebb-Williams Test: Preliminary work was done on an experiment, using a Hebb-Williams board, designed to test the effect of infection with bilharzia on maze-learning in *Mastomys*. Tests were carried out to find the rate at which uninfected mice and *Mastomys* learned to run through the maze, the best bait to use, etc.

Testing the Therapeutic Effects of New Drugs on Bilharziasis in Mastomys: Two antibilharzial drugs were submitted for testing in 1958. The first, glucosamine, was tested over a period of six weeks, the dosage used being 50 mgm. glucosamine per day, administered orally by stomach tube. The drug appeared to be non-toxic to the *Mastomys*, but did not cure the bilharziasis. The second, WBA/2152, manufactured by Ward, Blenkinsop & Co., Ltd., is still being tested.

VELDEENHEID, NELSPRUIT

Weekdierdoders

Talryke veld- en laboratoriumproewe is met natriumpentachloorfenaat gedoen. In ander dele van die wêreld, veral Egipte, is uitstekende resultate daarmee as weekdierdoder bereik. By ons is egter bevind dat die son 'n nadelige uitwerking daarop het in staande sowel as lopende water. Met toenemende hardheid van die water neem die uitwerking ook toe. By water in die natuur wissel die hardheid van 14 dele per miljoen (totale hardheid) tot omtrent 650 dele per miljoen (totale hardheid). Die uitwerking van die middel as weekdierdoder het ook afgeneem na gelang die hardheid toeneem, afgesien van die son se uitwerking. In Egipte is die konsentrasie van 10 dele per miljoen 22 kilometer ver stroomaf van die toedieningspunt af gehandhaaf, terwyl 'n nawerking in staande water ses weke lank behou is sonder vermindering van konsentrasie. Met die oog op hierdie uitstekende resultate is by ons begin met werk op die uitwerking van modder op die verbinding.

Die hoeveelheid modder in natuurlike water in Transvaal gedurende die vloedyd is volgens bevinding omtrent 50 maal minder as in die Nyl, waar die vloedyd van vier tot vyf maande duur. Dit is te vroeg vir gevolgtrekkings oor die werk by ons in verband met die uitwerking van modder.

Veldwerk met kopersulfaat is heeltemal gestaak. Dit is onbevredigend bevind, hoofsaaklik weens die gebruiklike besproeiingsstelsel, die groot hoeveelheid begroeiing in natuurlike strome, die voorkoms van vloedstromings wat gereelde toediening belet en die hoë koste.

Bayer 37 (samestelling onbekend) is in die laboratorium getoets in 'n konsentrasie ses keer sterker as aanbeveel, maar sonder weekdierdodende uitwerking.

Drie formulerings van gamma- en delta-isomere van benseenheksachloried is in die laboratorium getoets in konsentrasies tot 5 dele per miljoen (op die beginsel van totale verbinding nie aktief nie), maar sonder sukses.

Met die oog op hierdie ontmoedigende resultate (deels te wyte aan die watertipes, die skeikundige samestelling van die water en deels aan die weekdierdoders self) is 'n kontroleskema ontwerp, waarby die gebruik van weekdierdoders en die behandeling van enkelinge heeltemal uitgesluit is. Die skema is ontwerp vir die Crocodile Valley Citrus Estates, en die werk daaraan het begin. Die maatskappy het die koste verbonde aan die beoogde ingenieurswerke op hom geneem.

Epidemiologie

Al die kinders op die Crocodile Valley Citrus Estates is vir *Schistosoma mansoni* en *Schistosoma haematobium* ondersoek deur middel van gereelde stoelgangbesinking

FIELD UNIT NELSPRUIT

Molluscicides

Numerous field and laboratory trials were done with sodium pentachlorophenate, which in other parts of the world, especially Egypt, has given excellent results as a molluscicide. Here, however, it was found to be adversely affected by sunlight in both stagnant and flowing waters. This effect rose with increased hardness, which varied in natural waters from 14 parts per million (total hardness) to about 650 parts per million (total hardness). Its efficacy as molluscicide also diminished with increased hardness of water, irrespective of the action of sunlight. In Egypt, the concentration of 10 parts per million was maintained for 22 kilometers downstream from the point of application and a residual effect was maintained in stagnant water without diminution in concentration for a period of six weeks. In view of these excellent results, work here was started on the effect of mud on the compound. The amount of mud in natural waters in the Transvaal during flood time was found to be about 50 times less than that in the Nile where flood conditions last for some four to five months. It is too early to draw any conclusions from work done here on the effect of mud.

Field work on Copper sulphate was abandoned completely. It was found to be unsatisfactory, largely because of the system of irrigation practised, the great amount of vegetation in natural streams, flood conditions which prevented regular application, and expense.

Bayer 37 (composition unknown) was tried out in the laboratory in concentration six times that recommended without any molluscicidal effect.

Three formulations of gamma and delta isomers of Benzenehexachloride were tried out in the laboratory in concentrations up to 5 parts per million (total compound not active principle) without success.

In view of these depressing results (which were partly due to water types, partly to chemistry of the waters and partly due to the molluscicides themselves), a control scheme was planned which excluded the use of any molluscicide and any treatment of individuals. The scheme was planned for Crocodile Valley Citrus Estates and work has begun. The Estates have undertaken to bear the costs of the engineering programme visualised.

Epidemiology

All children on Crocodile Valley Citrus Estates were surveyed for *Schistosoma mansoni* and *Schistosoma haematobium* by routine stool sedimentation and urine

en urienondersoek. Alle negatiewe monsters is weer twee maal ondersoek. Die resultate dui daarop dat 80 tot 90% van die kinders aan albei vorme van die siekte ly. 738 kinders is ondersoek.

Opnames is in verband met *Schistosoma mattheei* by die mens gedoen by Witrivier, die Sigasi-Naturelle-reserwe, Komatipoort, Coopersdal (suid van Komatipoort), Palapye (Betsjoeanaland) en in die streek van die Hartbeespoortdam. Die voorkoms het gewissel van 0% by die Hartbeespoortdam tot omtrent 30% by Coopersdal. Geen pasiënt is gevind wat nie ook aan *S. haematobium* ly nie, terwyl die grootste meerderheid (behalwe dié van Palapye) tewens besmet was deur *S. mansoni*. Daar is omtrent ewe veel eiers in die derms en in die blaas gevind. Effens meer persone het blaas-infeksie gehad. Waar moontlik is die stoelgang en die urien op vyf agtereenvolgende dae ondersoek. Die uitskeiding van eiers was dikwels onbestendig: die een dag word min eiers gevind (moontlik 'n aanduiding van ligte infeksie) en die volgende dag weer baie.

Eiers van *S. mattheei* uit die urien van die mens is in slakke en witmuise, *Mastomus sp.* en *Tatera sp.*, geplaas en het baie volwasse wurms en eiers opgelewer wat met die uitskeiding afgeskei is. Al drie hierdie knaagdierse is baie vatbaar vir infeksie, maar dis nie die geval met *S. haematobium* nie. Die eiers van hierdie parasiet in knaagdierse is egter maklik om te onderskei van *S. mattheei* by bees'e, skape, bokke en knaagdierse wat op natuurlik wyse besmet is en van *S. mattheei* by knaagdierse (8 soorte) wat in die laboratorium besmet is, asook van *S. haematobium* by die mens. Tot nog toe is bevind dat die vorm en grootte van hierdie eiers vir vier geslagte by witmuise en by *Mastomus* konstant bly. Al vier bronne van die oorspronklike *S. mattheei* uit die mens het dieselfde resultaat by muise opgelewer, terwyl al die persone uit wie die eiers van *S. mattheei* geïsoleer is, met *S. haematobium* besmet was. By oorplanting in 'n skaap ontstaan daar baie volwasse mannetjies en wyfies maar geen eiers nie. Hierdie verskynsel is ook by party van die knaagdierse opgemerk. Eiers soos hierdie verdagte basters is aangetref by pasiënte van Palapye, Coopersdal en Komatipoort. Op al drie plekke was daar 'n besonder innige verband tussen die mens en beeste, terwyl daar by al drie 'n hoë voorkoms van *S. mattheei* by mense is.

Gedurende Julie 1958 is 'n studie van bilharziase by wilde knaagdierse op Coopersdal aan die gang gesit langs twee kanale waar daar 'n innige verband tussen die mens, beeste, knaagdierse en slakke was. *Mastomus sp.* en *Otomus sp.* was besmet deur *S. mansoni*; *Mastomus sp.* en *Tatera sp.* deur *S. mattheei* en eengeslagtelike infeksies, *S. mansoni* en waarskynlik *S. mattheei* by *Mastomus* en waarskynlik *S. mattheei* by *Lemniscomus*

examination. All negatives were re-examined twice. Results showed that between 80% and 90% of the children were suffering from both forms of the disease. 738 children were examined.

Surveys were done at White River, Sigasi Native reserve area, Komatipoort, Coopersdal (South of Komatipoort), Palapye (Bechuanaland), and in the region of Hartbeespoortdam for *Schistosoma mattheei* in man. Incidences varied from 0% at Hartbeespoortdam to about 30% at Coopersdal. No patient was found who was not suffering from *S. haematobium* as well and the large majority (except those from Palapye) were also infected with *S. mansoni*. The ova were found to be almost equally distributed in the gut and bladder, slightly more cases having bladder infections. Where possible, stool and urine examinations were done on five consecutive days and it was found that the excretion of ova was often erratic, few ova (possible evidence of light infection) being found one day and numerous ova the next.

S. mattheei ova from the urine of man, when put through snails and white mice, *Mastomus sp.* and *Tatera sp.*, yielded numerous adult worms and ova (which were excreted in the faeces). All three of the above rodents take this infection very readily, but this is not the case with *S. haematobium*. The resulting ova from rodents, however, are easily distinguishable from both *S. mattheei* as found in cattle, sheep, goats and rodents infected naturally and from *S. mattheei* in laboratory infected rodents (8 species) and from *S. haematobium* as found in man. So far, these ova have been found to remain constant in shape and size for four generations in white mice and *Mastomus*. All four sources of the original *S. mattheei* from man gave the same result when passed through mice and all patients from whom the *S. mattheei* ova were taken were infected with *S. haematobium*. When put through a sheep, numerous adult males and females were recovered but no ova. This was also noticed to happen with some of the rodents. Ova identical to these suspected hybrids were seen in patients from Palapye, Coopersdal and Komatipoort. In all three places there was very close association between man and cattle and all three have a high incidence of *S. mattheei* in man.

A study of bilharziasis in wild rodents was started during July 1958 at Coopersdal along two canals where there was close association between man, cattle, rodents and snails. *Mastomus sp.* and *Otomus sp.* were found infected with *S. mansoni*; *Mastomus sp.* and *Tatera sp.* with *S. mattheei* and unisexual infections, *S. mansoni* and probably *S. mattheei*, in *Mastomus* and probably *S. mattheei* in *Lemniscomus sp.* One *Otomus sp.* was

sp. By een *Otomus sp.* is eiers gevind wat nie te onderskei is van *S. haematobium* nie. By oorplasing van hierdie eiers in slakke en muise het volwassenes ontstaan met eiers wat maklik te onderskei is van *S. haematobium* en van *S. mattheei* net volgens lengte. Die volwasse wurms uit die oorspronklike *Otomus* geneem, was drie wyfies (een *S. mansoni*, een *S. haematobium* en een ongeïdentifiseer). Daar was twee mannetjies, een *S. mansoni* en die ander een 'n *S. mattheei*.

Geen besmette knaagdiere is van middel November 1958 tot 23 Maart 1959 gevind nie. Van Julie 1958 tot November 1958 is tot 25% besmet bevind. Dis nog te vroeg om tot besliste gevolgtrekkings omtrent die rede hiervoor te kom.

In die laboratorium is bevind dat die volgende soorte wilde knaagdiere goeie gashere vir *S. mansoni* uitmaak: *Mastomus natalensis*, *Tatera schintzi*, *Lemniscomus griselda* en *Aethomus chrysophilus*. Middelmatig tot swak in dié opsig was *Saccostomus campestris*, *Steatomus pratensis* en *Rattus rattus*.

In die laboratorium was die goeie gashere vir *S. mattheei* dieselfde as hierbo, met *Rattus rattus* daarby. *Saccostomus campestris* en *Steatomus pratensis* was slegte gashere.

Om die belangrikheid van wilde knaagdiere as draers van bilharziase te bepaal, is 'n kamp in omstandighede so na as moontlik aan die natuur gebou en met besmette en onbesmette knaagdiere bevolk. Besmetting deur die mens is so ver moontlik uitgeskakel. Die uitslag sal oor die volgende twee jaar bepaal word.

Vier besmette witmuise is met chloroform doodgemaak en aan natuurlike ontbinding oorgegee in vier groot akwariums wat elkeen 100 slakke bevat wat in die laboratorium geteel is. Twee slakke is later gevind wat cercariae ontlaas, wat weer volwassenes en eiers van *S. mansoni* afgegee het in muise.

Die opname in verband met *S. mattheei* by beeste is voortgesit. 'n Voorkoms by beeste is vasgestel. Daarby is die lewer van besmette en onbesmette beeste geweeg. Die lewer van besmette beeste was effens swaarder as dié van onbesmettes, maar die getalle is nog so klein dat geen gevolgtrekkings gemaak kan word nie. Die beeste se blase is almal in kaliumhidroksied verteer. Daar is bevind dat 13% van die blase eiers bevat, terwyl 4.4% letsels het wat met die blote oog gesien kan word.

Chemiese ontleding

Gereelde maandelikse ontledings is in veertien strome gedoen. Afgesien van seisoenskommeling is geen beduidende wisseling in die samestelling van die water waargeneem nie, behalwe skielike vermeerderings van mangaan en sulfaat in sekere strome, wat op die oomblik nog nie verklaar kan word nie.

found to harbour ova indistinguishable from *S. haematobium*. These ova when put through snails and mice returned adults with ova easily distinguishable from *S. haematobium* and distinguishable from *S. mattheei* in length only. Adult worms recovered from the original *Otomus* were three females (one *S. mansoni*, one *S. haematobium* and one unidentifiable). There were two males, one *S. mansoni* and the other ? *S. mattheei*.

No infected rodents were found from mid November 1958 to date (March 23), whereas from July 1958 to November 1958 up to 25% were found to be infected. It is still too early to come to any definite conclusions as to the reasons for this.

In the laboratory, the following species of wild rodents were found to be good hosts for *S. mansoni*: *Mastomus natalensis*, *Tatera schintzi*, *Lemniscomus griselda*, and *Aethomus chrysophilus*. Fair to poor hosts for *S. mansoni* were *Saccostomus campestris*, *Steatomus pratensis* and *Rattus rattus*.

Good hosts for *S. mattheei* in the laboratory were the same as above with the addition of *Rattus rattus*. *Saccostomus campestris* and *Steatomus pratensis* were poor hosts.

In order to evaluate the importance of wild rodents as reservoirs of bilharziasis, a camp was built with conditions as natural as possible and stocked with infected and uninfected rodents. Human contamination was kept out as far as possible. Results will be assessed over the next two years.

Four infected white mice were killed by chloroform and allowed to decompose naturally in four large aquaria each containing 100 laboratory-bred snails. Two snails were subsequently found discharging cercariae which returned *S. mansoni* adults and ova when put through mice.

The survey for *S. mattheei* in cattle was continued. In addition to obtaining an incidence in cattle, livers of infected and uninfected beasts were weighed. The livers of infected beasts were slightly heavier than those uninfected but the numbers are still too small for any conclusions to be drawn. Bladders of all beasts were digested in Potassium hydroxide and it was found that 13% of bladders contained ova compared with 4.4% having lesions visible to the naked eye.

Chemistry

Routine monthly chemical analysis was made on fourteen streams. Apart from seasonal changes, no significant alteration in the composition of the waters was observed, except for sudden rises in the manganese and sulphates in certain streams. No explanation can be given for this at the moment.

'n Metode waarby die Beckmann-pH-meter gebruik word, is uitgewerk om die opgeloste suurstof in water te bepaal. Die metode word verder ondersoek. Die nut en waarde daarvan buite die laboratorium met mikroskopiese hoeveelhede water word bepaal.

Slakke

Gereelde opnames van slakverspreiding is in die waters van die distrik Barberton gedoen. Die slakke is toe aan dr. Van Eeden gestuur om uit te ken. Die besmetlikheidsyfer van slakke is ook in twee strome by Barberton ondersoek.

Toets van medisyne

Twee medisynetoets is gedurende die jaar gedoen. Een is met antimoondimerkaptosuksinaat uitgevoer in die Havelockmynhospitaal op nuwelinge by die myn. Ons is dank verskuldig aan die bestuur van die myn vir toestemming om die hospitaal en die werkers vir die toets te gebruik. Die resultate was bemoedigend in verband met *S. haematobium* maar nie goed in verband met *S. mansoni* nie.

Die byuitwerking was veelvuldig en gevaarlik by pasiënte wat groter dosisse ontvang het. Die middel word nie aanbeveel vir lyers aan dubbele besmetting met *S. mansoni* en *S. haematobium* nie.

Die ander proef was met natriumantimoonglukonaat. Die uitwerking teen *S. haematobium* was goed, maar verskeie lyers aan *S. mansoni* is nie genees nie. By die voorgeskrewe dosis was daar geen byuitwerking nie, maar weer was die reaksie van die Bantoe swak op 'n reeks inspuitings.

A method which uses the Beckmann pH meter was developed to determine the dissolved oxygen in water. This is still under investigation and its use and value in the field on micro quantities of water is being determined.

Snails

Routine snail distribution surveys were done on the waters in the Barberton District. Snails were then sent to Dr. van Eeden for identification. Infectivity rates of snails were also studied on two streams in Barberton. No conclusions can yet be drawn.

Drug Trials

Two drug trials were carried out during the year. One with Antimony dimercapto succinate was carried out at the Havelock Mine hospital on new recruits to the mine. Thanks are due to the management of the mine for their co-operation in allowing the hospital and recruits to be used for this trial. The results were encouraging against *S. haematobium* but were not good against *S. mansoni* and side effects were numerous and dangerous in patients receiving higher dosage schedules. The drug is not recommended for patients suffering from double infections of *S. mansoni* and *S. haematobium*.

The other trial was with Sodium Antimony Glucuronate. The results against *S. haematobium* were good but there were several non-cures with *S. mansoni*. There were no side effects with the dosage schedule used but again the response of the African to a series of injections was poor.

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NAVORSINGSEENHEID VIR KARDIO-PULMONALE SIEKTES

Hoof van die Eenheid: PROF. G. A. ELLIOTT

Die Eenheid het oor die jare bedrewe geraak in die uitvoering van die besonder ingewikkelde toetse van die longfunksie wat van belang is by probleme van kliniese en industriële gesondheid. Die enigste moderne toetse van longfunksie wat die Kardiopulmonale Eenheid nie nou kan uitvoer nie, is dié wat afhanklik is van die geredelike beskikbaarheid van die kortstondige radioaktiewe isotoop van suurstof, O^{15} .

Die Eenheid ontvang nog steeds navorsers uit ander sentrums om hulle in dié soort werk te onderrig.

Die studie van longfunksie vetsugtiges is voortgesit. Daar is bevind dat die aseminspanning by vetsugtiges op alle peile van lugtoevoer toeneem en dat die suurstofverbruik die toename in transpulmonale inspanning oortref, met die gevolg dat 'n ondoeltreffende borsruimte ontstaan. Hierdie ondersoek het die toepassing van eie wysigings in die tegniek meegebring, waarvan die belangrikste 'n metode is om ongemerk hiper-ventilasie deur middel van na-aseaming deur 'n vaste dooie ruimte te bewerkstellig. Die doeltreffendheid van maatreëls om die werking van hierdie ondoeltreffende borsruimte te verbeter, is bestudeer.

Die onderskeiding tussen kardiaale asemnood en pulmonale asemnood is verder bestudeer. Na liggaamsbeweging het die nie-elastiese weerstand van die long bo normaal gestyg by pasiënte met gedekompenseerde hart, terwyl die nie-elastiese weerstand werklik gedaal het by siek harte wat nie onder spanning verkeer nie.

By 'n groot aantal bekende lyers aan kardiaale of pulmonale asemnood is die totale weerstand bereken uit die waardes vir meegewing en nie-elastiese weerstand. Die inspanning by asemhaling gedurende liggaamsbeweging is afgelei van die produk van die totale weerstand en die minuutventilasie. Die aseminspanning is toe grafies voorgestel teenoor die gemete minuutventilasie. By 'n normale proefpersoon is bevind dat die aseminspanning eweredig toeneem met die minuutventilasie (by matige liggaamsbeweging). Lyers aan primêre hartkwaal toon ook hierdie lineêre toename, terwyl die lyn op die grafiek oor die normale lê. Aan die ander kant toon lyers aan primêre longkwaal 'n oneweredig groter aseminspanning in verhouding tot die minuutvolume. Dit wil voorkom of daar 'n swak verdeling van hartopbrengs tussen die goeie en die swak long was en dat daar op 6,000 voet hoogte 'n faktor van asemvermoë by hartlyers was.

Die Eenheid het gehelp met die behandeling van lyers aan akute asemstilstand en het hierdie vraagstuk uit die

CARDIO-PULMONARY RESEARCH UNIT

Head of the Unit; PROF. G. A. ELLIOTT

The Unit has over the years become proficient in carrying out the very complicated tests of pulmonary function which are important in application to problems of clinical and industrial health. The only modern tests of pulmonary function which cannot now be carried out in the Cardio-Pulmonary Unit are those dependent upon the ready availability of the short-lived radioactive isotope of oxygen, O^{15} .

The Unit continues to receive workers from other centres to instruct them in this type of work.

The study of pulmonary function in obese subjects continued. It was found that the work of breathing in obese subjects for any ventilatory level is increased and that oxygen consumption outstrips the increase of trans-pulmonary work, the nett result being an inefficient thoracic cage. This investigation necessitated the application of our own modifications of technique, the most important of which was a method of surreptitiously producing hyperventilation by rebreathing through a fixed dead space. The effectiveness of measures to improve the working of this inefficient thoracic cage were studied.

The differentiation of dyspnoea of cardiac origin and dyspnoea of pulmonary origin continued to be studied. On exercise, the non-elastic resistance of the lung was found to run above normal in patients with decompensated hearts whereas in diseased hearts not under stress the non-elastic resistance actually fell.

A large number of patients with known cardiac or pulmonary dyspnoea had their total resistance calculated from the compliance and non-elastic resistance values. Work of breathing during exercise was derived from a product of the total resistance and the minute ventilation. Work of breathing was then graphed against the measured minute ventilation. In a normal subject, work of breathing was found to increase proportionately to the minute ventilation (for moderate exercise). Patients with primary cardiac disease demonstrate this linear increase as well and the line on the graph overlies the normal one. However, patients with primary lung disease had a disproportionately greater increase of work in breathing when related to the minute volume. Evidence suggested that there was a poor distribution of cardiac output between good and bad lung, and that at the altitude of 6,000 feet there was a respiratory disability factor in cardiac subjects.

The Unit assisted in the treatment of cases of acute respiratory failure and studied this problem from the

fisiologiese en die terapeutiese standpunt bestudeer in gevalle van emfiseem, ernstige miastenie, asemstilstand na 'n operasie en asemstilstand as gevolg van postserebrale letsel. Die praktiese vraagstukke is opgelos. Daar is bv. besluit oor die tipe kunsasemhaler, terwyl dit noodsaaklik bevind is om die mate van doeltreffendheid van die kunsmatige ventilasie met 'n spirometer te bepaal. 'n Fisiologiese vraagstuk wat ontstaan het, is die waarneming van strawwe koors in die liggaam maar nie van die ledemate nie by hipoventilasie. Die oorsaak hiervan is ondersoek maar nie gevind nie. Hierdie sonderlinge verskynsel sal by honde ondersoek word.

Die uitwerking van tabakrook op die longfunksie is bestudeer na aanleiding van die waarneming dat sekere longfunksietoetse beter resultate opgelewer het by die nie-rokers as by die rokers wat by die Silikoseburo ondersoek is. Die meganisme hiervan en die verband met chroniese longkwale soos chroniese brongitis is bestudeer.

'n Gekontroleerde langtermyn studie van die doeltreffendheid van chirurgiese ingryping om die longfunksie by chroniese kifoskoliose te verbeter, is begin. Sekere longfunksietoetse word voor, kort en lank na die chirurgiese verbetering van die vormafwyking gedoen. Geen resultate kan nog gegee word nie.

Daar is aangetoon dat die rooiselreaksie na bloedlating 'n nuttige toets is om tussen primêre en sekondêre polisitemie te onderskei. Die studie is uitgebrei om longfunksietoetse in die sekondêre gevalle in te sluit, en wel met of sonder antibiotika, om te sien of die verminderde longfunksie by longinfeksie uitwerking het op die vernuwings tyd van rooiselle. Die resultate van hierdie uitgebreide studie is nog nie georden nie.

'n Langtermynstudie van die metabolisme by hipertensie is begin. Dit het tegnieke meegebring vir die meting van ekstraseellulêre vog, basis- en totale liggaamswater. Een van die tegnieke is oorspronklik en is gepubliseer.

'n Tegniek is ontwikkel waarby binnearse radioaktiewe chroom gebruik word om die plek van die verborge bloedverlies uit die ingewande te bepaal. Sover lyk dit moontlik, maar meer gevalle is nodig om die geldigheid van die gevolgtrekkings te bevestig. Die saak is innig verbind met die diagnose en die behandeling van verborge ingewandsbloeding.

'n Ingewikkelde en tydrowende tegniek is ontwikkel om die patroon van die nefrone by normale persone en by lyers aan albuminurie aan te toon (hiermee sal in verband met ander niersiektes voortgegaan word). Dis bekend dat die nefronbevolking van die normale nier na vorm en grootte uiteenlopend is. Die studie is juis begin om die hipotese op die proef te stel dat uiteenlopende funksionele uitwerkings ontstaan wanneer sekere groepe nefrone (volgens vorm en grootte) deur siekte buite werking gestel word.

physiological and practical therapeutic standpoint in cases of emphysema, myasthenia gravis, post operative respiratory failure and post cerebral trauma respiratory failure. The practical aspects were clarified. For example, a decision regarding the type of artificial respirator was made, and it was found essential to measure the degree of effectiveness of the artificial ventilation by spirometry. A physiological problem that arose was the observation of gross hyperpyrexia of the body but not of the limbs in hypoventilatory states. The cause of this was investigated but not discovered (this strange phenomenon will be studied in dogs).

The effect of smoking on pulmonary function was studied following the observation that certain pulmonary function tests showed better results in non-smokers than in smokers studied at the Silicosis Bureau. The mechanism of this observation and the relationship to chronic lung disease such as chronic bronchitis was studied.

A long-range, controlled study of the effectiveness of surgical procedures to improve pulmonary function in case of chronic kyphoscoliosis was started. Certain pulmonary function tests are done before, immediately and remotely after, surgical correction of the deformity. No results can yet be recorded.

It was shown that the red cell response after venesection affords a useful test to distinguish primary from secondary polycythaemia. The study was extended to include pulmonary function tests in the secondary cases, with and without antibiotics, to see if the reduced pulmonary function of pulmonary infection had any effect on the red cell regeneration rate. Results of this extended study are not yet collated.

A long-term study of the metabolism in hypertension was started. This necessitated the establishment of techniques for the measurement of extracellular fluids, base and total body water, one of which is original and was published.

A technique was evolved using intravenous radioactive chromium to determine the site of occult blood loss from the bowel. So far it would appear that this is possible but further cases are required to definitely prove the validity of the conclusions. This has a very close bearing on the diagnosis of the cause and the treatment of occult bleeding from the bowel.

A complicated and time consuming technique was evolved to demonstrate the pattern of the nephrons in normals and in cases of albuminuria (this will be continued in relation to other kidney conditions). It is known that the population of nephrons in the normal kidney is diverse in regard to shape and size, and the study was initiated to test the hypothesis that diverse functional effects are produced when certain groups of nephron (groups delineated by their shape and size) are destroyed by disease.

Verskeie groepe hartkwale wat chirurgies verhelp is, is nagekontroleer (en sal verder nagekontroleer word) om beter te kan bepaal onder watter onstandighede sulke operasies gedoen moet word. Hierdie soort studie is nou feitlik 'n roetinedeel van die Eenheid se werksaamhede.

Die Eenheid se werk is vergemaklik deur die innige samewerking wat by voortdurende onderhou is tussen die Eenheid, die Silikoseburo en die Pneumokoniose-navorsingseenheid van die Wetenskaplike en Nywerheidsnavorsingsraad.

Various groups of heart condition corrected by surgery were followed up (and will continue to be followed up) with a view to the better determining of the conditions under which such surgery should be undertaken. This type of study is now virtually a routine part of the Unit's activities.

The work of the Unit was facilitated by the close collaboration that continued to exist between it, the Silicosis Bureau, and the Pneumoconiosis Research Unit of the Council for Scientific and Industrial Research.

NAVORSINGSEENHEID VIR KLINIESE VOEDING

Hoof van die Eenheid: PROF. J. F. BROCK

'n Jaar van groot vooruitgang is bekroon deur die opening van 'n nuwe drieverdiepinggebou wat die Eenheid en ander navorsingsgroepe van die Universiteit se Departement van Geneeskunde sal gebruik. Die opening is waargeneem deur die President van die W.N.N.R. in die teenwoordigheid van die Minister van Onderwys en 'n uitgelese geselskap.

Proteïenwanvoeding

Kwashiorkor word algemeen beskou as 'n sindroom van uiterste proteïenondervoeding (gebrek aan proteïenkos in 'n dieet wat in hoë mate uit styselkos bestaan). Dit kom veelvuldig in Suid-Afrika voor. Vir elke geval wat in die hospitaal gediagnoseer word, moet daar honderde, selfs duisende ligter gevalle wees wat tot 'n hoë kindersterfte bydra. Uit die navorsing van die Eenheid blyk dat 'n tekort aan aminosure 'n worteloorzaak van die verskynsel is. Aminosure is die bousteene van proteïen, terwyl proteïenkos ook belangrike beskermende vitamïene en minerale bevat. Styselkos is betreklik arm aan sekere noodsaaklike aminosure en aan party van die beskermende vitamïene en minerale.

Die Eenheid lê hom nou daarop toe om die minimum behoefte aan stikstof en sekere noodsaaklike aminosure vir die groeiende kind te bepaal en wil deur middel van toegepaste ondersoek vasstel in watter mate proteïenryk plantaardige kos soos bone en ertjies die tekortkomings van styselkos soos koring en mielies kan aanvul. Daar is goeie aanduiding dat 'n oordeelkundige

CLINICAL NUTRITION RESEARCH UNIT

Head of the Unit; PROF. J. F. BROCK

A year of great progress has culminated in the opening of a new three-storey building which the Unit and other research groups of the University Department of Medicine will use. The building was opened by the President of C.S.I.R. in the presence of the Minister of Education and a distinguished company.

Protein Malnutrition

Kwashiorkor is generally accepted as a syndrome of severe protein malnutrition (deficiency of protein foods relative to high intakes of starchy foods). It is widely prevalent in South Africa. For every case recognised in hospital there must be many hundreds, if not thousands, of milder cases contributing to high infant mortality. The researches of the Unit have established the fundamental part played in causation by deficiency of amino-acids. Amino-acids are the building bricks of protein while protein foods contain also important protective vitamins and minerals. Starchy foodstuffs are relatively deficient in certain essential amino-acids and in some of the protective vitamins and minerals.

The Unit is now concentrating on the minimum requirement of nitrogen and of certain essential amino-acids for the growing child and with applied studies on the extent to which protein rich vegetable foods such as beans and peas can correct the deficiencies of starchy foods such as wheat and maize. There are strong indications that by appropriate combination of legumes with starchy cereals requirement of the more expensive

samevoeging van peulkos met graanstyselkos die noodsaaklikheid van duur diereproteïenkos tot die minimum sal beperk. Die ekonomiese betekenis hiervan in Suid-Afrika is verreikend.

Hoewel bekend is dat kwashiorkor in Suid-Afrika heers, word nog nie besef dat proteïenwanvoeding 'n geweldige aandeel het in die totale sterfte en morbiditeit onder minderbevoorregtes in die eerste vyf lewensjare nie. Dit blyk uit die verhouding van die sterfte onder blankes tot die sterfte onder nie-blankes by die voor-skoolse kind.

Verhouding van Sterfte: Blank tot Nie-blank in die Kaapse Skiereiland

| Leeftyd | Blank | Nie-Blank |
|------------|-------|-----------|
| 0 - 1 jaar | 1 | 13 |
| 1 - 2 „ | 1 | 26 |
| 2 - 5 „ | 1 | 15 |

Die grootste wanverhouding is in die leeftydsgroep 1-2 jaar, waarin kwashiorkor sy toppunt in hierdie gemeenskap bereik.

Die rol van chroniese proteïenwanvoeding in die gemeenskap is nog onseker, maar as 'n mens die begrip ruim vertolk soos dit hoort, kan daar min twyfel wees dat dit in heel besondere mate bydra tot die veroorsaking van baie ernstige siektes (bv. primêre lewerkanker) wat onder minderbevoorregtes woed in die streke waar kwashiorkor endemies is, maar wat byna onbekend onder die bevoorregtes is. Die Eenheid het dus die proteïenbehoefte van volwasse Bantoeperone met behulp van stikstofbalanstegnieke bestudeer en die maniere ondersoek waarop mielies verryk kan word om dit 'n beter proteïenkos te maak. Dit is nou al duidelik dat verryking met melk en met peulproteïen die stikstofbalans verbeter. Aanvulling met sintetiese aminosure word nou bestudeer. Die gebruik van sintetiese aminosure sal later ongetwyfeld ekonomies wees.

Serumcholesterol en vet in die dieet

Onversadiging is nog die een bestendige eienskap om vette wat die serumcholesterolpeil verlaag, te onderskei van dié wat dit verhoog. Meer inligting word gesoek omtrent eienskappe soos kettlinglengte, gekonjugeerde dubbelbinding en die aanwesigheid van transure. Die aard van die faktor in hoendereiers wat die serumcholesterolpeil so aanmerklik verhoog, word ondersoek. Die mate waarin onversadigde olie die cholesterolverhogende uitwerking van kunsmatig gehidrogeneerde vette soos in margarien en kookvette

animal protein foods can be cut to a minimum. The economic implications in South Africa are far-reaching.

Ratio of deaths: European/non-European in the Cape Peninsula

| Age | European | Non-European |
|------------|----------|--------------|
| 0 - 1 year | 1 | 13 |
| 1 - 2 „ | 1 | 26 |
| 2 - 5 „ | 1 | 15 |

Although the prevalence of kwashiorkor in South Africa is acknowledged it is still not appreciated that an enormous contribution is made by protein malnutrition to the total of under-privileged mortality and morbidity in the first five years of life. This is exemplified by the ratio of European to non-European deaths in the pre-school child.

The biggest disproportion is in the 1-2 year age group which is the peak age incidence of kwashiorkor in this community.

The role of chronic protein malnutrition in the community is still uncertain but if a wide and proper view be taken of the significance of the term there can be little doubt that it is a very considerable contributory factor in the causation of many serious diseases (such as primary cancer of the liver) which are widely prevalent among the underprivileged people of the areas in which kwashiorkor is endemic and which are almost unknown among privileged groups. The Unit has therefore been studying the protein requirement of adult Banru subjects by nitrogen balance techniques and the means whereby maize can be enriched to provide a better quality protein. It is already clear that enrichment both with milk and with legume protein improves nitrogen balance. Supplementation with synthetic amino-acids is being studied. Synthetic amino-acids will undoubtedly be economically feasible in the future.

Serum Cholesterol and dietary fat

Unsaturation remains the one consistent character which distinguishes fats which lower the serum-cholesterol from those which raise it. More information is being sought on characters such as chain length, conjugated double bonds and presence of trans acids. The nature of the factor in hen's egg which raises the serum-cholesterol so significantly is being sought. The extent to which unsaturated oils can neutralise the cholesterol-raising effect of artificially hydrogenated fats as in margarine and cooking fats is being studied.

kan neutraliseer, word bestudeer. Die aanduidings is dat die serumcholesterolverhogende eienskappe van gehidrogeneerde vette op dié manier wel geneutraliseer kan word.

Die ondersoek van die voedings- en die metaboliese aspek van hierdie saak staan in die teken van die geweldige toename in die voorkoms van ischemiese (kroonslaagar-) aandoenings onder blanke Suid-Afrikanners. Die sterfte hieraan word volgens die wêreldstatistiek net deur dié in die V.S.A. oortref. Dit is nog nie bewys dat verlagings van die serumcholesterolpeil die lewensverwachting verbeter nie, maar die aanduidings is sterk. Dieetfaktore moet in verband gesien word met erkende bykomende oorsaaklike faktore soos gebrek aan liggaamsbeweging, die aanwesigheid van spanning en kommer en die rookgewoonte. Sekere erkende oorsaaklike faktore soos ras, familieverband en geslag kan nie deur volksgesondheidsmaatreëls beheer word nie, maar die geringe voorkoms van die siekte by ons Bantoe en bv. by die Japanners, gepaard met 'n toenemende voorkoms na gelang hierdie rasse in die stede en nywerhede ingetrek raak, dui daarop dat die sterfte onder blankes sterk verminder kan word as die werksame oorsake uitgeken en verhelp kan word.

Renaal/Metaboliese en Porfirieafdeling

Hierdie afdeling van die Eenheid het goeie werk gedoen en het verdere ondersteuning nodig. 'n Langtermynstudie van nefrose en die uitwerking van steroïede middels daarop het syfers voortgebring om die doeltreffendheid van die terapie te bepaal wat ongekëwenaar is in die wêreld. Sorgvuldig gekontroleerde kliniese studies van sekere nuwe diuretika (vir die verligting van edeem of watersug) is gepubliseer. Waardevolle ondersoek is gedoen na die gebruik en die metaboliese reëling van die kunsnier, wat in gevalle van akute tydelike nierstilstand die lewe kan red.

Fundamentele navorsing is gedoen na die meganiek en die oorsake van porfirinurie en na die kwale wat porfirie genoem word. Die saak is van groot belang vir Suid-Afrika, waar tot 25,000 potensieel aangetas kan wees deur die dominante erfenis van Mendel uit een enkele huwelik in die vroeë tyd aan die Kaap.

DANKBETUIGING

Die werksaamhede van die Kliniese Voedingseenheid het heelwat aandag getrek in Suid-Afrika sowel as in die buiteland. Daar het mooi bydraes binnegekom, finansieel en materieel. Die Eenheid wil sy dank teenoor die volgende liggame betuig:—

Die Personeelnavorsingsfonds van die Universiteit van Kaapstad.

The A.R. Richardson Research Fund, Kaapstad.

Die Munisipaliteit van Kaapstad.

Indications are that the serum-cholesterol raising property of hydrogenated fats can in this way be neutralized.

The nutritional and metabolic work in this field is being done against the background of the enormous rise in prevalence of ischaemic (coronary) heart disease in White South Africans who are second in world statistics only to the U.S.A. in mortality from this disease. It is not yet proven that lowering the serum-cholesterol will improve life expectation but the indications are strong. Dietary factors have to be taken in relation to admitted additional causative factors such as lack of exercise, tension and strain and smoking. Certain admitted causative factors such as race, family and sex are outside of public health control but the low prevalence of the disease in our Bantu and for example in the Japanese and the rising prevalence as these races become urbanised and industrialized suggests that White mortality could be very greatly reduced if the operative causes could be identified and corrected.

Renal/Metabolic and Porphyria

This section of the Unit has done fine work and needs further support. Long term study of nephrosis and the effects thereon of steroid drugs has produced figures for judging the efficacy of therapy which are unrivalled in the world. Carefully controlled clinical studies of certain new diuretics (for the relief of oedema or dropsy) have been published. Valuable studies have been done in the use and metabolic control of the artificial kidney which is lifesaving in cases of acute temporary kidney failure.

Fundamental studies have been made into the mechanism and causes of porphyria and into the disease called porphyria. The matter is of fundamental importance to South Africa where up to 25,000 people may have been potentially affected by Mendelian dominant inheritance from a single marriage in the early days of the Cape.

ACKNOWLEDGEMENTS

The activities of the Clinical Nutrition Unit have attracted considerable attention both inside and outside South Africa and there have been substantial contributions, both financial and material. The Unit wishes to make acknowledgement to the following organizations:

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 York.
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 New Jersey, U.S.A.
 E.I. du Pont de Nemours and Co., Wilmington,
 Del., U.S.A.
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Jointly with the Department of Child Health

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NAVORSINGSGROEP VIR DEGENERASIESIEKTE- TOESTANDE

Leier van die Groep: DR. A. J. BRINK

Spontane Subarachoïede Bloedings

Hierdie ondersoek is afgehandel en resultate is reeds vir publikasie vrygestel. Daar is drie aparte aspekte wat in publikasievorm verwerk is.

Hipertensiestudies

Die werk in verband met ernstige hipertensie, kliniese beeld en spesiale ondersoeke word voortgesit.

Die ensiemstudies op die urine van pasiënte met hipertensie kan nie voortgesit word nie, omdat die Warburg-apparaat nog nie gebruik kan word nie. Die urines word egter onder bevriësing bewaar.

DEGENERATIVE DISEASES RESEARCH GROUP

Leader of the Group: DR. A. J. BRINK

Spontaneous Subarachnoid Haemorrhage

This investigation was completed and the results released for publication. Three separate aspects were treated.

Hypertension Studies

The work in connection with malignant hypertension, clinical picture and special investigations is being continued.

The enzyme studies on the urine of patients with hypertension cannot proceed because the Warburg apparatus is not yet in operation. The urine is, however, stored in a frozen state.

'n Stuk werk in verband met die gebruik van Pempidine by hipertensie is afgehandel en word vir publikasie gereedgemaak.

Longfunksie studies

'n Toegeruste eenheid vir longstudies funksioneer bevredigend. Slegs diffusiestudies word nie nou onderneem nie.

'n Ondersoek na die tegniek en waarde van naaldbiopsie van die pleura is voltooi.

Hemodinamiese Studies

'n Laboratorium vir Kardiale kateterisasie werk bevredigend en roetine-ondersoeke word uitgevoer.

'n Ondersoek na die fisiologiese wisseling van die longsirkulasie onder omstandighede van veranderde intrapulmonale drukke, word eksperimenteel uitgevoer. Honde word hiervoor gebruik en daar is tot op datum vier honde-eksperimente uitgevoer. Na verwagting sou nog twee verdere ondersoeke nodig wees voordat die projek afgehandel is.

Vaskulêre Studies

Die groep is tans besig met 'n ondersoek na die vasculêre oorsake van diabetiese neuropatie, deur middel van pletismografiese studies wat gekorreleer word met biopsies by pasiënte met Diabetes Mellitus.

Elektro-ensefalografie en hartaritmie

Die nodige modifikasie van Schwarzer-elektro-ensefalograaf kon nog nie deur die plaaslike agente gedoen word nie; derhalwe is die werk tydelik onderbreek.

Renale Werk: Kunstnier

Die ondervinding in verband met die gebruik hiervan is reeds van veel betekenis gewees vir die Groep, en 'n referaat is hieroor gelewer by die Internistiekongres, gehou in Kaapstad gedurende Januarie 1959. Dit word eersdaags gepubliseer.

Verlag deur dr. L. Potgieter

Verlag deur dr. L. Potgieter uit die Lankenau-hospitaal, Philadelphia, dui daarop dat hy waardevolle werk doen, veral op Radioisotoopstudies vir die bepaling van kardiaal omsat en Oefenigstoetse.

Diverse studies

'n Studie van Sekelselanemie by 'n Kleurlingfamilie is uitgevoer.

Vooruitsigte

Vier gebeurtenisse sal sonder twyfel nog 'n belangrike uitwerking hê op die Groep se navorsingsaktiwiteite:—

Die inskakeling van die Conradie-hospitaal se afdeling vir chroniese siektes by die Karl Bremer-

A project in connection with the use of Pempidine in hypertension was completed. Results are being prepared for publication.

Longfunksie studies

A unit equipped for pulmonary studies is functioning satisfactorily. Diffusion studies only are not undertaken now.

An investigation of the technique and value of needle biopsy of the pleura was completed.

Haemodynamic Studies

A laboratory for cardiac catheterization functions satisfactorily and routine examinations are carried out.

An investigation of the physiological variations of the pulmonary circulation under conditions of modified intrapulmonary pressures is being carried out experimentally. Dogs are used, and four dog experiments have been carried out to date. It is expected that two further investigations will be required before completion of the project.

Vascular Studies

The Group is engaged on an investigation of the vascular causes of diabetic neuropathy by means of plethysmographic studies correlated with biopsies in patients suffering from diabetes mellitus.

Electro-encephalography and heart arrhythmia

The local agents have not been in a position to effect the necessary modification to the Schwarzer electro-encephalograph, with the result that the work was temporarily discontinued.

Renal work: Artificial Kidney

Experience in the use of the artificial kidney has been of great value to the Group, and a paper on this subject was read at the congress of physicians held at Cape Town during January 1959. The paper will be published shortly.

Report by Dr. L. Potgieter

It is evident from a report by Dr. L. Potgieter from the Lankenau Hospital, Philadelphia, that valuable work is being done by him, especially on radio-isotope studies for determining cardiac output and on exercise tests.

Miscellaneous studies

A study on sickle-cell anaemia was carried out on a Coloured family.

Prospects

Four events will doubtless influence the Group's research activities to a significant extent:—

The integration of the Conradie Hospital Ward for Chronic Diseases with the Karl Bremer Hospital and

hospitaal en die Universiteit Stellenbosch se op-
leidingsgroep-hospitale. Ons sal hier 'n belangrike
bron hê vir die Groep se aktiwiteite.

'n Goed toegeruste spesiale biochemiese labora-
torium vir die Departement Interne Geneeskunde sal
ongeveer Junie 1959 voltooi word.

Die beskikbaarstelling van 'n voltydse senior
kliniese fisioloog werksaam in die Departement
Interne Geneeskunde.

Die betrekking van bykomstige ruimte vir die
Interne-departement toegestaan by die nuwe opslaan-
geboue by die Karl Bremer-hospitaal.

the training group of hospitals of the Stellenbosch
University. This will constitute a very important
source for the Group's activities.

A well-equipped special biochemical laboratory for
the Department of Internal Medicine will be ready
by June 1959.

The availability of the services of a senior clinical
physiologist in the Department of Internal Medicine.

The occupation of additional premises allocated
to the Department of Internal Medicine in the new
pre-fabricated buildings at the Karl Bremer Hospital.

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TANDHEELKUNDIGE- NAVORSINGSEENHEID

Hoof van die Eenheid: PROF. J. T. IRVING

Die werk van die Eenheid in verband met die funda-
mentele prosesse in die fisiologie van die mond is
voortgesit, met besondere aandag aan die verkalking
van tande en die tandkasbeen en aan die stofwisseling
van die mondepittele.

DENTAL RESEARCH UNIT

Head of the Unit: PROF. J. T. IRVING

The work of the Unit on the fundamental processes
concerned with the physiology of the mouth continued
with special regard to the calcification of teeth and
alveolar bone and to the metabolism of the oral
epithelia.

Mikrochemie van Verkalking

In die vorige verslag is verklaar dat slegs die weefsel wat die heel laaste verkalk het, die kleurstof opneem wanneer verkalkende weefsels met warm piridien geëkstraheer en met soedanswart gekleur word. Dit het gegeld vir glasuur en dentien, asook vir been. Daar is nou bevind dat behandeling met warm alkohol, of warm alkohol en warm bensol, net so doeltreffend is. Die aard van hierdie reaksie is nog onopgeklaar, maar sekere feite dui daarop dat mukopolisakkariede daarby betrokke is. Die metachromasie van hierdie streek met toluïdienblou ('n taamlieke seker toets vir suurgroepe, gewoonlik sulfate) word byvoorbeeld versterk deur piridienbehandeling, terwyl hierdie metachromasie in die epifisekraakbeen met hialuronidase verwyder word. Die kleuring met soedanswart word nie deur hialuronidase beïnvloed nie, maar dit kan daaraan toe te skryf wees dat toluïdienblou en soedanswart verskillende dele van die mukopolisakkariedmolekule kleur, veral aangesien kleuring van hierdie streek met die perjoodsuur-Schiffreagens verhoog word deur hialuronidase. In die geval van tande is die voeg tussen dentien en predentien en die gedeeltes van die glasuur wat in suur oplosbaar word, intens metachromaties en sterk kleurbaar deur soedanswart. Al die soedanofiele streke het na geskikte behandeling 'n metileenblouverdwoning van onder pH 2.6. Uit die gegewens is sover afgelei dat 'n spesifieke suurmukopolisakkaried betrokke is by die aanvang van verkalking in tande en been.

Die Chemie van Dentienverkalking

Uit vroeëre navorsing blyk die aanmerklike verskil tussen die kollagene van sagte en harde weefsels. Omtrent 66% van die ϵ -aminogroepe van sagteweefselkollagene was vry om met fluoordinitrobenseen te reageer, maar by volkome verkalkte dentien en been wou geeneen reageer nie, en na ontkalking met suur het al hierdie groepe gereageer. Die stelling is geponeer dat daar 'n bepaalde kollageen in harde weefsel is en dat die ϵ -aminogroepe 'n aanmerklike rol in verkalking speel. Proewe is onderneem om te kyk of ontalkte dentien in geskikte omstandighede weer verkalk kan word. Afgesien van die teoretiese belang van so 'n prosedure kan dit ook belangrike praktiese toepassings in die kliniese tandheelkunde hê. Dit is moontlik gevind om ontalkte dentien weer te mineraliseer in oplossings waarvan die produk $\text{Ca} \times \text{P}$ laer is as wat vir selfbesinking nodig is. As die basis- of suurgroepe van die proteïenfraksie geblokkeer word, vind geen remineralisasie plaas nie, en na gelang die dentien die minerale materiaal opneem, word die ϵ -aminogroepe onreaktief. Dit lyk dus asof remineralisasie, in chemiese sin, die omgekeerde van ontkalking is en asof die beskouing dat ϵ -aminogroepe 'n ingrypende rol in verkalking speel, bevestig word.

Die teorie wat die Eenheid nou huldig, is dat 'n

Microchemistry of Calcification

In the last report it was stated that, when calcifying tissues were extracted with hot pyridine and stained with Sudan Black, only the most recent calcified tissue took up the stain. This applied to enamel and dentin and also to bone. It has now been found that treatment with hot alcohol, or hot alcohol and hot benzol, is equally effective. The nature of this reaction is still obscure, but certain facts make it appear that acid mucopolysaccharides are involved. For example, the metachromasia of this area with toluidine blue (a fairly specific test for acid groups, usually sulphates) is enhanced by pyridine treatment and in the epiphyseal cartilage this metachromasia is removed with hyaluronidase. The staining with Sudan Black is not affected by hyaluronidase, but this may be due to the fact that toluidine blue and Sudan Black stain different parts of the mucopolysaccharide molecule, especially since staining of this zone with the periodic acid—Schiff reagent is enhanced by hyaluronidase. In the case of teeth, the dentin-predentin junction and the parts of enamel becoming an acid-soluble, are intensely metachromatic and stain strongly with Sudan Black. All the sudanophil areas have, after appropriate treatment, a methylene blue extinction lower than pH 2.6. It has been concluded, on the balance of the evidence so far available, that a specific acid mucopolysaccharide is involved in the initiation of calcification in teeth and bone.

Chemistry of Dentin Calcification

Earlier work showed that there is a significant difference between the collagens of soft and hard tissues. About 66% of the ϵ amino groups of soft tissue collagens were free to react with fluorodinitrobenzene, but in fully calcified dentin and bone none would react and after decalcification with acid almost all these groups were reactive. It was postulated that there is a specific collagen in hard tissues, and that the ϵ amino groups play a significant role in calcification. Experiments were undertaken to see if decalcified dentin could, under appropriate conditions, be recalcified. Apart from its theoretical interest, such a procedure might have important practical implications in clinical dentistry. It was found that it was possible to remineralize decalcified dentin in solutions whose $\text{Ca} \times \text{P}$ product was below that necessary for spontaneous precipitation. If the basic or acidic groups of the protein fraction were blocked no remineralization occurred and, as the dentin took up the mineral material, the ϵ amino groups became unreactive. Thus the process of remineralization appeared to be, on a chemical basis, the reverse of decalcification and the concept that the ϵ amino groups played an intimate role in calcification was supported.

The theory now held by the Unit is that a specific

bepaalde mukopolisakkaried as opwekker van verkalking funksioneer, waarby die kollagenmolekuul as patroon vir die inenting van die apatietkristal dien.

Metabolisme van die Tandvleis en die Mondepitele

Die weefsels van jong en ou rotte is ondersoek met die oog op hulle deelname aan die trikarboksiesuur-siklus van Krebs. Met vars weefsels van jong rotte het al die stofwisselingsprodukte van die siklus 'n verhoogde respirasie getoon, maar met vars materiaal van ou rotte is so 'n uitwerking nie waargeneem nie, tensy die weefsel ten minste 'n dag lank in die koelkas gehou is. Vitamien D speel 'n belangrike rol in die siklus. Met weefsel van normale jong rotte het vitamien D nie die respirasie in die teenwoordigheid van die getoetste stofwisselingsprodukte beïnvloed nie, maar met weefsels van ragitiese rotte het vitamien D wel die respirasie verhoog. Dit is strydig met die uitwerking van vitamien D op die weefselrespirasie van ander organe soos in die vakliteratuur opgegee. Dit wil dus voorkom asof vitamien D noodsaaklik is vir die behoorlike stofwisseling van die mondepitele.

Beeninplantingsmateriaal

„Anorganiese” been (been sonder sy organiese bestanddeel) is getoets as inplantingsmateriaal by beengebroke, veral met die oog op die bevordering van vernuwing van tandkasbeen. Gebreke is in die dybene van rotte gemaak en daarna gevul met gepoeierde anorganiese been. Die resultate tot dusver toon dat anorganiese been beenvernuwing belemmer, wat strydig is met die bevindings van party buitelandse navorsers, want die vernuwing vind vinniger sonder anorganiese been plaas.

mucopolysaccharide acts as a primer for calcification, the collagen molecule serving the role of a template for seeding the apatite crystal.

Metabolism of the Gingiva and Oral Epithelia

The tissues of young and old rats have been investigated with respect to their participation in the Krebs' tricarboxylic acid cycle. With fresh tissues from young rats, all the metabolites of the cycle increased respiration, but with fresh material from old rats no such effect was seen, unless the tissue was stored in the refrigerator for at least one day. Vitamin D plays an important role in the cycle. With tissue from normal young rats, vitamin D did not affect the respiration in the presence of the metabolites tested but with tissues from rachitic rats, vitamin D increased the respiration. This is contrary to the effects of vitamin D upon tissue respiration of other organs, as reported in the literature. It would thus appear that vitamin D is essential for the proper metabolism of the oral epithelia.

Bone Implantation Materials

“Anorganic” bone (bone minus its organic content) has been tested as an implantation material for bony defects, especially with a view to stimulating alveolar bone regeneration. Defects have been made in the femora of rats and then filled with powdered anorganic bone. The results to date show that contrary to the findings of some overseas workers, anorganic bone hinders bone regeneration, which is faster in its absence.

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ENDOKRIEN-METABOLIESE NAVORSINGSGROEP

Leier van die Groep: PROF. F. FORMAN

Oor die algemeen is die werk voortgesit in verband met prediabetes, die mineraalbalans by verstourings van die kalsiummetabolisme en spesiale endokriene bepalings wat benut is by die ondersoek van wanvoeding, diabetes, granulosa-selgewas en die sindroom van Cushing. Die bepaling van aldosteron en estrogeen is veral besonder ingewikkeld, duur en tydrowend. Hierdie ondersoek om dié waardes onder bogenoemde omstandighede te bepaal, is blykbaar die eerstes wat gedoen is.

'n Besondere uitvloeisel was die formulering van 'n nuwe teorie oor kalsiummetabolisme, gegrond op die groep se balansproewe. Hierdie teorie is tentatief gestel in Baltimore, Michigan, Glasgow, Londen en Kaapstad en is met 'n mate van instemming ontvang.

Diabetes

Die kortisoon-glukosetoleransietoets: Hierdie toets is voortgesit in die groepe persone wat in die vorige jaarverslag beskrywe is. Daar is getoon dat 'n aantal persone by wie die diabetes aan die verminder was, nog sterk abnormaal was.

Toleransietoets met glukose binnears: Hierdie toets is begin en word op die oomblik op kinders, normale kontrolepersone en lyers aan kwashiorkor toegepas. Die bedoeling is om dit uit te brei tot die diagnose van prediabetes met kortisoonvoorbehandeling.

Funksie van buislose kliere by diabetes: Ter voorsetting van die studie van bynierfunksie wat verlede jaar begin is, is nagenoeg 60 pasiënte met en sonder retinopatie in al drie rasse-groepe nou ondersoek. Die ondersoek is wel nog nie klaar nie, maar tot dusver kon nog geen noemenswaardige versterking van die bynierwerking by diabetici met vasculêre aandoening aangetoon word nie.

Daar is beweer dat blanke lyers aan miokardiale infarksie 'n hoër peil van urinêre estrogeen as kontrolepersone het. Dit is bekend dat normale vroue veelal beskermd is teen miokardiale infarksie, terwyl dit veral by diabetici en dan nog in besondere mate by vroulike diabetici voorkom.

Die bepaling van estrogeenaafskeiding by diabetici (by wie vasculêre komplikasie dikwels voorkom) word dus onderneem. By hierdie studie sal blanke en Bantoe-pasiënte betrek word. Die Bantoe-groep behoort besonder interessant te wees, aangesien miokardiale infarksie baie selde onder hulle voorkom en omdat hulle boonop 'n ander patroon van estrogeenaafskeiding het.

ENDOCRINE / METABOLIC RESEARCH GROUP

Leader of the Group: PROF. F. FORMAN

In general, work continued on prediabetes, mineral balance studies in disorders of calcium metabolism, and special endocrine estimations which were put to use in the investigation of malnutrition, diabetes, granulosa-cell tumour and Cushing's Syndrome. Estimation of aldosterone and oestrogen in particular are extremely complicated, expensive and time-consuming. It is believed, however, that these are the first investigations to estimate these values in the conditions mentioned above.

An outstanding feature was the formulation of a new theory of calcium metabolism, based on the Group's balance experiments. This was tentatively put forward in Baltimore, Michigan, Glasgow, London and Cape Town and has received some approval.

Diabetes

The cortisone-glucose tolerance test: This test was continued in the groups of subjects who were described in the last annual report. A number of persons whose diabetes was in remission were shown to be still grossly abnormal.

Intravenous glucose tolerance test: This test was started and is being used at present on children, normal controls and those suffering from Kwashiorkor. It is intended to extend it to the diagnosis of prediabetes, with cortisone priming.

Endocrine Function in Diabetes: In continuation of the study of adrenal function started last year, some 60 patients have now been investigated, both with and without retinopathy, in all three racial groups. The investigation is not yet complete but thus far it has not been possible to demonstrate any significant increase in adrenal activity in diabetics with vascular disease.

It has been suggested that European patients with myocardial infarction have higher levels of urinary oestrogen than controls. It is known that normal females are largely protected from myocardial infarction, while it is especially common in diabetics, and even more strikingly so in female diabetics.

Estimation of oestrogen excretion in diabetics (in whom vascular complications are frequent) is therefore being undertaken. This study will include both European and Bantu patients. The latter group should be particularly interesting as they very rarely develop myocardial infarction and in addition have a different pattern of oestrogen excretion.

Ons brei die studie ook uit tot nie-diabetici met miokardiale infarksie.

In al hierdie studies word fraksies van serumcholesterol en lipoproteïen ook bepaal.

Mondterapie: Die kliniese toets van tolbutamied is verlede jaar afgehandel. 'n Beperkte toets van D.B.I. is begin. Dit is 'n kragtiger hipoglisemiese middel en het 'n aanmerklike uitwerking selfs by die jeugdige pasiënt.

Prediabetes: 'n Uitstalling van die Groep se navorsingswerk op dié gebied is gehou op die Derde Internasionale Diabetiese Kongres wat in Julie 1958 in Düsseldorf, Duitsland, plaasgevind het.

Kalsium- en fosformetabolisme

Reaksie op byskildklierhormoon: In verlede jaar se verslag is die algemene rigting van die ondersoek aangetoon. Die ondersoek is uitgebrei deur meer kontrolestudies by te voeg en deur 'n baie uitvoerige statistiese ontleding.

Altesame 29 normale mans is ondersoek, en die uitwerking van byskildklierhormoon op urinêre en serumkalsium en fosfor aangeteken.

Hierdie werk is nou klaar. Die vernaamste gevolgtrekkings is dat, hoewel daar 'n noemenswaardige toename by alle parameters op die derde en die vierde dag na toediening plaasgevind het, daar enkele gevalle sonder reaksie was. Met die oog hierop is dit miskien nie 'n betroubare toets om te onderskei tussen pseudohipoparatiroidisme en hipoparatiroidisme soos beweer is nie. Die verslag word vir publikasie gereed gemaak. *Ragitis:* Vier broers en susters met ragitis wat teen vitamien D weerstand bied, is ondersoek. Metaboliese en nierfunksiestudies is gedoen, en die pasiënte is 'n jaar lank nagekontroleer. Aanduiding van 'n gebrek is gevind in absorpsie van kalsium in die spysverteringskanaal sowel as in 'n verminderde reabsorpsie van fosfor in die nierbuis. Die ondersoek word voortgesit.

In Kaapland is daar nog baie lyers aan ragitis, 'n siekte wat elders vinnig aan die verdwyn is. Daar is baie onopgeloste vraagstukke verbonde aan hierdie siektetoestand. Een doel van die studie was om die betreklike belangrikheid van gebrek aan sonlig en/of kalkontneming in die etiologie te bepaal. Daar is bevind dat die kalsiumopname oor die algemeen bevredigend was, maar dat sonbestraling meestal onvoldoende was in die 50 gevalle wat sover bestudeer is.

Verder is hierdie pasiënte biochemies en radiologies ondersoek, terwyl die reaksie op kalsiferol en AT₁₀ (dihydrotagisterol) aangeteken is. Die gehalte van die serum aan vitamien D word biologies bepaal.

Die studie is nog aan die gang. Dit lyk of die serumkalsium slegs effens verminder word en dikwels normaal is. Eenaardig genoeg, daar was enkele akute gevalle met normale serumfosforwaardes.

We are also extending this study to include non-diabetic patients with myocardial infarction.

In all these studies serum cholesterol and lipoprotein fractions are being assayed.

Oral Therapy: The clinical trial of tolbutamide was completed last year. A small trial of D.B.I. was started. This is a more powerful hypoglycaemic agent, and has some considerable effect even in the juvenile type of patient.

Prediabetes: An exhibition demonstrating the Group's research work in this field was displayed at the Third International Diabetic Congress held in Dusseldorf, Germany, in July 1958.

Calcium and Phosphorus Metabolism

Response to Parathyroid Hormone: Last year's report indicated the lines on which this work is done. It was extended by addition of more control studies and by very detailed statistical analysis.

In all, 29 normal male subjects were investigated and the effect of parathyroid hormone on urinary and serum calcium and phosphorus noted.

This work is now complete. The main conclusions are that although there were significant increases in all parameters on the 2nd and 3rd days after administration, there were individual cases which did not respond. In view of this it might not be a reliable test for differentiating pseudohypoparathyroidism from hypoparathyroidism as has been suggested. The report is being prepared for publication.

Rickets: A family of four siblings with Vitamin D-resistant Rickets was investigated. Metabolic and renal function studies were done and the patients were followed up for a year. Evidence of a defect was found in both gastrointestinal absorption of calcium and a diminished renal tubular reabsorption of phosphorus. Further investigations are proceeding.

In the Cape there is a large reservoir of ordinary rickets, a disease fast becoming extinct elsewhere. There are many problems connected with this condition which are not understood. One purpose of the study was to determine the relative importance of lack of sunlight and/or calcium deprivation in the aetiology. It was found that on the whole calcium intake was satisfactory but that exposure to sunlight was generally inadequate in the 50 cases so far studied.

In addition, these cases were investigated biochemically and radiologically and the response to calciferol and AT₁₀ (Dihydrotagisterol) noted. The Vitamin D content of serum is being assayed by biological means.

Radiologiese genesing gaan die herstel van alkaliese fosfatase tot die normale peil baie maande vooruit. Die serumsitraatpeil is dikwels laag. Dihydrotagisterol bevorder genesing maar nie so vinnig as kalsiferol nie, terwyl na verhouding 'n groter dosis nodig is. Die uitwerking van hierdie twee stowwe is noukeuriger aangeteken in 'n volledige studie van die metaboliese balans by een pasiënt.

'n Familievoorkoms van „onkompliseerde” ragitis het in party gevalle voorgekom.

Miëlloom: Twee lyers aan hiperkalsemie weens miëlomatose is ondersoek—een deur middel van 'n volledige metaboliese balans. Die aandag is gevestig op die dramatiese uitwerking van kortisoon om die peil van serumkalsium sowel as dié van serumfosfor te verlaag, met daaropvolgende kliniese verbetering. Dit is nie seker of hierdie uitwerking bewerkstellig word via 'n blok in die absorpsie van kalsium in die spysverteringskanaal (soos wat by sarkoïdose voorkom) nie. Inderdaad is dit waarskynliker dat daar 'n direkte uitwerking op die been is. Die hoop bestaan dat radioaktiewe middels gebruik sal kan word om hierdie vraagstuk op te los.

(Met die medewerking van dr. T. Sachs word die antiliggamereaksie by miëlloom ondersoek met gebruikmaking van TAB en klein dosisse onverenigbare bloed as antigeen).

'n Vergelykende studie van die kalsiumgehalte van serum by die drie rassegroepe is begin, gekorreleer met maandelike verandering by die serumproteïen.

Verdere studies van metaboliese balans: Die Groep is besonder geïnteresseer in die werking van vitamien D en kortisoon op die kalsiummetabolisme en het voortgegaan met die bestudering hiervan by normale sowel as hipoparatiroïede proefpersone. Die gevolgtrekking is dat vitamien D drie primêre en aparte uitwerkings op die kalsiummetabolisme het en dat dit die urienkalsium kan verhoog sonder verandering in die serum-Ca of in die absorpsie uit die ingewande. 'n Opmerkbare bestendigheid van urinêre Ca en van ingewandsabsorpsie by heeltemal verskillende opnamepeile is by dieselfde persoon waargeneem, waaruit afgelei is dat verwekte veranderinge in urienkalsium as prikkel dien om veranderinge in die ingewandsabsorpsie van hierdie element uit te balanseer.

Balansstudies word op 'n proefpersoon uitgevoer wat ly aan Kinnear-Wilson se siekte met hiperkalsemie.

Funksie van Buislose Kliere by Wanvoeding

Kwashiorkor: 'n Ondersoek na die endokriene abnormaliteite by lyers aan kwashiorkor is met medewerking van die Navorsingseenheid vir Kliniese Voeding

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The study is still in progress. It appears that the serum calcium is usually only slightly reduced and often normal. It was surprising to find some acute cases with normal serum phosphorus values.

Radiological healing precedes the return of alkaline phosphatase to normal levels by many months. Serum citrate levels are often low. Dihydrotagisterol promotes healing but not as rapidly as calciferol and a proportionately higher dose is required. The effects of these two substances have been more carefully noted in a full metabolic balance study on one patient.

A familial incidence of “uncomplicated” rickets occurred in some cases.

Myeloma: Two patients with hypercalcaemia due to myelomatosis were investigated—one by means of full metabolic balance. Attention was directed to the dramatic effect of cortisone in lowering both the serum calcium and phosphorus with subsequent clinical improvement. It is not certain that this effect is mediated via a block in gastro-intestinal absorption of calcium (as occurs in Sarcoidosis). In fact it is more likely that there is a direct effect on bone. It is hoped that it will be possible to employ radio-active studies in elucidating this problem in the future.

(In co-operation with Dr. T. Sachs the antibody response in myeloma is being investigated employing TAB and small doses of incompatible blood as antigens).

A study was commenced of the comparison of calcium content of serum in the three racial groups, correlating with any change with the serum protein.

Further Metabolic Balance studies: The group is particularly interested in the mode of action of vitamin D and cortisone on calcium metabolism and continued to study this both in normal subjects, and in hypoparathyroid subjects. It was concluded that Vitamin D has three primary and separate actions on calcium metabolism, and that it can raise the urine calcium without any change in serum Ca or in absorption from the bowel. A remarkable constancy of urinary Ca and of intestinal absorption at quite different intake levels were observed in the same person and it was concluded that induced changes in urine calcium act as a stimulus to counterbalancing or compensating changes in intestinal absorption of this element.

Balance studies are being carried out on a subject with Kinnear-Wilson's disease who has hypercalcaemia.

Endocrine Function in Malnutrition

Kwashiorkor: (in collaboration with the Clinical Nutrition Research Unit): An investigation of the Endocrine abnormalities in patients suffering from Kwashiorkor

begin. Die metodes wat op die oomblik in die laboratorium in gebruik is, naamlik 17-ketosteroïede en 17-hidroksikortikoïede en aldosteron in die urien, word toegepas.

In 5 gevalle van kwashiorkor is die urien al om die derde dag van verblyf in die hospitaal ingesamel om 'n basislyn van die urinêre 17-Ks en 17-HOCS in verskillende fases van die siekte vas te stel. Wanneer meer gegewens van dergelike aard versamel is, sal die uitwerking van ACTH (kortikotrofen)-prikkeling van die bynier gemeet word.

Urinêre aldosteron is gedurende die edemateuse en die diuretiese fase van die siekte bepaal. Dit blyk dat die urien 'n matig hoë aldosteron gehalte in die edemateuse fase het, wat dan tot byna nul in die herstelfase daal. Die metode is veeleisend, duur en tydrowend. Heelwat tyd en krag is daaraan bestee om die tegniek te vervolmaak. Die huidige resultate is bemoedigend. Werk aan die finale beproewing van die metode se betroubaarheid is aan die gang.

By ontvangs van die noodsaaklike toerusting wat bestel is, sal die volgende metodes toegepas kan word:—

1. Bepaling van serum-17-HOCS voor en na prikkeling met ACTH.
2. Meting van die inname van proteïengebonde jodium en radioaktiewe jodium as maatstaf van skildklierfunksie.

Soortgelyke ondersoeke sal op normale kinders, wat as kontrolepersone dien, uitgevoer word.

Koolhidraatmetabolisme word deur middel van die binnearse glukosetoleransietoets ondersoek.

Ondersoek na die funksie van die buislose kliere by pellagrals: In hierdie voorlopige studie is 10 pellagrals en 10 normale Bantoes by Umtata ondersoek.

Hipofise-, bynier- en geslagsklierfunksie is ondersoek, terwyl 'n rassevergelyking met 'n kontrolegroep blankes van gelyke leeftyd gemaak is.

Die statistiese vergelykings is nog nie gereed nie. Daar was verminderde afskeidings van urinêre estrogeen, hidroksikortikoïede en ketosteroïede en follikelstimulerende hormone by die pellagrals, maar die verskil tussen die twee Bantogroepe is klein en weens die geringe getal gevalle waarskynlik statisties nie beduidend nie.

By vergelyking van Bantoe en blanke is bevind dat daar 'n geringer totale estrogeenafskieding en 'n verminderde estriolfraksie by die blanke is. Daar was geen verskil in hidroksikortikoïedafskieding by die twee groepe nie, maar 'n geringer afskieding van ketosteroïed by die Bantoes. Weer het die klein getal 'n statistiese vergelyking bemoeilik.

Die plan is om die werk voort te sit. Weens die geringe aantal lyers aan hierdie siekte in Kaapstad is die samewerking van die Departement van Geneeskunde van die King Edward VIII-hospital in Durban gevra. Hierdie projek begin binnekort.

was started. Methods currently available in the laboratory, namely, estimation of 17-ketosteroid and 17 hydroxycorticoids and aldosterone in the urine, were used.

In five cases of Kwashiorkor, urine was collected on every third day of hospitalization, in order to establish a base line of the urinary 17 KS and 17 HOCS in different phases of the disease. When more information of a similar nature has been accumulated, the effect of A.C.T.H. (Corticotrophin) stimulation on the adrenal gland will be measured.

Urinary aldosterone has been estimated during the oedematous and diuretic phases of the disease. It appears that there is a moderately high aldosterone content in the urine of the oedematous stage, which falls to almost nil in the recovery phase. The method used is an exacting, expensive and time consuming procedure. A great deal of time and effort has been spent on perfecting this technique and from results obtained to date it appears to be satisfactory. Work on the final proof of the reliability of the method is in progress.

On receipt of essential equipment which is in transit, the following methods will become available:—

1. Estimation of serum 17 HOCS before and after ACTH stimulation.
2. Measurement of Protein Bound Iodine and Radioactive Iodine uptake as a measure of Thyroid function.

Similar investigations will be conducted on normal children who will act as controls.

Carbohydrate metabolism is being investigated by means of the intravenous glucose tolerance test.

The investigation of Endocrine function in Pellagrins: In this pilot study, 10 pellagrins and 10 normal Bantu subjects were investigated at Umtata. Pituitary, adrenal and gonadal function was investigated, and a racial comparison to an age matched control group of Europeans made.

Statistical comparisons are not yet complete. There were diminished excretions of urinary oestrogens, hydroxycorticoids and ketosteroids, and F. S. H. in the pellagrins, but the difference between the two Bantu groups is small and because of the small number of cases unlikely to be statistically significant.

When comparing the Bantu and European it was found that there is a lower total oestrogen excretion and diminished oestriol fraction in the European. There was no difference in hydroxycorticoid excretion in the two groups but a lower excretion of ketosteroid in the Bantu male. However, the small number of cases again makes statistical comparisons difficult.

It is planned to continue this work. Due to the lack of cases of this disease in Cape Town, the co-operation of the Department of Medicine at King Edward VIII Hospital, Durban, has been enlisted. This project will begin in the near future.

Kliniese Endokrinologie

Voorbarige puberteit: Twee gevalle van granulosa-sêl-gewas wat voorbarige puberteit veroorsaak, is ondersoek, veral met die oog op kwantitatiewe bepaling van urinêre estrogeenafskiedings voor en na operasie en die estrogeengehalte van die gewasse self.

In albei gevalle was die afskeiding van estrogeen voor die operasie groot, maar het dit na verwydering van die gewas afgeneem.

'n Geval van nie-neoplastiese voorbarigheid word ondersoek.

Geslagsdifferensiasie: Die werk op hierdie gebied het voortgegaan soos in die vorige verslag vermeld. 'n Hersiene teorie is geformuleer om 'n verklaring te gee van baie van die wisselinge in tussengeslagtelike toestande wat gegrond is op die tydsfaktor by die besering van die ontwikkelende vrug in die baarmoeder. Die teorie is voorgelê op 'n kongres oor geslagsdifferensiasie wat in April 1958 in Londen gehou is.

Studies oor radio-isotope: Die gebruik van ^{131}I by die bestudering van skildkliersteurnisse is begin. Omtrent 250 toetse is voltooi. Daarby doen ons studies oor die wanabsorpsiesindroom, waarby ons Co^{60} -vitamien B_{12} gebruik, en oor rooibloedsêlvolumes en rooisêlloorlewingsstye, met gebruikmaking van Cr^{51} .

Uit die skildklierstudies het daar 'n ondersoek ontstaan na sekere eutireoïede pasiënte met kropgeswel wat 'n oormatige inname van radiojodium toon. 'n Poging word aangewend om hierdie groep met hipertereioede pasiënte wat 'n dergelike hoë inname toon, te vergelyk. Toetse met trijoodtironienonderdrukking, plasmaomset en skildklierbiopsie word as deel van hierdie ondersoek uitgevoer. Daar is nog te min gevalle ondersoek om selfs 'n voorlopige verslag te doen.

Clinical Endocrinology

Precocious puberty: Two cases of granulosa cell tumour causing precocious puberty have been investigated with particular reference to quantitative estimation of urinary oestrogen excretions, pre- and post-operatively, and the oestrogen content of the tumours themselves.

In both cases the excretion of oestrogen was high pre-operatively, and diminished after removal of the tumour.

A case of non-neoplastic precocity is under study.

Sexual Differentiation: Work in this field continued as in the last report. A revised theory was formulated to account for many of the vagaries of intersexual states, based on the timing of intrauterine damage to the developing foetus, which was presented at a Congress on sexual differentiation held in London in April, 1958.

Radio-isotope Studies: The use of ^{131}I in the study of thyroid disorders was started and about 250 tests were completed. In addition we are doing studies of malabsorption syndrome using Co^{60} -vitamin B_{12} and of red cell volumes and red cell survival times using Cr^{51} .

Out of the thyroid studies there has arisen an investigation into some euthyroid patients with goitre who show excessive uptake of radio-iodine. An attempt is being made to compare this group to hyperthyroid patients who show similar high uptakes. Tri-iodothyronine suppression tests, plasma conversion ratios and thyroid biopsies are being done as part of this investigation. As yet insufficient cases have been investigated to make a preliminary report.

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HARTNAVORSINGS- EENHEID

Hoof van die Eenheid: PROF. H. W. SNYMAN

Huisvesting: Die eenheid is gerieflikheidshalwe geplaas in die Kliniese Gebou (Universiteit van Pretoria) op die terrein van die Algemene Hospitaal, Pretoria. Hierdeur kan sowel blanke as nie-blanke pasiënte betrek word.

Fasiliteite: Apparaat voorsien deur die hospitaal vir basiese diagnostiese metodes, is aangevul deur die W.N.N.R. sodat fynere tegnieke en proefopstellings moontlik is. Met hartkateter in posisie kan deurlopende drukbepaling, drukpatroon, suurstofbepaling, klankverhoudings, en elektrokardiogram grafies voorgelê word. Verder kan hartklanke, venuse en arteriële drukpatrone geregistreer word.

Abnormale Fisiologie

'n Ontleding van die inligting verkry uit bogenoemde metodes en tegnieke leer dat opvattinge of stellings waarop diagnose berus, aanvulling of hersiening kan verduur. Dit is veral uit drukverhoudings dat nuwe insigte verkry word.

So word die betekenis van die diastoliese druk in die verskillende hartkamers krities ontleed na aanleiding van gevalle waarin die volledige drukpatroon voorkom, beskikbaar raak. Dit word as moontlik gestel dat die diastoliese druk in die atria die uitgangswaarde in die ventrikel reeds bepaal, vermoedelik deur 'n neurogene meganisme.

Die ontstaan en presiese tydsverhouding t.o.v. die drukverhoudings tussen die twee betrokke kamers word weereens nagegaan. Die verwagting is dat uit hierdie ontleding gevolgtrekkings uit die hartklanke gemaak kan word wat die graad van klepfoute kan help bepaal.

Uit drukverhoudings by perikardiale effusie kan weer die kritiese waardes vir kamervulling in verhouding tot die eksogene druk bepaal word. Daar word reeds gepoog om intrakardiale elektrokardiografie hierby in te skakel en die effek van die drukverhoudings op die elektriese veld noukeuriger na te gaan.

Abnormale venuse dreinerings

Uit twee kliniese probleme het die waarde van 'n diagnostiese patroon geblyk. Druk- en suurstofverhoudings kon die patrone omskryf en die gronde vir 'n kliniese diagnostiek aandui. Etlike van hierdie aandoenings is chirurgies herstelbaar en bied dus 'n onmiddellik vrugbare veld vir die toepassing van die inligting.

HEART RESEARCH UNIT

Head of the Unit: PROF. H. W. SNYMAN

Accommodation: For convenience the Unit is housed in the Clinical Building (University of Pretoria) on the grounds of the General Hospital, Pretoria. This arrangement makes both European and non-European patients available.

Facilities: Apparatus supplied by the hospital for basic diagnostic methods was supplemented by the C.S.I.R., making more refined techniques and experimental setups possible. With the heart catheter in position a continuous graphic representation of pressure determinations, pressure patterns, oxygen determinations, sound relations and electrocardiogram is available. In addition, heart sounds, venous and arterial pressure patterns may be recorded.

Abnormal Physiology

An analysis of the information derived from the above methods and techniques shows that the ideas and theories on which diagnoses are based, warrant amplification or revision. A study of pressure ratios, in particular, should lead to more modern views.

The significance of diastolic pressure in different ventricles of the heart is being investigated as cases with complete pressure patterns become available. It is already considered possible that the diastolic pressure in the atria determines the output value in the ventricle, probably by means of a neurogenic mechanism.

The origin and exact timing of the pressure ratios existing between the two ventricles concerned are being investigated again. It is expected that this analysis will make it possible to draw conclusions from the cardiac sounds which will be of use in determining the degree of valve defects.

From pressure ratios in pericardial effusion, again, the critical values for ventricle input in relation to the exogenous pressure may be determined. Efforts are already being made to employ intracardial electrocardiography in this connection and to investigate more accurately the effect of the pressure ratios on the electric field.

Abnormal venous drainage

Two clinical problems established the value of a diagnostic pattern. From pressure and oxygen ratios the patterns could be outlined and a basis found for clinical diagnostics. Several of these conditions yield to surgical intervention and thus constitute an immediately available trying ground for the application of the data found.

Rumatiekkoors

Syfers uit die Departement in die geheel en die Harteenheid in die besonder bevestig die groot rol van hierdie aandoening in die voorkoms van hartsiektes. Hoewel sommige van sy gevolge, en dan alleen ten dele, herstelbaar is, is dit die algemene ervaring dat in die grootste groep die littekenvorming in spier en klep die lewensverwachting geweldig beperk. Dit is veral die jong volwassene wat lewensverpligtings begin opneem, wat getref is. Die betekenis van streptokok-infeksies as aanleidende oorsaak van die rumatiekproses word allerweë erken en die profilaktiese benadering deur behandeling hiervan in verskeie gebiede in die buiteland reeds gevolg. 'n Profilaktiese poging is hier begin.

Ten aanvang word die graad van die proses volgens die aanvaarde vereistes (Amerikaanse Hartvereniging) bepaal. 'n Eie skema met numeriese skatting word gebruik. Vervolgens word die pasiënte met 'n sulfonamied of penisillien na gelang van omstandighede, behandel en gereeld opgevolg. Herhaalde skattings van die proses dien as maatstaf van die effek van hierdie behandeling op die proses.

Die voorkoming van residivisme of die vroeë behandeling word veral ten doel gestel. Die aantal pasiënte onder toesig was steeds aan: vir die eerstes streek die periode reeds tot 18 maande. Daar word besef dat nog vasgestel moet word of voorkoming van die rumatiekproses noodwendig voorkoming van rumatiese hartaandoenings sal meebring.

Kliniese bepaling van ventrikulêre hipertrofie

Vanweë die dikwels teenstrydige bevindings volgens fisiese, elektrokardiografiese en röntgenologiese metodes word nekropsiebevindings gevolg en gekorreleer met die kliniese. 'n Voldoende aantal nekropsieë met die volledige kliniese bevindings is 'n vereiste.

Rheumatic fever

Figures obtained from the Department in general and the Heart Research Unit in particular confirm the important part played by rheumatic fever in the incidence of heart disease. Although certain after-effects of rheumatic fever are remediable, even if only partially, it is the general experience that in the majority of cases the lesions formed in the muscles and valves greatly diminish expectation of life. Especially the adult youth who is on the point of taking up life's burdens, is seriously affected. The significance of streptococcal infections as causative factors of the rheumatic process is generally acknowledged and the prophylactic method of treatment followed in various overseas countries has also been adopted in South Africa.

First, the phase of the process is determined according to the accepted requirements (American Cardiac Association). Then, a system developed by the Unit is applied, using numerical determination. Subsequently, the patient is treated with a sulphonamide or a penicillin depending on the circumstances and regularly followed up.

Repeated estimations of the course of the disease serve as a measure of the effect of this treatment on the process. The main object is the prevention of recidivism or its early treatment. The number of patients under observation is growing steadily. The period is already 18 months for those in the first group. It is realised that it remains to be proved whether prevention of the rheumatic process necessarily eliminates rheumatic heart conditions.

Clinical determination of ventricular hypertrophy

Owing to the frequently occurring contradictions in results based on physical, electro-cardiographic and radiological methods, necropsy findings are followed up and correlated with clinical results. An adequate number of necropsies, in addition to complete clinical data, is essential.

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NAVORSINGSEENHEID vir MENSLIKE BIOCHEMIE

Hoof van die Eenheid: DR. A. R. P. WALKER

YSTERMETABOLISME VAN DIE BANTOE

Die meeste aandag word gegee aan die abnormale ysterafsetting (siderose) by die Suid-Afrikaanse Bantoe. Twee hipoteses is geopper om die verskynsel te verklaar. Die broers Gillman skryf dit hoofsaaklik toe aan 'n intrasellulêre steuring, waarskynlik aan die gang gesit deur chroniese wanvoeding. Walker en sy medewerkers beweer dat die Bantoe se gebruiklike hoë inname van yster, hoofsaaklik dié wat toevallig in hulle kos kom deur die wyse van bereiding daarvan, veral gegiste graankos, die aanleidende oorsaak is.

Die Ysterinname van die Bantoe

Die eerste studies oor die groot ysterinname is verskeie jare gelede al onderneem. Daarom is gemeen dat dit miskien sou loon om vas te stel of daar 'n beduidende verandering ingetree het, veral met die oog op die voorts krydende verwestering in die dieet en lewenswyse van die stedelike Bantoe.

Uit navrae blyk dat die totale verkoop van ysterkafferpotte in die Unie effens afneem, veral in stedelike gebiede. Nietemin is die verkoop nog hoog. Een Randse firma maak omtrent twee derde miljoen potte per jaar. Ander plaaslike firmas het egter 'n veel laer opbrengs. 'n Klein getal word ingevoer. Omtrent die helfte van die Randse firma se produksie word na Ghana uitgevoer, waar siderose glo algemeen is. Oor die algemeen is dit ongetwyfeld waar dat die Suid-Afrikaanse Bantoe hierdie potte en in mindere mate paraffienblikke en ander blikke op groot skaal gebruik.

Op die platteland het uit 'n verdere ontleding van graankos en gegiste graankos min of meer dieselfde ystergehalte geblyk as dié wat ons vroeër gevind het. In die stede verander die toestand egter, want deur die toenemende inkomste van die Bantoe word die kafferpot deur aluminium- en ander potte vervang. So is 'n hoë ystergehalte in die gekookte pap en ander kos vandag minder algemeen as vroeër. 'n Beperkte opname wat nog aan die gang is, dui daarop dat ongeveer al om die ander huisgesin in die armer stedelike Bantoegebiede kafferpotte gebruik, terwyl 'n veel laer verhouding by die meer gesonde Bantoe opgemerk is. Nog 'n verandering wat waargeneem is, is die geringer konsentrasie yster in munisipale kafferbier in vergelyking met die toestand enige jare tevore. Die rede is dat die bier nou uitsluitend in houers van vlekvrystaal gemaak word.

HUMAN BIOCHEMISTRY RESEARCH UNIT

Head of the Unit: DR. A. R. P. WALKER

IRON METABOLISM OF THE BANTU

Most attention is being given to the abnormal iron deposition (siderosis) in the South African Bantu. Two hypotheses have been advanced to explain the phenomenon. The Gillman brothers attribute it primarily to an intra-cellular disorder, probably started by chronic malnutrition. Walker and his associates submit that the primary cause is their habitually high iron intake, derived mainly from adventitious iron taken up during the preparation of their food, especially fermented cereal preparations.

Iron Intake of the Bantu

The initial studies on the high level of iron intake were undertaken several years ago. It was thought worthwhile, therefore, to discover whether any significant change has taken place, particularly bearing in mind the progressive sophistication of diet and manner of life of Bantu in urban areas.

Enquiries indicated that total sales of iron kaffir pots in the Union are decreasing slightly, especially in urban areas. Nevertheless, sales are still very large. One Rand firm produces about two thirds of a million pots per annum. Other local firms, however, have much lower productions. A small proportion is imported. About half of the Rand firm's production is shipped to Ghana, where siderosis is reported to be common. Generally speaking, there is no doubt that these pots and, to a lesser extent, paraffin cans and other tins, are very widely used by the South African Bantu.

In rural areas, further analysis of cereal foods and cereal fermented foods have revealed much the same iron uptake as was found previously. In urban areas, however, a change is occurring whereby with increasing income the kaffir pot is being replaced by aluminium and other vessels. Thus, high iron uptakes in cooked porridge and similar foodstuffs are less common now than previously. A limited survey, still in progress, has indicated that approximately every second household in poorer urban Bantu areas uses kaffir pots, whereas among upper class Bantu a far lower proportion is in evidence. A further change noted is the lower concentration of iron in municipal kaffir beer compared to several years ago. This is because it is now exclusively prepared in stainless steel vessels.

Die Johannesburgse brouery maak omtrent 10 miljoen gelling per jaar. Die gemiddelde drinker gebruik omtrent 1½ liter per dag, waardeur hy 20-30 mg. yster inkry. Daar is ongelukkig baie min betroubare inligting omtrent die hoeveelheid kafferbier wat die Bantoe self brou en uitdrink. Die meeste informante glo dat die produksie nog baie hoog is. Monsters van plaaslike stedelike selfgebroude kafferbier bevat net so 'n hoë konsentrasie yster as die bier wat op die platteland gemaak word, d.w.s. ruweg gemiddeld 100 mg. op die liter. Die feit dat die stedelike Bantoe so baie rondtrek, bemoeilik die bepaling van die mate waarin die algemene ysterinname afneem of moontlik sal afneem. Volgens die huidige veranderingstempo kan 'n mens met redelikheid 'n toename in anemie deur ystertekort by swanger Bantoevroue verwag. Tog word geglo dat die gros van die stedelike volwasse Bantoe, veral die mans, nog steeds 'n veel groter ysterinname toon as die blanke bevolking.

Ysterinname Gedurende die Kook van Gestooftde Vrugte in 'n Kafferpote

Daar is beweer dat magou en kafferbier miskien die een of ander besondere eienskap het wat die yster in kafferpote laat oplos, maar toe sekere suur vrugte soos appels, pruime en rabarber in so 'n pote gestooft is, is bevind dat die pH-waarde daarvan nie alleen sunder was as by gegiste graan nie, maar ook dat 'n veel groter hoeveelheid yster opgeneem is. Dit bewys dus dat gegiste graan geen besondere vermoë besit om yster te laat oplos nie.

Persentasie Anorganiese Yster in Gegiste Graankos van Bantoe

Uit 'n ondersoek van gefiltreerde bodryfsel uit gesentrifugeerde gegiste graankos het geblek dat dit in totaal 65-95% yster in anorganiese staat bevat wat ongetwyfeld absorbeerbaar is.

Absorpsie van Yster in Gegiste Graankos van Bantoe in Vergelyking met die in Terapeutiese Preparate

Studies word uitgevoer op gesonde Bantoe- en blanke proefpersone om veranderinge in serumyster en die ysterbindingsvermoë te bepaal wanneer die volgende ingeneem word: (1) 150 mg. yster as waterige ysterammoniumsulfaat op 1 liter water; (2) 150 mg. yster in plattelandse kafferbier (1-2 liter); (3) 150 mg. yster in munisipale bier, versterk deur die vereiste hoeveelheid ysterammoniumsulfaat. Serumyster ens. word in die basiese staat en na drie uur bepaal. Hoewel die getal proefpersone nie groot was nie, laat die waarnemings geen twyfel dat die toevallige yster in kafferbier geredelik geabsorbeer word nie. Verdere navorsing in verband met persone in 'n verskeidenheid voedingsomstandighede word gedoen.

The Johannesburg Brewery produces about 10 million gallons per annum. The average consumer imbibes about 1½ litres per diem, affording about 20-30 mg. iron. There is, unfortunately, very little reliable information about the extent of the preparation and consumption of home-made kaffir beer. Most authorities believe that production is still very large. Samples of local urban home-made kaffir beer contain as high a concentration of iron as such beer made in rural areas, a rough average of about 100 mg. iron per litre. The migrant character of urban Bantu renders it difficult to assess or to predict the extent of the general decrease of iron intake. According to the present rate of change, it is reasonable to expect an increase in iron deficiency anaemia in pregnant Bantu women. It is believed, however, that the bulk of urban adult Bantu, especially men, are still exposed to an iron intake much higher than that of the white population.

Uptake of Iron During the Cooking of Stewed Fruit in a Kaffir Pot

It has been suggested that magou (mahewa) and kaffir beer may have some special propensity for dissolving iron in kaffir pots, but on stewing certain acid fruits such as apples, plums and rhubarb in such a pot it was found, not only that the pH value of the stewed fruits was more acid than in fermented cereal preparations, but that the amount of iron taken up was far higher. It is clear, therefore, that fermented cereal preparations do not have any special or particular capacity for dissolving iron.

Percentage of Inorganic Iron in Bantu Fermented Cereal Foodstuffs

Examination of filtered supernatant from centrifuged fermented cereal preparations revealed the presence of 65-95% total iron in inorganic state, no doubt available for absorption.

Absorption of Iron in Bantu Cereal Fermented Foods, Compared with that in Therapeutic Preparations

Studies are being carried out on healthy Bantu and White subjects to determine changes in serum iron and iron binding capacity when the following are consumed. (1) 150 mg. iron as aqueous ferrous ammonium sulphate in 1 litre of water; (2) 150 mg. iron contained in rural kaffir beer (1-2 litres); (3) 150 mg. iron contained in municipal beer, reinforced with the appropriate amount of ferrous ammonium sulphate. Serum iron, etc., are determined at basal state and after three hours. Although the number of subjects that have been studied is not large, observations leave no doubt that the adventitious iron in kaffir beer is readily absorbed. Further work is proceeding on subjects in a variety of nutritional contexts.

Hematologiese Waardes by Swanger Bantoevroue

In 'n vroeër referaat (*J. Clin. Invest.*, deel 33, No. 23, 1954) is berig dat daar geen beduidende daling in sekere bloedwaardes (hemoglobien- en hematokrietpeil, serumyster) plaasvind na gelang swangerskap vorder by plattelandse Bantoevroue wat, soos welbekend, baie yster inneem nie. In die stede, soos reeds gesê, neem die ysterinname blykbaar af. Die gevolge hiervan kan dus te verwagte wees op die bloedwaardes gedurende swangerskap. Met die medewerking van dr. L. A. Freedman, adjunk-gesondheidsbeampte van Johannesburg, en dr. M. Brown van die Shanty Town-kliniek, word bloedmonsters verkry van swanger Bantoevroue gedurende die drie trimesters. Die proefpersone is uit verskillende ekonomiese kringe—pondokke en die beter klas behuising (White City, Dube, Killarney)—afkomstig. Volledige kliniese en ander gegewens word gelyktydig verkry. Uit die studies tot dusver wil dit voorkom asof anemie deur ystertekort veelvuldiger in die stede as op die platteland voorkom en dat dit in die stede buitendien meer dikwels onder die betreklik welgestelde as onder die arm Bantoe aangetref word. Die toestand is die omgekeerde van dié onder blanke vroue. Die waarnemings word uitgebrei tot plattelandse Bantoe-groepe, met inbegrip van sulke betreklik primitiewe groepe soos dié in Sekoekoenieland (Jane Furse-gedenkospitaal) en beter bedeelde plattelandse Bantoe soos by die Zebediela Citrus Estates (met die medewerking van dr. P. J. Quin). As die geleentheid daar is, is ons van plan om later waarnemings te doen onder Indiërs, Kleurlinge en arblankes.

Met die oog op die beskikbaarheid van serum van sulke proefpersone word verskeie ander bepalings in verband met bestanddele gedoen waarin die Eenheid alenige tyd geïnteresseerd was, naamlik serumproteïen en -fraksionering, sekere serumlipiede, serumkalsium en serummagnesium. Die uitwerking van „beskawing” op die patroon van die serumproteïen en sy fraksies is dus 'n onderwerp van groot belang op die oomblik. Na aanleiding van onlangse studies deur dr. Bersohn en medewerkers aan die Instituut vir Mediese Navorsing oor die korrelasie van serumcholesterol en -magnesium is dit vervolgens van belang om vas te stel of die gewone toename in sekere bloedlipiede by swangerskap in verband staan met verandering in die serummagnesiumpeil. Verder het uit vroeëre studies van die Eenheid geblyk dat die Bantoe, in teenstelling met die blankes, 'n styging in serumkalsium gedurende swangerskap en soging toon. Klaarblyklik is dit gewens om 'n afdoende verklaring van hierdie onverwagte verskynsel te vind.

Konferensie oor Hormone en Aterosklerose

Die hoof van die Eenheid is uitgenooi na dié konferensie, wat in Maart 1958 in Brighton, Utah, gehou is, en om 'n referaat te lewer, eerstens in die algemeen oor

Haematological Values of Pregnant Bantu Women

In a previous paper (*J. Clin. Invest.*, Vol. 33, No. 23, 1954) it was reported that there was no significant fall in certain blood values (haemoglobin and haematocrit levels, serum iron) as pregnancy progresses in predominantly rural Bantu known to be habituated to a high iron intake. In urban areas, as already indicated, level of iron intake is apparently decreasing; as already stated, ramifications of this change would therefore be expected in blood values during pregnancy. In collaboration with Dr. L. A. Freedman, Deputy M.O.H., Johannesburg, and Dr. M. Brown of Shanty Town Clinic, samples of blood are being obtained from pregnant Bantu women during the three trimesters. Subjects studied are from different economic levels,—poor accommodation (Shelters), and better class accommodation (White City, Dube, Killarney). Full clinical data and other information are being obtained simultaneously. Studies thus far undertaken give the impression that iron deficiency anaemia, when it occurs, is commoner in urban than in rural areas; and in urban areas, moreover, is commoner among better class than poorer Bantu. The situation is the converse of that among white women. Observations are being extended to include rural Bantu groups, including such relatively primitive groups as those in Sekhukuniland (Jane Furse Memorial Hospital), and rural better class Bantu, as at Zebediela Citrus Estates (in collaboration with Dr. P. J. Quin). At a later date, if opportunity offers, it is planned to make observations on Indian, Coloured, and poor White groups.

In view of the availability of sera from such subjects, several other determinations are being undertaken on components in which the Unit has been interested for some time, namely, serum protein and fractionation, certain serum lipids, and serum calcium and magnesium. Thus, the effect of sophistication on the pattern of serum protein and its fractions is a subject of much importance at the present time. In view of recent studies by Dr. Bersohn and associate workers at the Institute for Medical Research on the correlation of serum cholesterol and magnesium, it is of interest to discover whether the usual rise in certain blood lipids in pregnancy is associated with any change in serum magnesium levels. Earlier studies by this Unit revealed that the Bantu, in contrast to white subjects, are marked by a rise in serum calcium during pregnancy and lactation. Obviously, it is desirable to have adequate confirmation of this unexpected phenomenon.

“Hormones and Atherosclerosis” Conference

The Head of the Unit was invited to attend this Conference, held at Brighton, Utah, in March 1958, and to present a paper, firstly dealing generally with

dieet, bloedlipiede, aterosklerose en kroonslagaarsiektes by die Suid-Afrikaanse Bantoe, en tweedens oor biochemiese gegewens uit ons land in verband met lewersiekte en lewerabnormaliteit en die uitskeiding van estrogen en ketosterofiede.

Op die konferensie is onder andere vrae gestel oor die spesifieke sterftesyfer—totaal en volgens leeftyd—van die Bantoe aan kroonslagaarsiektes en aan serebrale vaskulêre siektes. Met die medewerking van dr. H. Grusin is hierdie vrae nagegaan, en die uitkomst, saam met 'n ondersoek na die juistheid van die gegewens en wenke ter aanvulling van leemtes in ons kennis, word in die *American Journal of Clinical Nutrition* gepubliseer. Die belangrikste gevolgtrekking is die dringende behoefte om te bepaal: (1) die presiese mate van „beskawing” in dieet en lewenswyse by Bantoe wat werklik sterf aan kroonslagaarsiektes en (2) die mate van korrelasie tussen dieet, soutinname, bloeddruk, serum-elektroliete en die voorkoms van en sterfte aan serebraal-vaskulêre siektes by groepe Bantoe uit streke ver genoeg uit mekaar.

Belemmering deur Bilharzia (*S. Haematobium*)

Die biochemiese en ander ondersoeke wat in vorige verslae uiteengesit is, het voortgegaan onder Bantoeskoolkinders in die Rustenburgse streek, waar verskeie grade van besmetting met *S. haematobium* voorkom. Die voortgesette werk dui nog steeds daarop dat die toegepaste norme geen beduidende verskil in die algemene gesondheidstoestand toon tussen groepe kinders wat besmet en dié wat nie besmet is nie.

Hierdie gevolgtrekking geld egter uitsluitend vir die bestudeerde bevolkingsgroep. Dit veronderstel nie noodwendig dat *S. haematobium* in die algemeen geen beduidende nadelige uitwerking op biochemiese, fisiese, geestelike of voedingsgebied het of die welsyn andersins skaad nie.

Moontlik is die norme wat tot dusver toegepas is, nie gevoelig genoeg om die belemmering aan te toon nie, of anders kan dit wees dat klaarblyklike stigmata slegs by die ouer leeftydsgroepe duidelik aan die lig kom. Nog 'n moontlikheid is dat die belemmering afgesien van dié by ernstige infeksies, nie opvallend skadelik is nie. 'n Verdere oorweging wat tot versigtigheid maan om die waargenome resultate nie te algemeen te vertolk nie, is die feit dat die bestudeerde kinderbevolkings blykbaar groter welvaart geniet as ander wat in naburige streke besoek is. Die Bantoe kinders wat in die Rustenburgse streek bestudeer is, bied moontlik nie die beste bevolkingsdeursnee om die lig te laat val op die belemmering wat deur bilharzia veroorsaak word nie. Met die oog op die huidige meningsverskil oor die omvang van die sterfte- en die siektesyfer wat regstreeks of onregstreeks aan bilharziabesmetting toe te skryf is, is dit blykbaar noodsaaklik om verdere

diet, blood lipids, atherosclerosis and coronary heart disease in the South African Bantu, and secondly, with local biochemical information bearing on liver disease and abnormality, estrogen and keto-steroids excretion.

At the Conference, questions were asked about, *inter alia*, the differences between crude and age specific mortality rates from coronary heart disease and from cerebral vascular disease among the Bantu. In association with Dr. H. Grusin, these questions have been investigated and the results, with an examination of the accuracy of the data, and suggestions for remedying inadequacies of knowledge are being published in the *American Journal of Clinical Nutrition*. The most important conclusion reached is the urgent need to determine (1) the precise state of sophistication of diet and manner of life of Bantu actually dying from coronary heart disease, and (2) the measure of correlation prevailing between diet, salt intake, blood pressure, serum electrolytes, and incidence and mortality from cerebrovascular disease, in appropriately differing regional groups of Bantu.

Handicap Imposed by Bilharzia (*S. Haematobium*)

Biochemical and other investigations detailed in previous reports were continued on Bantu school children in the Rustenburg region attending schools featured by varying levels of *S. haematobium* infestation. The further work continues to indicate that for the criteria used there appears to be no significant difference in general health between groups of children with and without the infestation.

This conclusion, of course, is applicable exclusively to the population group studied. The conclusion does not necessarily imply that *S. haematobium*, generally, has no significant deleterious effect on nutritional, biochemical, physical, mental, or other well-being.

Possibly the criteria thus far employed may be insufficiently sensitive to reflect the handicap, or, obvious stigmata may become markedly apparent only in the older age groups. Alternatively, the handicap, apart from that in severe infections, may not be markedly deleterious. A further point which cautions against too general an interpretation of observations is that the child populations studied appear to be “better off” than other child populations visited in neighbouring regions. Bantu children studied in the Rustenburg region may not be the best segment of population to shed light on the handicap imposed by bilharzia. In view of present differences of opinion on the extent of mortality and morbidity due, directly or indirectly, to such infestation, it would seem imperative to carry out further studies

studies uit te voer op Bantoeinders en ouer proefpersone in streke waar die besmetting erger is as wat dit naby Rustenburg is. Dit lyk of sulke studies veral nodig is op plekke in Mosambiek waar die nadelige uitwerking volgens die werkers ter plaatse besonder opvallend is.

Klaarblyklik is die voorgaande maar een uit baie maniere waarop die vraagstuk aangepak kan en moet word.

on groups of Bantu (children and older subjects) in regions where infestation is more severe than it is near Rustenburg. Studies seem especially necessary in regions in Mozambique, where the ill effects according to local workers are very marked.

It is clear, of course, that the above is but one of a number of ways in which the problem can and must be approached.

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VOEDING- EN TANDHEEL- KUNDIGE GESONDHEIDS- NAVORSINGSGROEP

Hoof van die Eenheid: PROF. C. L. DE JAGER

DOEL EN STREWE

Tandverrotting is een van die siektes waaraan die grootste gedeelte van die mensdom ly. In sekere gemeenskappe word gevind dat 100% van die individue aan hierdie siekte onderworpe is. Weliswaar is daar die gemeenskappe wat relatief vry van die siekte is en waar die voorkoms, op individue bereken, 15 persent is.

NUTRITION AND DENTAL HEALTH RESEARCH GROUP

Head of the Unit: PROF. C. L. DE JAGER

AIMS AND OBJECTS

Dental decay is a disease afflicting the great majority of humans. In certain communities it is found that 100% of the individuals are subject to this condition. On the other hand, to be sure, there are communities relatively free from dental decay, where the incidence is 15% by individuals.

Hierdie probleem van tandverrotting tref ook Suid-Afrika in so 'n besonder hoë mate dat die voorkoms van tandverrotting oor die 90% gemiddeld is en tandheelkundige dienste vandag een van die groot vereistes vir die welsyn van die Suid-Afrikaanse bevolking is.

In die bekamping van tandverrotting word die metodes gebaseer op die heersende teorieë in hierdie verband. 'n Tand bestaan hoofsaaklik uit 'n hoogs gekalsifiseerde glasuurdop om 'n minder gekalsifiseerde tandbeen, wat tot in die wortel instrek. Al die teorieë kom in hoofsaak hierop neer dat sekere kieme floreer op voedsels wat deur die mens gebruik word en dat die afskeiprodukte van hierdie kieme dan op een of ander manier die bestanddele van die tand vernietig, sodat die tand verval en stukkie uitbreek, waardeur die sogenoemde gaatjie in die tand ontstaan.

Die werklike toedrag van sake is dat daar geen sekerheid oor hierdie verrottingsproses bestaan nie, aangesien nog soveel skakels ontbreek.

Die doel van hierdie Groep is hoofsaaklik om te probeer vasstel watter rol voeding in die tandverrottingsproses speel en deur watter maatreëls en wysigings van die voeding of eetgewoontes van die Suid-Afrikaanse bevolking daar 'n verbetering in die onrusbarende toestand van die Suid-Afrikaanse tande-gesondheid gebring kan word.

SAMESTELLING

Deur die belangstelling van die Departement van Voeding en sy konsensieuse poging om sy gestelde doel na te strew, is daar deur die Minister van die Departement 'n komitee benoem om in te gaan op die verwantskap van voeding en tandheelkundige gesondheid. Na 'n lang tyd van beraadslaging is uitendelik besluit om by die Minister aan te beveel om hierdie Groep in die lewe te roep. Verder het die Departement ook fondse toegestaan om hierdie Groep in sy beginjare te sterk.

Deur die medewerking van die Departement van Voeding, die Wetenskaplike en Nywerheidsnavorsingsraad en die Universiteit van Pretoria, het hierdie groep tot stand gekom.

METODE VAN WERKSAAMHEDE

Soos onder die doelstellinge hierbo uiteengesit, blyk dit dus dat daar verskillende aspekte is wat oorweeg en nagespeur moet word alvorens ons met enige mate van sekerheid 'n aanduiding sou kon gee watter wysigings van die eetgewoontes voordelig vir Suid-Afrika sou wees, aangesien omstandighede van een geografiese gebied na die ander verskil.

Suid-Afrika is in die gelukkige posisie dat hy nog beskik oor gebiede wat relatief geïsoleerd is, maar vanweë die vinnige tegniese ontwikkeling van die afgelope tyd, raak hierdie gebiede al minder en minder geïsoleer. Die ondersoek kan nie wag nie.

The problem of dental decay affects South Africa to such an extent that the incidence is, on an average, more than 90%, with the result that dental services are of vital importance to the welfare of the South African population.

In combating dental decay, the methods used are based on the accepted theories in this connection. A tooth consists in the main of a highly calcified enamel coating, covering a less highly calcified bony part called dentine, which reaches down to the roots. The theories all agree that certain germs flourish on the food consumed by man and that the secretions of these germs then attack the constituent parts of the tooth, destroying them to such an extent that decay sets in and parts are broken off, causing the well-known holes.

Actually, the exact process of dental decay is not known to any degree of certainty, because of the large number of gaps in our knowledge.

The Group aims in particular at determining the role of nutrition in the process of dental decay and at devising measures for changing the dietary habits of the South African population in order to effect an improvement in the disquieting state of dental health in South Africa.

COMPOSITION

Through the conscientious efforts of the Department of Nutrition to attain the aims it has set itself, the Minister of that Department appointed a committee to investigate the relationship between nutrition and dental health. After protracted deliberations it was decided to recommend the establishment of this Group to the Minister. In addition, the Department made funds available to sustain the Group in its first years.

The establishment of the Group was the result of co-operation between the Department of Nutrition, the Council for Scientific and Industrial Research and the University of Pretoria.

PROCEDURE

As is evident from the paragraph "Aims and objects" above, there are several aspects calling for consideration and research before it would be possible to give a reasonably definite indication of those changes in the dietary habits that would be beneficial to the South African population, taking into account the differences brought about by geographical distribution.

South Africa is in the fortunate position that there are still relatively isolated areas, but owing to the rapid technical development of recent years, these areas are progressively being opened up. Research cannot be postponed for long.

Daar is gebiede, soos by Nuwerus, waar die tandheelkundige gesondheid van die bevolking besonder goed is. Die voorkoms van tandverrotting is van 9 tot 13 persent van individue. In die Langkloofgebied naby Port Elizabeth, vind ons ook 'n relatief goed geïsoleerde gebied waar tandverrotting by 99 persent van individue voorkom. Deur die twee gebiede deeglik te ondersoek en te ontleed, het ons dus 'n geleentheid om 'n moontlike oorsaak in die verskil van die eetgewoontes van die twee gebiede te ontdek.

Om hierdie doelstellinge ten uitvoer te bring, is die hele navorsing verdeel in die volgende projekte:—

Tandheelkundige Projek

Hierdie projek bestaan daarin om

- (i) 'n volledige ondersoek te maak van die tandheelkundige gesondheid van die twee gebiede, wat elke ses maande herhaal moet word om ook die snelheid waarmee die proses voortgaan, vas te stel;
- (ii) die suurgehalte van tandoppervlakke te meet en deur sekere proewe die snelheid van suurvorming in die twee gebiede te bepaal;
- (iii) 'n chemiese ontleding van die tandheelkundige materiaal van die verskillende twee gebiede te maak;
- (iv) die tandstrukture mikroskopies vas te lê in 'n poging om alle afwykings op hierdie gebied op te spoor.

Dieetkundige Projek

Die dieetkundige projek bestaan daarin dat dieetkundige opnames van die twee gebiede gedoen sal word om vas te stel wat elke gebied se eetgewoontes is.

Mikrobiologiese Projek

Soos hierbo uiteengesit, is dit baie duidelik dat die mondkiepe die kernprobleem van tandverrotting is en dat dit hoogs noodsaaklik is dat hierdie aspek uitermate beklemtoon word. Derhalwe word die mondkiepe van die verskillende gebiede deeglik ondersoek in 'n poging om vas te stel of daar 'n verskil bestaan.

Landbouprojek

Aangesien die mens leef uit die bodem waarop hy woon, is dit van die uiterste belang om vas te stel wat in elke gebied uit die bodem geput word. Derhalwe word landbouopnames gemaak en word die water, die grond en die voedsels wat in die verskillende gebiede ingeneem word, ontleed; die verskille wat daar mag wees, sal van baie groot belang in die hele navorsing wees. Die veldgewasse word insgelyks ontleed.

There are areas, as at Nuwerus, where the dental health of the community is very good. Dental decay, there, has an incidence of 9 to 13 per cent by individuals. The Langkloof area, near Port Elizabeth, is also relatively well isolated, but there the incidence of dental decay is as high as 99 per cent by individuals. These two areas, therefore, offer a golden opportunity of finding the reasons for the difference in incidence by thoroughly investigating and analyzing the differences in the dietary habits of the two communities. For this purpose the whole investigation was divided into the following projects:—

Dental Project

This project consists of—

- (i) a complete survey of the dental health of the two areas, to be repeated every six months in order to determine the rate of change;
- (ii) a measurement of the acidity of the dental surfaces and experiments to determine the rate of acid formation in the two areas;
- (iii) a chemical analysis of the dental material of the two areas;
- (iv) a microscopic survey of the dental structures in order to determine any discrepancies in this respect.

Dietary Project

The dietary project consists of dietary surveys of the two areas in order to determine the eating habits in each.

Microbiological Project

As was explained above, it is quite clear that the oral germs constitute the basic problem in dental decay and that it is most essential that this aspect should be strongly stressed. For this reason oral germs from the various areas are thoroughly investigated with a view to determining any differences there may be.

Agricultural Project

Since man derives his sustenance from the soil on which he lives, it is of utmost importance to determine what nutrients are drawn from the soil in each area. Therefore, agricultural surveys are being made in order to analyse the water and soil, as well as the foods consumed in the different areas. The differences there may be, will be of great interest in the general research. Field crops, too, are analyzed.

Voedingstatusopname

Om tot verstandige gevolgtrekking te kom, is dit ook nodig dat 'n mens moet weet in watter gesondheidstoestand die bevolking van die onderskeie gebiede verkeer. Derhalwe word die voedingstatusopname gedoen om 'n volledige beeld van elke gebied te verkry.

Uit navorsing in ander dele van die wêreld gedoen, deur die werk van ander navorsers en die resultate wat verkry kan word met hierdie ondersoek, word daar gehoop om belangrike feite vas te lê ten opsigte van tandverrotting van die Suid-Afrikaanse bevolking.

Uit die samestelling soos hierbo genoem, blyk dit dat daar wye en groot ondersteuning vir hierdie projek is en indien daar met die ywer en vasberadenheid voortgegaan sou word wat tans deur elke deelnemer openbaar word, ly dit geen twyfel dat hierdie grootse onderneming resultate van groot formaat sal lewer nie.

WERKSAAMHEDE GEDURENDE 1958

Gedurende 1958 is hoofsaaklik aandag bestee aan die administratiewe en organisatoriese samestelling van die Groep.

Die vernaamste werksaamhede was die koördinasie van die verskillende afdelings en die indeling van die verskillende gebiede van elke afdeling. Hierdie gedeelte is tans afgehandel.

Voorlopige dieetkundige opnames is gedurende Oktober 1958 sowel te Langkloof as Nuwerus onderneem. Ewekansige keuses van die kinders te Langkloof en Nuwerus is ook gedurende hierdie tydperk gedoen.

Gedurende Februarie/Maart 1959 is sowel dieetkundige opnames as tandheelkundige navorsing in die twee gebiede uitgevoer. Die besonderhede is nog nie beskikbaar nie en is ook nog nie verwerk nie en interpretasie daarvan is dus nog nie moontlik nie.

Grondmonsters is in die Nuwerus-gebied geneem en die ontledings daarvan het gedurende hierdie jaar plaasgevind. Hierdie ontleding van die grond te Nuwerus sal later herhaal word maar tans word aandag gegee aan die neem van monsters te Langkloof vir dieselfde doel.

Speekselmonsters is van persone in albei gebiede geneem, en mikrobiologiese klassifisering van die mondorganismes het 'n aanvang geneem. Hierdie ontledings is egter nog nie verwerk nie.

Survey of Nutritional Status

In order to arrive at sound conclusions it is also necessary to be informed about the condition of health of the population in the different areas. A nutritional status survey is, therefore, being undertaken to gain a complete picture of every area.

From research done in other parts of the world, investigations by other workers and the results it is expected to gain from this survey, it is hoped to discover important facts bearing on dental caries in the South African population.

As is evident from the paragraph headed "Composition" above, there is wide and strong support for this project, and if the zeal and determination now evinced by every participant could be maintained, this large-scale undertaking will undoubtedly bring results of a high order.

ACTIVITIES DURING 1958

During 1958 attention was devoted mainly to the administrative and organizational aspects of the Group's work.

The most important activities were the co-ordination of the various sections and the allocation of areas to each section.

Preliminary dietary surveys were undertaken at both Langkloof and Nuwerus during October 1958. Random selections of children were also made at Langkloof and Nuwerus during this period.

During February/March, 1959, both dietary surveys and dental research were carried out in the two areas. Details are not yet available and have not been collated; therefore interpretation of the results is not possible at this stage.

Soil samples were taken in the Nuwerus area, and analyses have been made during the year. These analyses will be repeated at a later stage, but at present attention is given to soil sampling at Langkloof for the same purpose.

Samples of saliva were taken from subjects in both areas, and the microbiological classification of the oral organisms was begun. The results of the analyses have, however, not been interpreted.

VOEDINGNAVORSINGS- EENHEID

Direkteur: PROF. J. GILLMAN

VOEDING

Metabolisme van Vitamien A

Die eerste volledige verslag oor die metabolisme van vitamien A, wat deur middel van C^{14} -vitamien-A-alkohol ondersoek is, is voltooi en vir publikasie voor-gelê.

'n Ondersoek na die metabolisme van vitamien A is voortgesit. Uit 'n reeks studies het geblyk dat die peil van vitamien A in die serum nie voorspel kan word uit kennis van die lewer se gehalte aan vitamien A nie, en omgekeerd dat die serum se gehalte aan vitamien A geen aanduiding van die vitamien-A-peil in die lewer gee nie. Tweedens kon aangetoon word dat vitamien-A-asetaat na verwydering van die pankreas slegs spoors-gewyse geabsorbeer is, terwyl vitamien-A-alkohol beter as vitamien-A-asetaat geabsorbeer is, hoewel nog baie minder as by die normale bobbejaan. Buitendien wys die versteuring in die absorpsie van vitamien-A-alkohol en -asetaat daarop dat die bobbejaan met verwyderde pankreas ook 'n belemmerde vetabsorpsie sal toon. Dertens is vasgestel dat die lewer se gehalte aan vita-mien A met die bobbejaan se ouderdom gekorreleer kan word. Dit is naamlik laag voor die bobbejaantjie gespeen is, terwyl dit daarna vinnig tot die maksimum styg en daar bly ten spyte van die hoë gehalte aan vitamien A in die dieet.

Aanvulling van Mielies

Die ontleding van ons voedingsproewe met rotte, waarby die aanvulling van mielies met verskeie kosse, o.a. afgeroomde melkpoeier, sojabone, voedselgis en kasein, biologies nagegaan is, is voltooi. Hierdie studie het altesame 74 proewe op 1500 witrotte mee-gebring, waarby groeiprestasie, volgens toename in liggaamsgewig, die lewensduur en vryheid van ernstige orgaanpatologie as die vernaamste maatstawwe gebruik is om die waarde van die proefdiëte te bepaal.

Uit die gegewens het geblyk dat geslagsrypheid en 'n lang lewensduur moontlik is by rotte op diëte wat ten minste drie verskillende groeipatrone bevorder, naamlik (1) stadige groei met geringe maksimum gewig, (2) vin-nige groei gelyk aan dié van die kontrolediere en (3) vin-niger groei as dié van die kontrolediere. Op hierdie grondslag was dit moontlik om die proefdiëte te takseer volgens die vermoë om voortplanting en 'n redelike lewensverwagting te bevorder en nie binne perke volgens die werklike liggaamsgewig wat na 'n bepaalde tyds-verloop bereik is nie.

NUTRITION RESEARCH UNIT

Director: PROF. J. GILLMAN

NUTRITION

Metabolism of Vitamin A

The first full report on the metabolism of vitamin A, investigated with the aid of C^{14} vitamin A alcohol, was completed and submitted for publication (28).

Investigations into the metabolism of vitamin A were continued and a series of studies showed that the level of vitamin A in the serum could not be predicted from a knowledge of the vitamin A content of the liver, and, conversely, that the vitamin A content of the serum afforded no indication of the level of vitamin A in the liver. Secondly, it was possible to demonstrate that after pancreatectomy, vitamin A acetate was absorbed in traces only while vitamin A alcohol was absorbed better than vitamin A acetate although still much less than in the normal baboon. Moreover, the derange-ment in the absorption of vitamin A alcohol and of acetate suggested that the pancreatectomized baboon would also show impaired absorption of fat. Thirdly, it was established that the vitamin A content of the liver could be correlated with the age of the baboon, being low in the pre-weaning stage and rising rapidly to a maximum, remaining unaltered thereafter despite the high content of dietary vitamin A.

Supplementation of Maize

The analysis of our rat nutritional experiments in which the supplementation of maize with various foods, including skimmed milk powder, soyabean, food-yeast and casein, was assessed biologically, was brought to completion. This study involved a total of 74 experi-ments conducted on 1,500 white rats, in which growth performance, as measured by increase in body weight, the length of survival and freedom from gross organ pathology were used as the main criteria in assessing the value of the experimental diets.

From the data, it was shown that sexual maturity and longevity could be attained by rats fed diets promoting at least three different patterns of growth, namely (1) slow growth with a low maximum weight (2) rapid growth similar to the controls and (3) growth in excess of the controls. On this basis, it was possible to assess the experimental diets in terms of the capacity to pro-mote reproduction and a reasonable expectation of life and not, within limits, in terms of the actual body weight achieved over a defined period of time.

'n Biologiese ontleding van mielies as kos het gewys dat ten minste die proteïen en koolhidraat van mielies onder bepaalde omstandighede goed gebruik kan word deur die groeiende rot. Maar om mielies 'n doeltreffende kos te maak, was dit nodig om tegelyk 'n ekstra bron van proteïen—mineraal of dierlik—, minerale, die B.-kompleks en vitamien A, E en D te verskaf. Daar is beklemtoon dat daar geen langdurige verbetering in groei en oorlewing bereik kan word deur net die proteïengehalte of die mineraalbalans of die vitamien-B-kompleks of die vitamien A en D (in vet oplosbaar) van 'n uitsluitende mieliedieet te reguleer nie.

Afgeroomde melkpoeier was die enigste kos wat op sigself in voldoende konsentrasie die doeltreffendheid van 'n mieliedieet kon verbeter en die rotte in staat stel om 'n prestasie te lewer wat vergelykbaar is met dié van die kontrolerotte. By wyse van teenstelling is sojabone in 'n mieliedieet slegs dan tot voordeel van die groeiende rot as 'n soutmengsel, B-kompleks en vitamien A, E en D bygevoeg word. Terselfdertyd is aangedui dat sojabone, in teenstelling met afgeroomde melkpoeier, geneig was om 'n hoë voorkoms van nierletsels, veral nefrokalsinose, mee te bring. In hierdie verband is die aandag gevestig op die ongeregverdigde klem wat daar op die proteïengehalte van natuurlike kos gelê is in die soektog na geskikte aanvullings van mielies, sonder behoorlike oorweging van die moontlike orgaanbeskadiging wat daardeur veroorsaak kan word en van die ander dieetvereistes. Uit die gegewens het geblyk dat afgeroomde melkpoeier in alle opsigte die verskillende bestanddele van mielies aanvul, in teenstelling met sojabone, wat wel 'n nuttige bron van proteïen uitmaak, maar die mineraalwanbalans vererger en die vitamien-A-behoefte verhoog. Onvermoë om in party gevalle resultate te reproduseer, beklemtoon die noodsaaklikheid daarvan om eers die kwaliteit van verskillende natuurlike kosse te standaardiseer voordat hulle op algemene skaal as aanvullings van mielies gebruik word. Die proewe het ook 'n geslagsverskil by die proteïenbehoefte aan die lig gebring. Wyfierotte het naamlik goed gegroei op 'n dieet van 9% proteïen, terwyl die mannetjies ten minste 11% nodig gehad het om net so goed soos die kontrolerotte te groei.

Dieet en Geslagsverskille by Liggaamsgewig

Voorlopige waarnemings is aangeteken oor die uitwerking van dieet op die tyd wanneer die geslagsverskil merkbaar word in die liggaamsgewig van groeiende rotte. Onder die standaardomstandighede van dieet en omgewing in ons laboratorium is die liggaamsgewig van mannetjie en wyfie gedurende die eerste sewe weke na geboorte dieselfde, maar dit loop daarna sterk uiteen. Deur die rotte te voer op 'n dieet waarvan die proteïen uitsluitend van plantaardige herkoms is of op 'n dieet wat 40% vet bevat, is die uiteenloping van die

Biological analysis of maize as a food showed that, in defined circumstances, the protein and carbohydrate of maize at least could be effectively used by the growing rat. But, in order to render maize efficient as a food, it was necessary to provide simultaneously an additional source of protein, either vegetable or animal, of minerals, of B complex and of vitamins AED. It was emphasized that no long-term improvement in growth and survival could be achieved by adjusting only the protein content, or the mineral balance or the vitamin B complex or the fat-soluble vitamins A and D of an exclusively maize diet.

Skimmed milk powder was the only food which alone, in adequate concentrations, could improve the efficiency of a maize diet and allow rats to perform in a manner comparable with the controls. By contrast, soyabean, in a maize context, could only be used to advantage by the growing rat provided that a salt mixture, B complex and vitamins AED were also added. At the same time, it was indicated that soyabean, unlike skimmed milk powder, tended to promote a high frequency of kidney lesions and particularly nephrocalcinosis. In this connection, attention was drawn to the unjustifiable emphasis placed on the protein content of natural foods in the search for suitable supplements to maize without due consideration being given to the possible organ damage which might be inflicted and without due regard to the other dietary requirements. From the data, it appeared that skimmed milk powder complemented in every way the various ingredients of maize in contrast to soyabean which, though providing a useful source of protein, aggravated the mineral imbalance and increased the vitamin A requirement. Failure to reproduce results in some instances emphasized the necessity for standardizing the quality of various natural foods before these were used as supplements to maize on a national scale. The experiments also disclosed a sex difference in the protein requirements, female rats achieving a good growth on diets containing 9% protein whereas male rats required at least 11% protein in order to grow as well as the controls.

Diet and Sex Differences in Body Weight

Preliminary observations were recorded on the effect of diet on the time at which the sex difference declared itself in the body weight of growing rats. Under the standard conditions of diet and environment in our laboratory, the male and female body weights are similar during the first seven weeks of post-natal life but show a marked divergence thereafter. By feeding rats on a diet in which the protein was derived exclusively from vegetable sources or on a diet containing 40% of fat, the divergence in the male and female body

mannelike en die wyfie se liggaamsgewigkrommes tot die 11de-13de week vertraag. Hierdie vertraging kan nie aan 'n aanmerkbare neerdrukking van die liggaamsgewig toegeskryf word nie.

Die gevolgtrekking is gemaak dat die dieet die intensiteit van die deelname van testis en ovarium kan wysig en so die tyd bepaal waarop die uiteenloping van die liggaamsgewig by mannetjie- en wyfierotte plaasvind, asook die mate van die uiteenloping. Dit wil sê: geslagsmanifestasie is 'n funksie van die dieet.

Vitamien-D- en Kalsiummetabolisme

Studies in verband met die mineralisasie van sagte weefsels, met inbegrip van die aorta, word voortgesit. Ons hoop om volgende jaar volledig hieroor verslag te doen.

'n Bydrae oor die verbetering van die Eastoe-tegniek vir die bepaling van aminosuikers is gepubliseer.

EKSPERIMENTELE KARSINOGENESE

Dieet en Gewasvoorkoms

Die langtermynondersoek na die wysigende invloed van die dieet en die fisiese omgewing op die voorkoms van spontane gewasse by rotte is voltooi en gepubliseer. 1,114 spontane gewasse is beskryf in 'n reeks van 1,342 opeenvolgende outopsies op witrotte (GG-stam), oorspronklik uit die Wistar-stam. Meer as twee derde van die rotte het oor die 18 maande oud geword, terwyl 51% oor die twee jaar geleef het. Een of meer gewasse is by 791 (59%) van die rotte bespeur. Die feit dat 551 (41%) gewasvry was ten spyte daarvan dat hulle tot in die gewasvormende ouderdom geleef het, dui daarop dat die kwaadaardige oorgang nie uitsluitend 'n funksie van die leeftyd is nie. Die buislose kliere was die setel van 79% van al die spontane gewasse, waarby 48% uit die byniermurg, 11% uit die hipofise, 11% uit die interstisiële selle van die testis en 10% uit die skildklier afkomstig is. By wyse van teenstelling was sarkome ongewoon, terwyl geen enkele primêre gewas in die asemhalingskanaal aangetref is nie. Daar was geen bewys dat 'n kwaadaardige oorgang in een buislose kliere neoplasie in 'n ander bevorder of voorkom het nie.

Deur grondige wysiging van die dieet, sonder belemmering in die lewensverwachting, kon ingrypende veranderinge in die gewasvoorkomsyfer bewerkstellig word, o.a. 'n vermindering in feochromositoom en 'n vermeerdering van karsinoom in die baarmoeder van rotte uit die GG-stam. 'n Dieet met hoë proteïengehalte maar vry van koolhidraat het die totale voorkoms van gewasse en van gewasdraende rotte verminder.

Die wysigings in die voorkoms van gewasse in die buislose kliere dui daarop dat die dieëte ten minste 'n

weight curves was delayed until the 11th-13th week. This delay could not be ascribed to any marked depression in body weight.

It was concluded that whatever the role of the endocrine glands, diet could modulate the intensity of participation of the testis and ovary in determining the time of divergence and the magnitude of the differences in the weight of male and female rats respectively. That is to say, sex expressivity is a function of diet.

Vitamin D and Calcium Metabolism

Studies on the mineralization of soft tissues including the aorta, are proceeding and it is hoped to be able to report fully on this aspect of the work during the coming year.

An improvement of the Eastoe technique for the estimation of amino sugars was published.

EXPERIMENTAL CARCINOGENESIS

Diet and Tumour Frequency

The long-term investigation on the modifying influence of diet and the physical environment on spontaneous tumour frequency in rats was brought to completion and published. 1,114 spontaneous neoplasms were described in a series of 1,342 consecutive autopsies on albino rats (GG strain), originally derived from the Wistar strain. More than two-thirds of the rats survived beyond the age of 18 months and 51% beyond the age of two years. One or more neoplasms were detected in 791 (59%) of all rats. The fact that 551 (41%) were tumour-free, despite survival into the tumour-bearing age, suggested that the neoplastic transformation was not exclusively a function of age. The endocrine glands were the site of 79% of all spontaneous neoplasms, 48% arising from the adrenal medulla, 11% from the pituitary, 11% from the interstitial cells of the testis and 10% from the thyroid. By contrast, sarcomata were uncommon and not a single primary growth was found in the respiratory tract. There was no evidence to show that a neoplastic transformation in one endocrine gland promoted or excluded neoplasia in another.

By radical modification in the diet, without interference with life expectation, it was possible to achieve profound changes in tumour frequency rates including, amongst others, a reduction in phaeochromocytoma and an increase in carcinoma of the uterus in GG strain rats. A high protein, carbohydrate-free diet reduced the overall frequency of tumours as well as of tumour-bearing rats.

The modifications in the frequency of endocrine tumours suggested that the diets had created at least a

gunstige endokrienverband tot stand gebring het vir die vertraging of versnelling van 'n grondliggende verkantering wat in eerste instansie vooraf bepaal kon gewees het deur ander faktore as dieet.

Verskille is opgemerk in die voorkoms van spontane gewasse by twee rondtrekkende stamme witrotte, naamlik Utrecht en Kopenhagen, in vergelyking met rotte van die GG-stam wat onder gelyke omstandighede van dieet en omgewing grootgemaak is. Solank die beduidende omgewingsfaktore ten opsigte van dieet en moontlik ook die fisiese kenmerke van die omgewing, soos hoogte, klimaat en ander, nog nie geïdentifiseer is nie, sal dit onmoontlik wees om te bepaal in watter mate sogenaamde stamverskille by gewasvoorkoms toegeskryf kan word aan een of meer bepaalde faktore in die omgewing of aan genetiese faktore. Ons het nou ons eie diere gestandaardiseer, sodat dit nou moontlik sal wees om die betreklike bydrae van genetiese en omgewingsfaktore tot die ontstaan van gewasse te ondersoek.

Galsuur- en Galpigmentmetabolisme

In die verslag van 1955-1956 is die aandag gevestig op die moontlike belang van galsuur- en galpigmentmetabolisme in die meganisme wat lewerkarsinoom bevorder. Hierdie studie is in twee rigtings voortgesit, naamlik (i) die metabolisme van galpigmente en (ii) die betreklike konsentrasies van di- en trihidroksicholaansuur gedurende die induksie van karsinoom deur bottergeel.

Galpigment: Nadat aangetoon is dat die kopro- en uroporfiriene vinnig verander as bottergeel aan die rotte gevoer is en met die oog op die vroeë vergroting van die milt, is dit nodig geag om retikulosietellings te doen en om dit met die breekbaarheid van die rooi selle te korreleer. Hierdie gedeelte van die ondersoek is gesteun deur 'n beurs van die Nasionale Kankervereniging. Die resultate tot dusver dui daarop dat die rot vroeg straf anemies word, gepaard met 'n groot toename in retikulosiete en 'n sterker weerstand van die rooiselle teen hemolise. Opmerklik was ook dat die retikulosiete teen die verwagting in uiters gevoelig was vir geringe veranderings in die spanning van die swewingsvloeistof. Dit het geblyk dat die groter uitskeiding van porfiriene, wat vroeër uit ons laboratorium berig is, toegeskryf moet word aan die hemolitiese proses wat bottergeel aan die gang sit. Die meganisme wat hierdie hemolitiese anemie verwerk, word nou ondersoek. In hierdie verband is dit van belang dat lewer- en miltvergroting nie seldsaam is in Bantoe gemeenskappe wat aan lewerkanker onderhewig is nie. Die ondersoek wat nou in ons laboratorium aan die gang is, kan van praktiese waarde wees om gegewens te verstrek oor die etiologie van lewer- en miltvergroting by die Bantoe.

favourable endocrine context for retarding or accelerating an underlying cancerization process which might have been determined in the first instance by factors other than diet.

Differences were observed in the frequency of spontaneous neoplasms in two migrant strains of albino rats, namely, Utrecht and Copenhagen, as compared with GG strain rats, when reared under similar conditions of diet and environment. It was suggested that until the significant environmental factors, depending on diet and possibly also on the physical attributes of the environment, such as altitude, climate etc. were identified, it would not be possible to assess the extent to which so-called strain differences in tumour frequency could be attributed to one or more specific factors in the environment or to genetic factors. In view of the fact that we have standardized our own animals, it will now be possible to examine the relative contribution of genetic and environmental factors to the emergence of tumours.

Bile Acid and Bile Pigment Metabolism

In the 1955-1956 report, attention was drawn to the potential importance of bile acid and bile pigment metabolism in the mechanism promoting carcinoma of the liver. This study was continued in two directions, namely, (1) the metabolism of bile pigments and (2) the relative concentrations of di- and tri-hydroxy cholanolic acids during the period of induction of carcinoma by butter yellow.

Bile pigment: Having shown that the copro- and uroporphyrins were rapidly altered after feeding butter yellow to rats, and in view of the early enlargement of the spleen, it was felt necessary to undertake reticulocyte counts and to correlate these with the fragility of the red cells. This part of the investigation was undertaken with the aid of a fellowship from the National Cancer Association. The results to date showed that the rat early developed a severe anaemia, accompanied by a great increase in reticulocytes and increased resistance of the red cells to haemolysis. Noteworthy too was the fact that the reticulocytes, contrary to expectation, were highly susceptible to slight changes in the tonicity of the suspending fluid. It became evident that the increased excretion of porphyrins, previously reported from our laboratory, was due to the haemolytic process induced by butter yellow. The mechanism responsible for this haemolytic anaemia is now being investigated. In this connection, it is of interest to mention that amongst African communities which develop liver cancer, hepato-splenomegaly is not uncommonly found. The investigations now in progress in our laboratory may be of practical value in providing some information on the etiology of hepato-splenomegaly in the African.

Galsure: Onderzoek na die betreklike konsentrasie van di- en trihidroksicholaansuur by rotte wat met bottergeel gevoer word, is voortgesit. Dit lyk (a) of bottergeel die totale volume van gal wat die lever per dag afskei, vermeerder, (b) of die groter volume gal nie die konsentrasie van galsure bepaal soos op die oomblik gemeen word nie, (c) of die dihidroksicholaansuur teengewerk word, terwyl die trihidroksicholaansuur onaangetas bly, mits altesame meer as 10 ml. gal per dag afgeskei word. Korrelerende studies van die totale hoeveelheid en die betreklike konsentrasie van die di- en trihidroksicholaansuur en die struktuurveranderings van die lever is nou aan die gang. Voorlopige resultate bring aan die lig dat net sekere soorte lewerbeskadiging gepaard gaan met 'n aanmerklike verandering in die metabolisme van die galsure.

Blaaskanker

Morfologies: 'n Uitvoerige studie van die voorkoms en patogenese van blaaskarsinoom en die verhouding daarvan tot schistosomiase by die inboorling van Portugese-Oos-Afrika is in samewerking met dr. Prates, direkteur van die patologiese diens van Mosambiek, voltooi. Die patologiese kenmerke en die geslags- en leeftydverdeling van 100 gevalle van blaaskanker is ondersoek. Op grond van die klassifikasie van gewastipes volgens die aanbevelings van Dukes en Masena is bevind dat pla veiselkarsinoom verantwoordelik is vir 59% van alle gevalle van blaaskanker, gevolg deur papillêre oorgangselkarsinoom (21%), die anaplastiese soort (13%) en die soliede oorgangselsoort (7%). Die aandag is gevestig op die oorwig van plaveiselkarsinoom in vergelyking met die voorkoms daarvan in Engeland.

Blaaskanker tree meer dikwels by die Bantoe onder 50 jaar op as wat blykbaar die geval met die bevolking in Engeland of die Verenigde State is. As 'n korreksie vir die leeftydstruktuur van die bevolking aangebring word, dui die strekking van sekere gegewens daarop dat die voorkoms van blaaskanker met toenemende ouderdom toeneem soos in die Westerse wêreld berig, hoewel dit by leeftye onder die 50 nie ongewoon is nie. By elke dekade maak plaveiselkarsinoom omtrent 50% van alle kanker gevalle uit. Dit lyk of die man ongeveer 1.75 maal vatbaarder as die vrou is, maar hierdie verhouding sal gewysig moet word met die oog op die geslagsverskil by hospitaalopnames.

Die aandag is gevestig op die voorkoms van plaveiselmetaplasie in die gewas self en in die onaangetaste deel van die blaasslymvlies in 43% gevalle. Eiers van die schistosoom is in 33% van die gevalle in die blaas en die gewas geïdentifiseer.

Die voorkomssyfer van bilharziale sistitis is ook in 478 opeenvolgende outopsies (322 mans en 156 vroue) ondersoek, waarby alle leeftydsgroepe verteenwoordig was. Besmetting deur schistosome is by 18.9% van

Bile acids: Investigations into the relative concentration of di- and tri-hydroxy cholanolic acids in butter yellow-fed rats were continued. It would appear that (a) butter yellow increases the total volume of bile excreted per day by the liver, (b) contrary to current views, the increased volume of bile does not determine the concentration of bile acids, (c) provided the total amount of bile excreted per day is above 10 ml. the dihydroxycholanolic acid is depressed while the trihydroxycholanolic acid remains unaffected. Correlative studies of the total amount and relative concentration of the di- and tri-hydroxy cholanolic acids and the structural changes in the liver are now in progress. Preliminary results disclose that only certain types of liver injury will be accompanied by appreciable change in the metabolism of the bile acids.

Cancer of the Bladder

Morphological: A detailed study of the frequency and the pathogenesis of carcinoma of the bladder and its relationship to schistosomiasis in the Portuguese East African was completed in collaboration with Dr. Prates, Director of Pathological Services for Moçambique. The pathological features, sex and age distribution of 100 cancers of the urinary bladder were examined. Basing the classification of tumour type on that recommended by Dukes and Masena, squamous carcinoma was found to account for 59% of all cancers of the bladder to be followed in order by papillary, transitional cell carcinoma (21%), the anaplastic variety (13%) and by the solid transitional cell type (7%). Attention was drawn to the preponderance of squamous cell carcinoma as compared with that which obtains in England.

Cancer of the bladder declared itself more frequently in the Bantu under the age of fifty years than seemed to be the case in England or the United States.

If a correction for the age structure of the population was applied, suggestive evidence seemed to indicate that although cancer of the bladder was common under the age of fifty, the incidence seemed to increase with age as reported in the Western World. At every decade, squamous carcinoma accounted for approximately 50% of all cancers. The male appeared to be 1.75 times more susceptible than the female but this ratio will need further modification in view of the sex difference in hospitalization.

Attention was drawn to the occurrence of squamous metaplasia in the tumour itself and in the unaffected part of the mucosa of the bladder in 43% of cases. Eggs of the schistosome were identified in the bladder and the tumour in 33% of cases.

The frequency of bilharzial cystitis was also examined in 478 consecutive autopsies (322 males and 156 females), all age groups being represented. Infestation with schistosomes was observed in 18.9% of girls and

die meisies en 11.8% van die seuns onder 10 jaar en by 82% van die mans in die leeftydsgroep 30 tot 40 jaar waargeneem.

Die makroskopiese en mikroskopiese kenmerke van blaasschistosomiase is gekorreleer en die patogenese en onderlinge verhouding van die verskillende reaksies wat beskryf is, is gerekonstrueer en skematies voorgestel. Spesiale aandag is gegee aan die gedrag van die blaasepiteel by die verskillende letsels. Die komplekse reaksies in die epiteel kon bevredigend vertolk word na aanleiding van die herstelverskynsels. Leukoplakie is in 11% van die ondersoekte blase aangetoon en om die aangegeewe redes beskou as 'n kwaadaardige reaksie.

Die aandag is gevestig op die verskeidenheid van weefselreaksies wat in die blaas waargeneem is op die eiers van die schistosoom. Geen korrelasie kon vasgestel word tussen die aantal eiers en die intensiteit van die weefselreaksie nie, hoewel die skielike storting van eiers onder sekere omstandighede 'n intense selreaksie buite alle verhouding tot die getal eiers op tou kon sit. Die soort reaksie wat die schistosoom uitgelok het, was blykbaar 'n funksie van die toestand van die weefsels in die blaas op 'n gegewe oomblik, met inagneming van die staat van herstel na 'n voorafgaande besmetting.

Solank die gronde vir die verskil in reaksie van die blaas op die eiers nog nie verklaar is nie, lyk dit nie moontlik om die rol van die schistosoom in die etiologie van blaaskanker by die inboorling van Portugees-Oos-Afrika te bepaal nie. Die gevolgtrekking is gemaak dat schistosomiase, wat ook al die rol daarvan, in elk geval geen direkte uitwerking het nie en dat die beskikbare gegewens nie genoeg is om schistosomiase as belangrike etiologiese faktor by blaaskanker uit te skakel r.i.e.

Chemies: Met die oog op die hoë voorkomssyfer van blaaskarsinoom by die inboorling van Portugees-Oos-Afrika is dit nodig geag om die urien te ondersoek na die teenwoordigheid van karsinogene van endogene oorsprong.

Om mee te begin, is urienmonsters deur middel van tweedimensionale papierchromatografie ondersoek. 'n Aantal verskille in die chemiese samestelling van die Portugees-Oos-Afrikaanse Bantoe in vergelyking met die Johannesburgse Bantoe is bespeur. Hierdie waarnemings is van aanmerklike belang en regverdig verdere intensiewe ondersoek.

METABOLIESE STUDIES

By die Bobbejaan

Endokriene regulering van bloedsuiker, lipemie en ketonomie by diabetesse bobbejane. In vorige studies is daarop gewys dat versuim om hiperlipemie, met inbegrip van hipercholesterolemie, te ontwikkel en die ontwikkeling van slegs 'n ligte ketose 'n toestand van

11.8% of boys under the age of ten years and in 82% of males between the ages of thirty and forty years.

The macroscopic and microscopic features of vesical schistosomiasis have been correlated and the pathogenesis and interrelations of the various reactions described have been reconstructed and represented schematically. Special consideration was given to the behaviour of the bladder epithelium in the various lesions. The complex reactions in the epithelium could be satisfactorily interpreted in terms of the phenomenon of repair. Leukoplakia was demonstrated in 11% of the bladders examined and, for reasons mentioned, was regarded as a prenoplastic reaction.

Attention was drawn to the diversity of tissue reactions in the bladder observed in response to the eggs of the schistosome. No correlation could be established between the number of eggs and the severity of the tissue reaction, although the sudden shedding of eggs in some circumstances could precipitate an intense cellular reaction out of proportion to the number of eggs. The type of reaction evoked by the schistosome appeared to be a function of the state of the tissues in the bladder at a given moment, having regard to the state of repair following a previous infestation.

Until the basis for the difference in reactivity of the bladder to the ova was understood, it did not seem possible to assess the role of the schistosome in the etiology of bladder cancer in the Portuguese East African. It was concluded that whatever the role of schistosomiasis, it was by no means direct and that the evidence available was not sufficient to exclude schistosomiasis as an important etiological factor in bladder cancer.

Chemical: In view of the high frequency of bladder carcinoma in the Bantu of Portuguese East Africa, it was felt necessary to examine the urines for the presence of carcinogens of endogenous origin.

As a first stage, urine samples were examined by 2-dimension paper chromatography. A number of differences were detected in the chemical composition of the urine in the Bantu of Portuguese East Africa as compared with the Bantu in Johannesburg. These observations are of considerable interest and justify further intensive investigation into this problem.

METABOLIC STUDIES

In the Baboon

Endocrine control of blood sugar, lipaemia and ketonaemia in diabetic baboons: In previous studies it was shown that failure to develop a hyperlipaemia, including a hypercholesterolaemia and the development of only a mild ketosis reflected a state of relative

betrekkende oorwerkzaamheid van die skildkliere, onderdrukking van die somatotrofe funksie van die hipofise en/of betrekkende onderdrukking van bynierskors werking weerspieël. Hierdie bevinding is proefondervindelik getoets op 'n bobbejaan waarvan die pankreas verwyder was en waarby lipemie of ketonemie na ont-trekking van insulien nie ingetree het nie. Verwydering van die skildklier by so 'n dier is gevolg deur duidelike lipemie en ketonemie. Hierdie proef het getoon dat die mate van skildklierwerking die gedrag van die bloed-vette en die bloedketone by bobbejane met verwyderde pankreas diepgaande kan beïnvloed.

Intermediëremetabolisme van vette, koolhidrate en proteïene. Die voorlopige ondersoek na die oorsprong van vet en ketone by bobbejane met verwyderde pankreas is in 1955-1956 begin en in die afgelope jaar aanmerklik uitgebrei. Die intermediëre meta-bolisme van 2-C¹⁴-piruvaat is by normale bobbe-jane en bobbejane met verwyderde pankreas ondersoek, met en sonder insulien. Die C¹⁴-werking van die kooldioksied in die uitgeasemde lug, van die verskil-lende vetfraksies in die bloed, lewer, niere, spiere en hart, van die glukose in die bloed, van die glikogeen in die niere, lewer en spiere, van die proteïene in die bloed en in verskeie organe is bepaal. Tot dusver is in samewerking met die Nasionale Chemiese Navorsingslaboratorium aangetoon (1) dat daar by die bobbejaan waaraan insulien ontnem is, baie min sintese van die vetsure van trigliseriede deur bemid-deling van piruvaat plaasvind, (2) dat vetsure van fosfolipiede wat in die lewer en serum gevind word, gedeeltelik uit piruvaat gesintetiseer kan word, (3) dat cholesterol wat in die lewer, serum en omentale vet gevind word, gedeeltelik altans uit piruvaat by die diabetiese bobbejaan gesintetiseer kan word en (4) dat ketoonliggaampies in die urien gedeeltelik van piruvaat by diabetiese bobbejane afkomstig kan wees—dit in teenstelling met Bloch (1947) se bewering dat asetielasetaat nie voortkom uit 'n piruvaatvoorloper by diere nie.

Gegewens omtrent die vette, koolhidrate en pro-teïene van die ander organe en weefsels word nou versamel.

Serumamilase en serumalkaliese fosfatase: As deel van die metaboliese studies van normale en diabetiese bobbejane is 'n ondersoek na die serumamilase en die serumalkaliese fosfatase onderneem. Dit het heelwat voorlopige werk meegebring om reekse van hierdie ensieme by bobbejane van alle leeftye en van albei geslagte op te stel. Daar is reeds 'n aanduiding (a) van 'n interessante verhouding tussen serumamilase en die bloedsuiker, (b) dat daar meer as een serumamilase is wat elkeen 'n ander substraat vereis om bespeur te word en (c) dat die serumalkaliese fosfatase baie hoër

hyperaktiviteit van die thyroïd, depressie van die soma-totropie funksie van die pituitary and/or relative depressie van adreno-cortical aktiviteit. Hierdie bevinding is onderwerp van eksperimentele toetsing in 'n pancrea-ctomized baboon wat nie slaag het om 'n lipaemie of 'n ketonaemie te ontwikkel na afname van insulien. Ver-wyding van die thyroïd klier in so 'n dier is gevolg deur 'n duidelike lipaemie en ketonaemie. Hierdie eksperiment het getoon dat die mate van thyroïd aktiviteit die gedrag van die bloedvette en die bloedketone in pancrea-ctomized baboons kan beïnvloed.

Intermediëremetabolisme van vette, koolhidrate en proteïene.—Die voorlopige ondersoek na die oorsprong van vet en ketone by bobbejane met verwyderde pankreas is in 1955-1956 begin en in die afgelope jaar aanmerklik uitgebrei. Die intermediëre meta-bolisme van 2-C¹⁴-piruvaat is by normale bobbe-jane en bobbejane met verwyderde pankreas ondersoek, met en sonder insulien. Die C¹⁴-werking van die kooldioksied in die uitgeasemde lug, van die verskil-lende vetfraksies in die bloed, lewer, niere, spiere en hart, van die glukose in die bloed, van die glikogeen in die niere, lewer en spiere, van die proteïene in die bloed en in verskeie organe is bepaal. Tot dusver is in samewerking met die Nasionale Chemiese Navorsingslaboratorium aangetoon (1) dat daar by die bobbejaan waaraan insulien ontnem is, baie min sintese van die vetsure van trigliseriede deur bemid-deling van piruvaat plaasvind, (2) dat vetsure van fosfolipiede wat in die lewer en serum gevind word, gedeeltelik uit piruvaat gesintetiseer kan word, (3) dat cholesterol wat in die lewer, serum en omentale vet gevind word, gedeeltelik altans uit piruvaat by die diabetiese bobbejaan gesintetiseer kan word en (4) dat ketoonliggaampies in die urien gedeeltelik van piruvaat by diabetiese bobbejane afkomstig kan wees—dit in teenstelling met Bloch (1947) se bewering dat asetielasetaat nie voortkom uit 'n piruvaatvoorloper by diere nie.

Data pertaining to the fats, carbohydrates and pro-teins of the other organs and tissues are now being assembled.

Serum amylase and alkaline phosphatase: As part of the metabolic studies in normal and diabetic baboons, an investigation of the serum amylase and serum alkaline phosphatase was undertaken. This entailed a considerable amount of preliminary work in estab-lishing ranges of these enzymes in baboons of all ages and in both sexes. There is already an indication (a) of an interesting relationship between the serum amylase and the blood sugar, (b) that there is more than one serum amylase, each requiring a different substrate for its detection and (c) that the serum alkaline phosphatase

by jong bobbejane is as wat berig is vir ander jong diere.

By die Rot

Skildklier funksie en galmetabolisme: Navorsing oor die rol van die skildklier in die reëling van die cholesterol, lipiedfosfor en die di- en trihidroksicholaansuur in die gal van gefistuliseerde rotte is voortgesit. Daar is getoon dat skildklierhormone (trijoodtironien- en trijoodtirosiensuur) die afskeiding van gal en die konsentrasie van cholesterol, lipiedfosfor en chenodesoksicholsuur in rottegal vermeerder, terwyl die konsentrasie van die cholsuur aanmerklik verminder word. Skildklierhormone sal ook die galafskeiding van deoksicholsuur stimuleer, mits die enterohepatiese sirkulasie gehandhaaf word. Daar word gemeen dat skildklierhormone alle metaboliese reaksies in verband met cholesterol sintese en cholesterolkatabolisme in die lever stimuleer, gepaard met 'n vermindering in die afskeiding van trihidroksicholaansuur en 'n vermeerdering in dihidroksicholaansuur in die gal.

Vorming van Proteïen gebonde-sodium deur middel van kinoon: Die ondersoek na die biosintese van proteïengebonde jodium is ook voortgesit. Die teenwoordigheid van 'n jodiumoksiderende stof in die gal van sommige rotte is aangetoon, waaruit blyk dat kinoon van belang kan wees by die jodering van proteïen. Uit proewe in vitro met melkproteïen is aangetoon dat jodering in regstreekse verhouding tot die kinoonkonsentrasie staan en dat 'n prealbumienspits bevattende I^{131} by elektroforese in die teenwoordigheid van kinoon beklemtoon word.

Jodiuminname by amiloïdose: Die spontane ontwikkeling van primêre amiloïdose by bobbejane het 'n geleentheid gebied om party van die biochemiese versteurings van tiroïdale jodiummetabolisme in dié gevalle te bestudeer. Deur middel van I^{131} is getoon (1) dat die skildklier 'n sterk verminderde vermoë aan die dag lê om jodium te konsentreer en (2) dat die teenwoordigheid van ongebonde geïodeerde tirosiene by 'n normale bobbejaanschildklier en die afwesigheid van hierdie ongebonde aminosure in amiloïdotiese skildkliere 'n aanduiding kan wees van (a) 'n groter mate van proteolise van thyroglobulien van die kolloïed van die normale skildklier, met 'n gevolglike toename van skildklierhormone in die sirkulasie van die normale bobbejaan, of (b) die bestaan van 'n sterk glikoproteïen-jodiumkompleks in die kolloïed van die amiloïdotiese skildklier wat nie so gereedelik gehidroliseer word deur die tiroïdale proteolitiese ensieme as die thyroglobulienproteïen van die normale skildklier nie of (c) 'n sekondêre kompleksvorming tussen amiloïed en kolloïed wat kunsmatig gedurende homogenisasie voortgebring is en die ekstraheerbaarheid van die ongebonde aminosure beïnvloed.

is much higher in young baboons than is reported for other young animals.

In the Rat

Thyroid function and bile metabolism—Work on the role of the thyroid in regulating the cholesterol, lipid phosphorus and the di- and tri-hydroxy cholic acids in bile obtained from fistularized rats was continued. It was shown that thyroid hormones (triiodothyronine and triiodothyroacetic acid) increase bile flow and the concentration of cholesterol, lipid phosphorus and chenodeoxycholic acid in rat bile whereas the concentration of the cholic acid is markedly reduced. Thyroid hormones will also stimulate the biliary secretion of deoxycholic acid provided that the enterohepatic circulation is maintained. It was suggested that thyroid hormones stimulated all metabolic reactions concerned with cholesterol synthesis and cholesterol catabolism in the liver, accompanied by a reduction in the secretion of tri-hydroxycholic acid and an increase in dihydroxycholic acids in the bile.

Formation of protein-bound iodine by quinone—The investigation into the biosynthesis of protein-bound iodine was also continued. The presence of an iodide-oxidizing substance was demonstrated in the bile of some rats indicating that quinone might be important in the iodination of protein. From in vitro experiments with milk protein, it was shown that iodination was directly proportional to the quinone concentration and that, in electrophoresis, a prealbumin peak containing I^{131} was emphasized in the presence of quinone.

Iodine uptake in amyloidosis.—The spontaneous development of primary amyloidosis in the baboons provided an opportunity for studying some of the biochemical derangements of thyroidal iodine metabolism in these cases. With the aid of I^{131} , it was shown (1) that the thyroid showed a greatly reduced capacity to concentrate iodine and (2) that the presence of free, iodinated tyrosines in normal baboon thyroid and the absence of these free amino acids in amyloidotic thyroids might indicate either (a) a greater degree of proteolysis of thyroglobulin of the colloid of the normal thyroid with a resultant increase of thyroid hormones in the circulation of the normal baboon, or (b) the existence of a strong glycoprotein-iodine complex in the colloid of the amyloidotic thyroid which is not as readily hydrolysed by the thyroidal proteolytic enzymes as the thyroglobulin protein of the normal thyroid or (c) a secondary complex formation between amyloid and colloid produced artificially during homogenization and affecting the extractability of the free amino acids.

ANDER STUDIES

Elektrokardiogram by die bobbejaan: Dr. B. Kaminer van die Department van Fisiologie het gebruik gemaak van die geriewe van die Eenheid om die elektrokardiografiese patroon by 'n reeks van 15 bobbejane te ondersoek. Uit 'n vergelyking van die elektrokardiografiese patroon by die mens en die bobbejaan het geblyk dat daar aanmerklike verskille bestaan ten opsigte van hartsnelheid, vorm van die P-golf, die Q-S-tyd, die inval van Q₁-golwe, uitwyking van T-asse uit die QRS-asse en die rigting van die T-golwe. Die dikwels voorkomende diskordansie van die T-golf moet ondersoek word.

Pankreasverwydering by die bobbejaan: Die tegniek om die pankreas van 'n bobbejaan te verwyder, is as bydrae gepubliseer deur dr. Allan en Leonsins van die Departement van Heelkunde nadat hulle 25 diere geopereer het.

ALGEMEEN

Die hoof van die Eenheid het as voorsitter opgetree by vergaderings van die Subkomitee vir Kankerbespeuring en van die Al-Afrikaanse Komitee vir Kankernavorsing besuide die Sahara en van die Internasionale Kankerbond in Londen, Julie 1958. Hy het ook 'n referaat gelewer op die Internasionale Kankerkongres in Londen.

Op uitnodiging van die Universiteit van Ibadan het hy in Februarie 1959 'n geslote konferensie oor lewerkwale in Afrika aan die Universiteitskollege van Ibadan, Nigerië, bygewoon.

Die Eenheid het gedurende Januarie 1959 besoek ontvang van professor Emerson Day, direkteur van die Strang-kliniek vir Kankerbespeuring en professor in preventiewe geneskunde in die Sloan-Kettering-afdeling van die Cornell-universiteitskollege vir geneskunde, New York. Op uitnodiging van die Portugese regering het professor Gillman professor Day vergesel op 'n besoek van 'n week aan Mosambiek om die moontlikheid van verdere kankersyferopnames in dié gebied te ondersoek.

Professor P. Pene, senior arts aan die Dantec-Hospitaal in Dakar, het die Unie in Maart besoek vir samesprekings oor vraagstukke rakende lewerkwale. Dr. M. Prates, direkteur van die patologiese diens van Mosambiek, het sewe weke by die Eenheid deurgebring (April en Mei 1959) en probleme in verband met lewer- en blaaskanker bestudeer.

OTHER STUDIES

Electrocardiogram in the baboon—Dr. B. Kaminer of the Department of Physiology made use of the facilities of the Unit in order to examine the electrocardiographic pattern in a series of 15 baboons. From a comparison of the egg pattern in man and the baboon, it was shown that notable differences existed in respect of heart rate, form of the P wave, Q-S duration, the incidence of Q₁ waves, deviation of T axes from the QRS axes and the direction of the T waves. The frequent discordancy of the T wave still remains to be investigated.

Pancreatectomy in the baboon—The technique of pancreatectomy in the baboon was published by Drs. Allan and Leonsins of the Department of Surgery after they had performed the operation on 25 animals.

GENERAL

The Head of the Unit presided, in his capacity as Chairman, at meetings of the Cancer Detection Subcommittee and of the Pan-African Committee for Cancer Research, South of the Sahara, of the International Union against Cancer, in London, July 1958, and read a paper at the International Cancer Congress in London.

At the invitation of the University of Ibadan, he attended a closed conference on Liver Disease in Africa at the University College of Ibadan, Nigeria, in February, 1959.

The Unit was visited during January 1959 by Professor Emerson Day, Director of the Strang Cancer Detection Clinic and Professor of Preventive Medicine in the Sloan-Kettering Division of Cornell University College of Medicine, New York. At the invitation of the Portuguese Government, Professor Gillman accompanied Professor Day on a week's visit to Mozambique in order to investigate the possibility of establishing further cancer rates surveys in that territory.

Professor P. Pene, senior physician at le Dantec Hospital in Dakar, visited the Unit in March for discussions on problems relating to liver disease. Dr. M. Prates, Director of Pathological Services for Mozambique, spent seven weeks in the Unit (during April and May, 1959) studying problems related to cancer of the liver and of the bladder.

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NAVORSINGSEENHEID VIR PNEUMOKONIOSE

Direkteur: DR. A. J. ORENSTEIN

'n Uitvoerder verslag oor die werksaamhede van die Eenheid kan van die Direkteur, Posbus 4788, Johannesburg, verkry word.

Die beginmoelikhede van hierdie eenheid is verby en die werksaamhede het nou in die algemeen die patroon aangeneem wat waarskynlik etlike jare sal standhou. In die Afdeling Patologie is studies onderneem wat baie belangrike toepassing kan vind as dit slaag. Een studie gaan oor die wyse waarop sekere stofsoorte die longe beskadig. Verskeie verklarings is geopper, maar geeneen klop volkome met die feite nie. Die Eenheid ondersoek die teorie dat die skadelike stofsoorte 'n allergie verwek, d.w.s. 'n sensitisering van die weefsels. Dié allergie verwek weer antiliggame, d.w.s. 'n afweermeganisme. As hierdie teorie bevestig sou word, sal dit die verskil in reaksie op die verskillende stofsoorte verklaar, asook die wisseling in die mate van vatbaarheid daarvoor by verskeie diersoorte en by die mens. Daaruit kan ook die moontlikhede van desensitisering van die weefsels vir stofvoortvloei.

Die tweede vraagstuk wat ondersoek word, geld die moontlikheid om 'n substans te vind wat in die vroeë stadiums van silikose (of selfs profilakties) toegedien kan word om die neutralisasie en uitskakeling van die skadelike substans (wat dit ook al mag wees) wat deur stof veroorsaak word, te bevorder.

In die Afdeling Fisiologie en Somatotipie is daarin geslaag om die installasie op te stel wat vir die somatotipiese en respirasiestudies nodig is. Die inrigting is ontwerp deur dr. B. van Lingen en deur 'n plaaslike masjienbouersfirma gebou.

Die werk van die borskliniek het die noodsaaklikheid van 'n aanmerklik groter kliniek, met voorsiening vir 'n klein aantal binnepatiënte en vir kliniese navorsing,

Dr. A. J. Orenstein, Direkteur van die Navorsingseenheid vir Pneumokoniose

Dr. A. J. Orenstein, Director of the Pneumoconiosis Research Unit

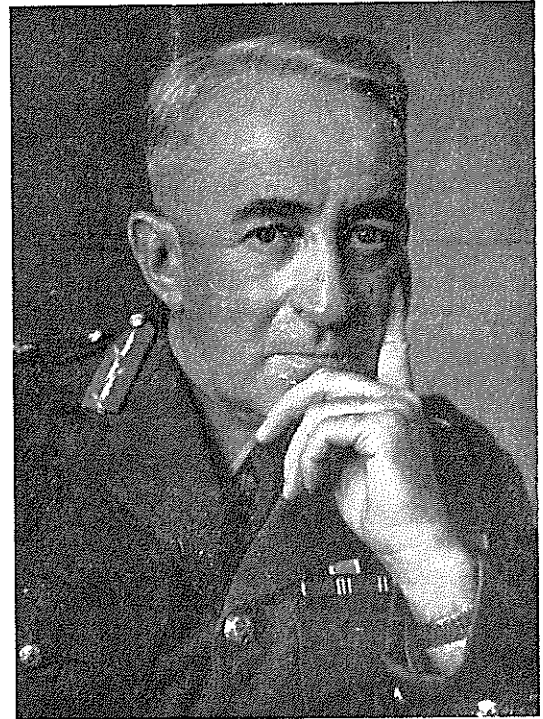
PNEUMOCONIOSIS RESEARCH UNIT

Director: DR. A. J. ORENSTEIN

A more detailed report on the activities of the Unit is obtainable from the Director, P.O. Box 4788, Johannesburg

Teething difficulties in this unit are now past and the work has settled down to what will probably be a general pattern for several years. In the Pathology Division, studies commenced on two problems which, if solved, could have very important practical applications. One concerns the way in which certain dusts damage the lungs. Various explanations have been proposed but none completely agree with the facts. The Unit is investigating the theory that the damage-producing dusts produce an allergy (which is a sensitization of the tissues) that in turn may produce antibodies (which constitute a defence mechanism). This theory, if validated, would explain the difference in reaction to the various dusts, and the variations in the degree of susceptibility to them, in various species of animals and men. It might also make possible the desensitization of the tissues against the dust.

The second problem being investigated concerns the possibility of finding a substance which could be



duidelik bewys. Die oprigting van so 'n kliniek is egter klaarblyklik nie die taak van 'n navorsingsorganisasie nie.

Die ondersoek in verband met blootstelling aan stof in die werklike bedryf is voortgesit en uitgebrei na gelang geskikte personeel beskikbaar geword het. 'n Elektroniese stofsteller is 'n paar maande al ondersoek. Dit lyk of dit gebruik kan word by die tel van stofmonsters wat deur termiese presipitators vasgelê is, die instrumente wat by studies in verband met stofblootstelling in die bedryf gebruik word. Die gebruik daarvan sal stofstelling baie vergemaklik en die besonder inspannende en tydrowende stoftellery onder die mikroskoop en gevolglik ook die waarnemersfout wat by hierdie soort werk byna onvermydelik is, uitskakel.

Die Kamer van Mynwese werk met die Eenheid saam en maak 'n span bymekaar om stofontwikkeling by verskeie mynwerksaamhede te bestudeer en middele te soek om stofvorming te bestry en stof te versprei en te verwyder.

Sulke studies is klaarblyklik van onmiddellike praktiese belang.

Die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese en die Departement van Meganiese en Elektrotegniese Ingenieurswese van Rand Mines Limited werk met die Eenheid saam om te kyk of daar nie 'n aanneemlike metode gevind kan word om water uitwendig na die boormasjiene (drukklugbore) te lei nie.

'n Belangrike werksaamheid van die Eenheid was die organiseer van die Pneumokoniosekonferensie wat van 9 tot 24 Februarie in Johannesburg gehou is. Sewentien vooraanstaande buitelandse navorsers op die verskillende gebiede wat met pneumokoniose in verband staan, het saam met ongeveer 50 Suid-Afrikaanse navorsers beraadslaag oor die veelvuldige probleme van pneumokoniose uit die oogpunt van die patoloog, die radioloog, die fisioloog, die klinikus, die internis, die skeikundige en die myningenieur. Die Konferensie het 50 aanbevelings gedoen.

Die verrigtings is opgeteken en sal deur Churchill van Londen uitgegee word. Die redigeer van omtrent 600,000 opgetekende woorde en die afbring daarvan tot omtrent 200,000 vir publikasie is 'n groot taak. Die Direkteur hoop om daarmee voor die einde van die jaar klaar te wees.

administered to a person in the early stages of silicosis (or perhaps even as a prophylactic) which would promote the neutralization and elimination of the noxious substance (whatever it may be) produced by the dust.

In the Physiology and Somatotyping Division success has been achieved in assembling the plant required for the somatotyping and respiration studies. This plant was designed by Dr. B. van Lingen, and built by a local engineering firm.

The Chest Clinic has demonstrated the need for a clinic on a considerably larger scale, with provision for a small number of in-patients, and for clinical research. The establishment of such a clinic obviously does not fall within the obligations of a research organization, however.

The investigations on exposure to dust in actual working conditions continued and increased in quantity as suitable research personnel became available. An electronic dust counter has been under investigation for some months and it now seems likely that it will be adaptable for counting the dust samples secured by thermal precipitators, the instruments used in the occupational dust exposure studies. Its use would greatly facilitate the dust counting and do away with the very tedious and time-consuming work of counting dust under the microscope, thus eliminating "observer error", almost unavoidable in this type of work.

The Chamber of Mines, which is co-operating with this Unit, is assembling a team to intensively study dust production in various mining operations, as well as means for controlling dust production, its dispersal and removal.

Such studies are obviously of immediate practical interest and importance.

The National Mechanical Engineering Research Institute and the Mechanical and Electrical Engineering Department of Rand Mines Ltd. are co-operating with this Unit in an attempt to devise an acceptable method of feeding water externally to drilling machines ("Jackhammers").

An important activity of the Unit was the organization of the Pneumoconiosis Conference which was held in Johannesburg from the 9th to the 24th of February. Seventeen eminent overseas workers in the various branches of science concerned with pneumoconiosis joined with some 50 South African workers to discuss, from the point of view of pathologists, radiologists, physiologists, clinicians, physicists, chemists and mining engineers, the many problems presented by pneumoconiosis. Fifty recommendations were adopted by the Conference.

The proceedings have been recorded and will be published by Churchill of London. The editing of some 600,000 recorded words, and its reduction to about 200,000 for publication, is a major task which the Director hopes to complete before the end of May.

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TERINGNAVORSINGS- EENHEID

Hoof van die Eenheid: DR. B. A. DORMER

Gedurende die afgelope jaar het die Eenheid sy werk voortgesit in verband met die identifikasie van verskeie stamme suurvaste basille van hospitaalpasiente. Organismes is geïsoleer wat onder die volgende groepe tuishoort: fortuitum, geelbasil, saprofiet en ongeklasseerde mikobakterieë.

Werk in verband met INAH-bestande stamme gaan voort, maar die aandag is van die maksimum bestandheid afgelei na die belangriker vraag of die mutasies almal ewe vinnig bestandheid verwerf. Die doel is met ander woorde om vas te stel of die mikrobakterie-bevolking ten opsigte van bestandheid by 'n bepaalde pasiënt homogeen is. Tot dusver lyk dit of die oplossingsmetode van Canetti van die Pasteurinstituut daarop dui dat die organismes in 'n tuberkuleuse holte in bestandheid verskil. Dit is in ooreenstemming met werk wat in dié verband elders in die wêreld gedoen is. Maar dit is klaarblyklik nie die end van die storie nie, want daar is bevind dat slegs 'n baie verswakte siektetoestand met so 'n heterogene bevolking by 'n marmot verwek kan word. Hierdie bevinding skakel die moontlikheid daarvan uit dat 'n bestande bevolking tog 'n paar virulente organismes kan hê. Daar moet egter nog meer werk in verband met hierdie hele saak gedoen word. Ons kan volstaan deur te sê dat, vir sover die navorsing in die Eenheid gevorder het, dit meer en meer lyk of 'n pasiënt met 'n bestande en dus verswakte mikobakteriestam maar uit die hospitaal ontslaan kan word, omdat die infeksie wat op iemand anders oorgedra kan word, lig, selfbeperkend en moontlik immuniserend sal wees ten opsigte van 'n virulente stam. Dit sal van onskatbare waarde wees as hierdie proewe tot ape uitgebrei kan word.

Verdere navorsings is gedoen op 'n stam wat versterkte groei getoon het op mediums wat INAH bevat. Toetse op hierdie organisme dui daarop dat hierdie eienskap nie alte bestendig is nie en dat die organisme geneig is om dit te verloor by subkultuurkweking terug na die kontrole-eksemplare. Daar is egter geen twyfel dat die Eenheid so 'n stam uit drie verskillende pasiënte verkry het nie. Met gebruikmaking van hierdie organisme in biologiese toetse is post mortem bevind dat die siektebeeld nogal uitgebreider is by die marmotte wat geen behandeling met INAH ontvang het nie. Hierdie werk kan natuurlik heel besondere gevolge hê vir die INAH-terapie van die mens. Al die proewe wat uitgevoer is in 'n projek in verband met die vergelykende immunisasiewaarde van BCG teenoor BCG

TUBERCULOSIS RESEARCH UNIT

Head of the Unit: DR. B. A. DORMER

During the past year the unit continued its work of identification of different strains of acid-fast bacilli from patients in the hospital. Organisms were isolated which fall under the following groups: Fortuitum, Yellow bacillus, Saprophytic and Unclassified mycobacteria.

Work continues on INAH resistant strains, but attention has been drawn away from considerations of the maximum resistance which can be obtained, to the more important matter of whether the mutants all acquire resistance at the same rate—in other words, to discover whether the mycobacterial population is homogeneous in respect of resistance in a given patient. Thus far, using the dilution method of Canetti of the Pasteur Institute, it would appear that the organisms in a tuberculosis cavity have differing resistances. This would be in keeping with work carried out on this question in other parts of the world. But this is obviously not the end of the story, because it has been found that only very attenuated disease can be produced in a guinea pig by such a heterogeneous population. This fact appears to rule out the possibility that a resistant population may still contain a few organisms that are virulent. More work, however, must be done on this whole matter. Suffice it to say that, as far as work in the Unit has progressed, there appears to be a developing case that a patient with a resistant and therefore attenuated strain may be discharged from hospital on the basis that any infection which might be conveyed to another individual would be mild, self limiting and possibly immunising in respect of a virulent strain. It would be invaluable if the experimental work in this regard could be extended to monkeys.

Further work was carried out on a strain which was found to show enhanced growth on media containing INAH. Tests on this organism tend to show that this quality is not very stable, and that it tends to lose it by sub-culturing back onto the controls. There is no doubt, however, that such a strain was recovered by the unit from three different patients. Using this organism in biological tests, it was found that by giving INAH, the disease picture on post-mortem was somewhat more extensive than in those pigs which had no treatment. This work, of course, has a very definite implication in human therapy with INAH. All tests carried out in a project dealing with the comparative immunising value of BCG as against INAH resistant BCG on the guinea pig tended to show that a somewhat better protection against a virulent strain is given by

wat teen INAH bestand is by die marmot, dui daarop dat BCG wat teen INAH bestand is, 'n heelwat beter beskerming teen 'n virulente stam bied. Buitendien het hierdie laaste tipe besonder belowende resultate opgelewer by naterapie by wyse van inspuiting in 'n dier met virulente besmetting. Hierdie werk sal herhaal moet word.

Ten opsigte van lewerbeskadiging wat vermoedelik toe te skryf is aan sekere teringmiddels, is geen aanmerklike vordering gemaak nie. Die groot moeilikheid is dat feitlik al die pasiënte in hierdie hospitaal meer as een soort middel ontvang. Buitendien toon nogal 'n hele paar lewersnitte post mortem 'n soort degenerasie wat 'n mens by besmetlike hepatitis aantref. Tog kan gesê word dat 'n mens by pasiënte wat aan iets dood is (skok na operasie, hemoptise, kroonslagartrombose ens.) en wat heelwat terapie ontvang het, vind dat die lewerselle in redelik goeie toestand is.

Die werk in verband met swamme by tuberkulose het 'n klemverskuiwing ondergaan. Dit het gekom deurdat vasgestel is dat 'n sekere toevallige swambesmetting van tuberkulosekulture blykbaar die groei van die mikobakterie volkome stuit. Hoewel dit nie een van die voorgeskrewe projekte was nie, is dit klaarblyklik 'n goeie voorbeeld van 'n toevallige ontdekking wat onverwyld verder gevoer moet word, selfs ten koste van ander werk.

Die serum van 'n aantal pasiënte is elektroforeties ondersoek om te bepaal of tuberkuloselyers 'n lae gammaglobuliëengehalte het. Hierdie ondersoek is verbind met 'n gelyktydige bepaling van die 17-ketosteroïede. Die resultate word opgeneem in 'n verhandeling wat binnekort sal verskyn. Daar kan egter nou al gesê word dat die resultate almal binne die aanvaarde normale grense val.

Werk in verband met die mikobakteriestamme deur bepaling van hulle nikotiënsuurgehalte nader voltooiing.

Daar bestaan min twyfel dat die profylaktiese proef met die kudde melkkoeie (waarby INAH saam met die voer aan die kalwers gegee word) hoogs suksesvol verloop. Geeneen van die kalwers het besmet geraak deur hulle tuberkulose kontakte nie en reageer nog negatief op die tuberkulientoets. Party van hierdie kalwers is nou self dragtig. Dit lyk of daar 'n maklike en aangename manier gevind is om 'n skoon kudde uit 'n besmette te teel.

BCG that is INAH resistant. Moreover, this latter type has shown very promising results when used as a repeat therapy by injection in an animal with a virulent infection. This work has to be repeated.

In respect of liver damage suspected to be due to certain anti-tuberculous drugs, no appreciable advance has been made. The great difficulty here is that practically all patients in this hospital are on more than one drug. Moreover, not a few liver sections taken at post-mortem show a type of degeneration which one gets with infective hepatitis. However, it can be said that in patients who have died from some other cause (post-operative shock, haemoptysis, coronary thrombosis etc.) and who have had a considerable amount of therapy, one often finds the liver cells in reasonably good shape.

Work on fungi in association with tuberculosis underwent a change of focus. This was brought about through the finding that a certain chance fungal contamination of tuberculosis cultures seemed to inhibit the growth of the mycobacterium completely. Although this was not one of the prescribed projects it is obviously a good example of a chance finding which needs a quick follow-up, even at the expense of other work.

The sera from a number of patients was examined electrophoretically with a view to determining whether tuberculous patients had a low content of gamma globulin. This investigation was combined with an estimation of the 17-Keto Steroids at the same time. These results are being incorporated in a paper which will shortly be published. It can however be stated here that the results all fell within what is considered to be the normal range.

Work on the differentiation of mycobacterial strains by estimation of their nicotinic acid content is nearing completion.

There seems little doubt that the prophylactic experiment on a herd of dairy cows (where INAH is being incorporated in the food of their calves) is proving highly successful. None of these calves have become infected by their tuberculous contacts and are all still negative to the tuberculin test. Some of this progeny are now themselves in calf. It seems that a happy and easy method of raising a clean herd from an infected one has been found.

VIRUSNAVORSINGS- EENHEID

Hoof van die Eenheid: PROF. A. KIPPS

Die belangstelling van die Eenheid was gespits op fundamentele navorsing in verband met die eienskappe en die gedrag van 'n aantal verskillende virusse en die oplosbare antigene wat dikwels daarmee saam in virusbesmette weefsels voorkom.

Die samewerking van ander laboratoriums in die Unie van Suid-Afrika in verband met sekere aspekte van die werk word met dank erken.

Oplosbare Virusantigene

Die immunofisiese metode vir die verwydering van antigene onsuiverhede uit biologiese ekstrakte is verder ontwikkel en word nou „voorbereidende immunoëlektroforese” genoem. Hiervoor is 'n spesiale apparaat ontwerp en gebou. 'n Kort verhandeling waarin die toepassing van hierdie metode beskryf word, is aan die Biochemiese Genootskap voorgelê. Ons hoop dat dit moontlik sal wees om met hierdie toestel oplosbare antigene uit muisharsings te berei in 'n staat van suiwerheid wat anders moeilik te bereik is.

Immunologiese proewe met ekstrakte uit die harsings van muis geïnfekteer met die hondsdolheid-virus wat van die virus bevry is deur sentrifugasie, het nie alleen vier antigene van normale weefsel aan die lig gebring nie maar ook ten minste twee verskillende oplosbare rabiesantigene. Die moontlikheid dat hulle maar uit dieselfde stof in twee verskillende aggregasietoestande bestaan, is nog nie uitgesluit nie.

Metodes van suiwering deur basinking by pH 4.5, elektroforese, immunoëlektroforese, kalsiumfosfaatadsorpsie en behandeling met eter lei tot aanmerklike vernietiging van die oplosbare antigeen.

Die chromatografie van die ekstrakte uit muis geïnfekteer met die hondsdolheid-virus se harsings op 'n anioonuitruiler-DEAE-sellulose is uitvoerig bestudeer en wil nou voorkom as 'n belowende suiweringsmetode na basinking by pH 4.5. Hierdie metode het 'n minimale hoeveelheid antigeen opgelewer, slegs gemeng met 1/30-1/40 van die proteïenonsuiverheid van die oorspronklike ekstrak, maar hierdie materiaal is lank nog nie suiwer nie.

Sone-elektroforese van virusse

Hierdie tegniek is nou by die studie van groot getalle virusse toegepas en het uiters nuttig gebyk by die karakterisering van virustipes en -stamme.

By die ingewandsgroep van virusse wat tot dusver ondersoek is, het die drie tipes poliomiëlitisvirusse en

VIRUS RESEARCH UNIT

Head of Unit: PROF. A. KIPPS

The main interest of the Unit centred around fundamental research into the properties and behaviour of a variety of viruses and the soluble antigens with which they are frequently associated in virus-infected tissues.

The collaboration of other laboratories in the Union of South Africa in some aspects of this work is acknowledged with gratitude.

Virus Soluble Antigens

The immunophysical method for removing antigenic impurities from biological extracts has been further developed and is now called “preparative immuno-electrophoresis”. For this a special apparatus has been designed and constructed. A short paper describing the use and application of this method was presented to the Biochemical Society. It is hoped that, with this apparatus it will prove possible to prepare soluble antigens from mouse brains in a state of purity otherwise difficult to attain.

Immunological experiments with extracts of rabies-infected mouse brains, freed from the virus by centrifugation, have revealed the presence of not only four normal tissue antigens but at least two distinct rabies soluble antigens. The possibility that they consist of the same substance in two different states of aggregation has not yet been excluded.

Methods of purification involving precipitation at pH 4.5, electrophoresis, immunoelectrophoresis, calcium phosphate adsorption and ether treatment, result in marked destruction of the soluble antigen.

Chromatography of the rabies-infected mouse brain extracts on an anion exchanger DEAE cellulose has been extensively studied and now appears to be a promising method of purification after precipitation at pH 4.5. This method has provided a minute amount of antigen mixed with only 1/30-1/40 of the protein impurity of the original extract, but this material is still far from pure.

Zone electrophoresis of viruses

This technique has now been applied to the study of large numbers of viruses and has proved most useful in characterizing virus types and strains.

Among the enteric group of viruses so far investigated, the three types of poliomyelitis virus as well as

die virusse van Coxsackie A9 en Coxsackie B3 gelyksoortige elektroforetiese beweeglikheid, naby aan dié van die vergelykingshemoglobien.

ECHO-virusse van tipes 6 en 13, asook Coxsackie B1, het 'n beweeglikheid wat aanmerklik groter is as dié van die hemoglobien.

Virusse wat geïsoleer is uit beeste met knopviesiekte toon groot verskille in elektroforetiese beweeglikheid. BZD-virus het 'n beweeglikheid tussen die vinnige Allerton en die stadiger Neethling.

Virusse van perdesiekte en bloutong en die Van den Ende-virusse is elektroforeties inhomogeen en word nog ondersoek.

Drie vorme van die Sinkdalkoorsvirus is bestudeer. Die neurotropiese virus van die muis het 'n enkele elektroforetiese komponent, maar die pantropiese sowel as die neurotropiese muisvorm wat in eiers oorgespuis is, toon twee komponente.

Hierdie tegniek het uitstekende preparate van gesuiwerde virussuspensie vir elektronmikroskopie opgelewer.

Ultracentrifugasie van virusse

'n Nuwe metode om die deeltjiegrootte van virusse te bepaal, is ontwerp, waarby gebruik gemaak word van die uitswaairotor van die voorbereidende ultracentrifuge van Spinco. Met hierdie nuwe tegniek is baie van die beperkings van die ouer tegnieke wat in hierdie laboratorium gebruik is, uit die weg geruim.

'n Herondersoek van die besinkingskonstantes van die poliomiëlitisvirus MEF, tipe II het die aanwesigheid van twee besmettende komponente bevestig.

Die Allerton- en die BZD-virus het 'n deeltjiegrootte van 150 m.u. Die Neethling-virus word nog ondersoek.

Die bloutongvirus uit kulture van skaapnierweefsel bestaan uit 'n groot komponent van omtrent 150 m.u. en 'n kleiner een van omtrent 50 m.u.

Die Van den Ende-virus is volgens hierdie metode polidispers bevind. Dit het besmettende deeltjies van 50 m.u., 19 m.u. en < 12 m.u. in deursnee. Die bestaan van hierdie baie klein deeltjie moet bevestig word deur metodes wat vry diffusie en diffusie in agar meebring. Die bevestiging kan van aanmerklike betekenis wees.

Jelpresipitentegnieke

Die diffusiekonstantes van presipiterende antiliggamme uit die serum van verskillende diere teen dieselfde antigeen is volgens die jeldiffusiemetode bepaal. Daar is bevind dat die antiliggamme van die marmot, die konyn en die rot dieselfde diffusiekonstante het.

Hierdie resultaat is van waarde by die identifiseer van presipitasiebande volgens die jeldiffusietegniek van Oudin.

those of Coxsackie A9 and Coxsackie B3 have similar electrophoretic mobilities close to that of the reference haemoglobin.

ECHO viruses of types 6 and 13 in addition to Coxsackie B1 have mobilities appreciably higher than that of the haemoglobin.

Viruses isolated from cases of bovine Lumpy Skin Disease show wide differences in electrophoretic mobility. B.Z.D. virus has a mobility intermediate between the fast moving Allerton and the slower Neethling virus.

Horsesickness, Bluetongue and van den Ende viruses are electrophoretically inhomogeneous and are still under investigation.

Three forms of the Rift Valley Fever virus have been studied. The mouse neurotropic virus has a single electrophoretic component but both the pantropic form and the mouse neurotropic form which had been passaged in eggs, show two components.

This technique has provided excellent preparations of purified virus suspension for electron microscopy.

Ultracentrifugation of viruses

A new method for particle size determination of viruses has been developed, making use of the swingout rotor of the Spinco preparative ultracentrifuge. This new technique overcomes many of the limitations of the older techniques used in this laboratory.

A reinvestigation of the sedimentation constants of MEF₁ type II poliomyelitis virus confirmed the presence of two infective components.

The Allerton and B.Z.D viruses have a particle size of 150 m.u. and Neethling virus is still under investigation.

The Bluetongue virus derived from sheep kidney tissue culture was found to consist of a large component of about 150 m.u. and a smaller one of about 50 m.u.

The van den Ende virus has been shown by this method to be polydisperse. It has infective particles of 50 m.u., 19 m.u. and < 12 m.u. diameters. The existence of this very small particle requires confirmation by methods involving free diffusion and diffusion into agar: its confirmation could be of considerable fundamental significance.

Gel precipitin techniques

The diffusion constants of precipitating antibodies from sera of different animals against the same antigen have been determined by the gel diffusion method. It was found that the antibodies of the guinea-pig, the rabbit and the rat had the same diffusion constant.

This information is of value in the identification of bands of precipitation by the Oudin gel diffusion technique.

Hierdie tegniek is op uitgebreide skaal toegepas in ons laboratorium by die bestudering van sekere plant-virusse en by 'n ondersoek na die antigene struktuur van *Pseudomonas aeruginosa*.

Studies oor die poliomiëlitisvirusse

Na 'n lang reeks oor-en weer inspuittings tussen weefselkultuur en muisharsings en tussen muis en muis is die poliomiëlitisvirus Mahoney tipe I met sukses aangepas vir groei in die harsings van suipmuise.

Pogings is aangewend om 'n rekombinant met aangepaste poliomuisvirusse tipes I en II voort te bring. 'n Mate van sukses is behaal, maar die aanwesigheid van antigeen tipe I in die rekombinante virus kon moeilik buite alle twyfel bewys word.

Komplementfikseringstoetse met die Mahoney-besmette harsings van suipmuise het 'n goeie fiksering deur die virusfraksie getoon maar baie min fiksering deur die oplosbare antigeen. Die hoeveelheid oplosbare antigeen neem met voortdurende inspuiting in muisharsings toe.

Proewe met besmette RNA van poliomiëlitisvirus het belowend afgesit. Weefselkultuur is met sukses besmet.

Rous-sarkoomvirus

Studie oor die suiwering van die Rous-sarkoomvirus is deur 'n lid van die Virusnavorsingseenheid gedurende 'n jaar studieverlof in die California Institute of Technology in Pasadena, V.S.A., uitgevoer.

Tegnieke is ontwikkel om groot hoeveelhede virus voort te bring, wat deur differensiële ultrasentrifugasie gekonsentreer en gesuiwer kan word. Elektronmikroskopie van hierdie preparate het die sferiese deeltjies van die Rous-sarkoomvirus getoon, hoewel nie heeltemal vry van afbraakprodukte nie.

Verdere suiweringsmetodes met gebruikmaking van tripsien, ribonuklease, ionuitruilharse en fluorkoolstof is met goeie gevolg probeer. Die bereiding van besmetlike RNA van die Rous-sarkoomvirus het nie geslaag nie.

Verskille in die vatbaarheid van hoenderfibroblaste vir die Rous-sarkoomvirus is waargeneem. Verskille in die verhouding van virus tot sel is belangrik, aangesien party selle geen kwaadaardige vervorming ondergaan nie maar nuwe virus afskei. Hierdie verskynsel sal verder bestudeer word.

Verspreide herpesinfeksie by Kwashiorkor

In post-mortemstudies oor kwashiorkor is 'n nuwe sindroom vasgestel deur die identifikasie van enkelvoudige infeksies met sisteemherpes by kinders van 9 tot 18 maande oud. Meer as 'n dosyn gevalle is reeds gevind, en by party daarvan blyk uit isolasies uit die

This technique has been extensively used in this laboratory in the study of certain plant viruses and in an investigation into the antigenic structure of *Pseudomonas aeruginosa*.

Studies on the poliomyelitis viruses

After a long series of to-and-fro mouse tissue culture passages and mouse to mouse passages, the Mahoney type I poliomyelitis virus was successfully adapted to growth in suckling mouse brains.

Attempts were made to produce a recombinant with Types I and II mouse adapted poliomyelitis viruses. Some success was achieved but the evidence of the presence of a Type I antigen in the recombinant virus has been proved difficult to establish beyond criticism.

Complement fixation tests with the Mahoney infected suckling mouse brains showed good fixation by the virus fraction but very little fixation by the soluble antigen. The amount of soluble antigen is increasing with prolonged passage in mouse brains.

Experiments with infectious R.N.A. of poliomyelitis virus have had an encouraging start and tissue cultures have been successfully infected.

Rous Sarcoma virus

Studies on the purification of the Rous sarcoma virus were carried out by one member of the Virus Research Unit while on 12 months study leave in the California Institute of Technology in Pasadena, U.S.A.

Techniques were developed to produce large amounts of virus which could be concentrated and purified by differential ultracentrifugation. Electron microscopy of these preparations showed the spherical particles of the Rous Sarcoma virus but not quite free of debris.

Further methods of purification using trypsin, ribonuclease, ion exchange resins and fluoro-carbon were tried without satisfactory results. Preparation of infectious R.N.A. of the Rous sarcoma virus was not successful.

Differences in susceptibility of chicken fibroblasts to Rous Sarcoma virus were observed. Differences in the virus-cell relationship are important since some cells fail to undergo malignant transformation yet secrete new virus. This phenomenon will be further studied.

Generalized herpes infection in Kwashiorkor

In post-mortem studies on cases of kwashiorkor, a new syndrome has been established by the identification of systemic herpes simplex infections in the 9-18 month old children. More than a dozen cases have now been found and in some of them, isolations from the organs

organe dat daar stok konsentrasies van virus in die lewer, die milt, die bynier en partykeer die bloed aanwesig is.

Hierdie gevalle word voorturend waargeneem om 'n beter begrip van die siekte se patogenese te verkry.

Plantvirsusse

Proewe met die virus van geelmosaïek by die raap en die ringvlekvirus van die skorsie is met gebruikmaking van tegnieke wat in ons laboratorium ontwikkel is, uitgevoer.

'n Metode is gevind om virussuspensies in besmettende plantsap te suiwer. Die deeltjiegrootte van die virus is bepaal (25 m.u.) en die gedrag daarvan by jeldiffusie en sone-elektroforese bestudeer. Die ondersoek het 'n besonder vinnige metode om hierdie virusse uit te ken, tot gevolg gehad.

Ander virusse van die pampoengewasse word op die oomblik ondersoek.

Die Van den Ende-virus en -inhibeerder

Met gebruikmaking van Cooper-plate is noukeurige titrasies van die Van den Ende-virus gemaak. Hoewel hierdie virus nie gemaak is om rooiselle te hemagglutineer nie, is aangetoon dat die virus by hoenderen ganselle geadsorbeer word en dat hierdie adsorpsie voorkom word deur die Van den Ende-inhibeerder in die serum van normale diere, asook deur bepaalde antiligggame. Die adsorpsie word verder gestrem deur voorafgaande behandeling van die selle met aktiewe Lee B-influensavirus of deur die reseptorvernietigende ensiem.

'n Uitvoerige vergelyking is gemaak van die Van den Ende- en die Francis-inhibeerder. Hoewel hulle eenders gedra in 'n elektriese veld en by perjodaat en tripsien, is hulle verskillend verdeel in diereserum en diereweefsels.

Die Van den Ende-virus is die eerste bekende virus wat deur 'n warmtestabiele natuurlik voorkomende inhibeerder of van hierdie aard geneutraliseer is.

Gereelde virusisolاسies

Die Departement van Bakteriologie van die Universiteit van Kaapstad gaan voort met gereelde virusisolاسies in kliniese probleem-gevallen.

Hierdie diens is onafhanklik van die W.N.N.R. en die Virusnavorsingseenheid van die Universiteit van Kaapstad, maar staan onder toesig van die Direkteur.

have revealed high concentrations of virus in the liver, spleen, adrenal and sometimes in the blood.

These cases are being closely followed with a view to obtaining a better understanding of the pathogenesis of the disease.

Plant viruses

Experiments with the Turnip Yellow Mosaic Virus and the Squash Ringspot Virus have been carried out using the techniques developed in this laboratory.

A method was found for purifying virus suspensions in infective plant sap. The particle size of the virus was determined (25 m.u.) and its behaviour in gel diffusion and zone electrophoresis studied. These investigations led to a very rapid method of identification of these viruses.

Other viruses of the Cucurbits are at present under investigation.

The van den Ende virus and inhibitor

With the use of the plaque technique in Cooper plates, accurate titrations of van den Ende virus have been made. Although this virus has not been made to haemagglutinate red cells, it has been shown that the virus is adsorbed to fowl and goose cells and that this adsorption is prevented by the van den Ende inhibitor in normal animal sera as well as by specific antibodies. This adsorption is furthermore inhibited by prior treatment of the cells with active Lee B Influenza virus or by the receptor destroying enzyme.

A detailed comparison has been made between the van den Ende and Francis inhibitors. Although they behave similarly in an electric field and in the presence of periodate and trypsin, they are differently distributed in animal sera and in animal tissues.

The van den Ende virus is the first known virus to be neutralised by a heat stable naturally-occurring inhibitor of this type.

Routine virus isolations

The Department of Bacteriology of the University of Cape Town continues to provide a service for routine virus isolations from problem clinical cases.

This service is independent of the C.S.I.R. and U.C.T. Virus Research Unit but is under the supervision of the Director.

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GEVANGENISNAVOR- SINGSGROEP VIR DIEET EN METABOLISME IN VERBAND MET HART- BLOEDVATSIEKTES

Leier van die Groep: DR. P. J. KLOPPERS

Oor die hele wêreld word die belangstelling in die verhouding tussen dieet en die serumlipiede en die moontlike verband daarvan met die toenemende gevaar

PRISON RESEARCH GROUP ON DIET AND METABOLISM RELATING TO CARDIO-VASCULAR DISEASE

Leader of the Group: DR. P. J. KLOPPERS

Throughout the world, interest in the relationship between diet and the serum lipids and their possible bearing on the increasing hazard of atherosclerosis is

van aterosklerose volgehou. Die groot en toeneemende getal sterfgevälle weens kroonslagaarsiektes en die voorkur wat die siektes vir sekere bevolkingsgroepe toon, verhef die vraagstuk tot een van die grootstes in die mediese navorsing van ons tyd.

Baie verslae is hieroor gepubliseer, maar die meeste daarvan is of statistiese opnames in verband met bevolkingsgroepe, wat kroonslagaarsiektes in verband bring met sekere eet- en ander gewoontes, of nastudies van klein groepies pasiënte vir beperkte tye.

Die Gevangenisdiëetprojek het die voordeel dat dit 'n langtermynstudie van 'n groter groep is onder omstandighede wat 'n buitengewone mate van kontrole moontlik maak.

Die ondersoek het verlede jaar 'n bestendige staat bereik. Vanjaar is kliniese en biochemiese waarnemings van 'n vrywillige groep van 60 langtermyngevangenes gedoen. Die groep bestaan uit ewe veel blankes en Bantoe.

Veranderings in die diëet is aangebring om die uitwerking te bepaal van isokaloriese vervanging van vetryk preparate van verskeie soorte, bv. versadigde dierevet, gehidrogeneerde plantevet of hoofsaaklik onversadigde plantaardige olies. Veranderings in die diëet is ook aangebring om die uitwerking van ru-kos en van fekale massa op die serumlipiede te bepaal.

By die Gevangenis

Die voortreflike samewerking van die gevangenisowerheid word met dank erken.

Die vrywilligers het oor die algemeen die proefneming getrou gesteun, hoewel dit hulle vry gestaan het om enige tyd en om watter rede ook al daarmee uit te skei. Daar heers 'n gesonde spangees. Die gevangenes voel dat hulle deel het in 'n saak wat ander tot voordeel kan wees.

Bereiding van kos

Die Departement van Voeding en sy diëetkundiges het hartlik saamgewerk. Twee deelydse kombuis-hulpe help met die bereiding. Die kos word tot die naaste gram geweeg en word onder toesig geëet. Na die ete word die oorskiet weer gemeet en opgeteken. Die werk begin om 4 vm. in die kombuis en moet elke dag, ook gedurende naweke en op vakansiedae, winter en somer, gedoen word. Die diëte bestaan uit vetryk en vetarm en massale en nie-massale bereidings. Omtrent 40% van die ingenome kalorieë het by verskeie geleenthede bestaan uit plantaardige olie, gehidrogeneerde vet of dierevet. Die bereiding van isokaloriese en aanneemlike etes het heelwat vindingrykheid gekos, want elke diëet moes maande lank volgehou word. Die vrywilligers het die etes smaaklik gevind. Die bietjie oorskiet en die feit dat niemand uitgeskei het nie, is 'n bewys van die goeie kookkuns.

maintained. The large and increasing number of deaths due to coronary vascular disease and the selective incidence in certain population groups has made such investigations one of the foremost medical problems of our times.

Many reports have been published relating to this problem; but most are either statistical surveys dealing with population groups and relating coronary disease to certain dietary and other habits or are follow up studies dealing with small groups of patients over restricted periods.

The Prison Diet project has the advantage of permitting the long term study of a larger group under conditions which allow an unusual degree of control.

A steady state had been achieved last year. During this year clinical and biochemical observations were regularly made on a group of 60 volunteer long term prisoners consisting of equal numbers of White and Bantu subjects.

Changes in the diet were made to evaluate the effects of Isocaloric substitution of high fat preparations of various sorts, such as saturated animal fats, hydrogenated vegetable fats or mainly unsaturated vegetable oils. Changes in the diet were also made to estimate the effect of roughage and of faecal bulk on the serum lipids.

At the Prison

The excellent co-operation of the Prison authorities is gratefully acknowledged.

The volunteers have remained in the main loyal to the experiment even though they are free to withdraw at any time and for any reason. A healthy team spirit prevails and they feel that they are taking part in a venture designed to help others.

Preparation of food

The Department of Nutrition and their dieticians have been most co-operative. Two part-time kitchen-aids assist in the preparations. The food is weighed to the nearest gram and is consumed under supervision. At the end of the meal all left-overs are again measured and recorded. Work starts in the kitchen at 4.00 a.m. and must be done every day, also through the weekends and holidays and through the winter and the summer. The diets have included high fat and low fat and high bulk and low bulk preparation. About 40% of the ingested calories have at various times consisted of vegetable oil, hydrogenated fat or animal fat. Preparation of isocaloric and acceptable meals have called for no little ingenuity since each diet has continued for months. The volunteers have found the meals acceptable and the few left-overs and no resignations are a testimonial to culinary skill.

Ontleding van kos

Die Nasionale Voedingnavorsingsinstituut het 'n uitgebreide ontleding van elke dieet gemaak. Die Instituut se hulp in so baie opsigte dra by tot die goeie verloop van die projek.

Kliniese toesig

Kliniese ondersoek, met inbegrip van elektrokardiografiese en oefeningstoleransietoetse, word gereeld deur 'n internis uitgevoer. Alle voorvalle en tussenkomende ongesteldhede word aangeteken. Bloedmonsters word wekeliks geneem en aan die S.A.I.M.N. oorgegee. Gehomogeniseerde monsters van die stoelgang word vir tydperke van 7 dae versamel en gereeld by die S.A.I.M.N. afgelewer.

Die S.A.I.M.N. (met inbegrip van die Ernest Oppenheimer-navorsingseenheid)

'n Baie groot aantal ontledings word gereeld by die S.A.I.M.N. uitgevoer. Dit word in tweevoud in afsonderlike laboratoriums gedoen. Baie lipiedfraksies word bepaal, asook die fekale uitskeiding van sterole, galsure en vetsure.

Party van die prosesse en bepalinge in verband met fraksionering is baie nuut. Slegs enkele publikasies wat dié gegewens bevat, het verskyn, waarskynlik geneem met die bestek van ons gegewens nie.

Die Departement van Kliniese Patologie behartig die bepaling van die fibrinolitiese aktiwiteit in die serums.

Invloed van vet in die dieet op samestelling van serum-vetsuur

Die S.A. Instituut vir Mediese Navorsing berig dat hierdie studies nie alleen bevestig dat bloedlipiedpeile hoogs gevoelig is vir verandering in die vetgehalte en die vetsamestelling (sien hieronder) van die dieet nie, maar dat die samestelling van die vetsure wat in hierdie lipiede verbind is, baie afhang van die aard van die vet in die dieet.

Uit die resultate blyk dat die vetsuursamestelling van alle klasse lipiede vatbaar is vir verandering, maar dat hierdie verandering die opvallendste is by die trigliseriede, wat besonder gou reageer op dieetwisseling.

Toe die verhouding van die vetkaloë van 15% tot 38% verhoog is deur die isokaloriese vervanging van koolhidraat deur vet, het sonneblomsaadolie die verhouding van linoleïensuur in die trigliseriede verhoog van 16% tot 40-45%. Die ooreenstemmende veranderinge vir die cholesterolesters en fosfolipiede was onderskeidelik 35% tot 55% en 24% tot 35%. Geen veranderinge van dié aard is teweeggebring of deur gedeeltelik gehidrogeneerde sonneblomsaadolie (sonder linoleïensuur) of deur botter nie. Verder het die serum

Analysis of food

The N.N.R.I. have made extensive analyses of each diet offered and their help in many ways contributes to the satisfactory running of the project.

Clinical Supervision

Clinical examination, including electro-cardiographic and exercise tolerance tests, are regularly performed by a Physician Specialist. Any incidents or inter-current illnesses are recorded. Blood specimens are taken at weekly intervals and delivered to the S.A.I.M.R. Pooled homogenised stool specimens collected over seven-day periods are delivered to the S.A.I.M.R. at intervals.

The S.A.I.M.R. (including the Ernest Oppenheimer Research Unit)

A very large number of analyses are regularly conducted by the S.A.I.M.R. The analyses are conducted in duplicate in separate laboratories and many lipid fractions are estimated as well as the faecal excretion of sterols, bile acids and fatty acids.

Some of the fractionization processes and estimations are very new and only a few publications embodying such material have been made, probably none having the scope of the present data.

The Department of Clinical Pathology undertakes the estimation of fibrinolytic activity in the serums.

Influence of dietary fat on serum fatty acid composition

The S.A. Institute for Medical Research reports these studies as confirming, not only that blood lipid levels are highly susceptible to change in dietary fat content and composition, (see later) but that the composition of the fatty acids combined in these lipids is very dependent on the nature of the dietary fat.

Results indicate that while the fatty acid composition of all classes of lipides are susceptible to change, this change is most marked for the serum triglycerides, which are very responsive to dietary manipulation.

When the proportion of fat calories was raised from 15% to 38% by isocaloric substitution of fat for carbohydrate, sunflower-seed oil raised the proportion of linoleic acid in the triglycerides from 16% to 40-45%, corresponding changes for the cholesterol esters and phospholipides were from 35% to 55%, and 24% to 35%, respectively. No such changes were produced either by partially hydrogenated sunflower-seed oil (containing no linoleic acid), or by butter. Furthermore, on the sunflower-seed oil diet, in contrast to that of either hydrogenated oil or butter, the serum total

se peil van totale vetsuur by die sonneblomsaadolie-dieet gedaal, in ooreenstemming met dergelike dalings in die serum se peil van totale cholesterol en fosfolipied.

Uit hierdie bevindings wil dit voorkom asof linoleïensuur in die dieet tot 'n vinniger afvoer van die bloedlipiede uit die serum aanleiding gee, moontlik as gevolg van 'n groter stabilisasie van die lipoproteïene deur linoleïensuur, wat weer aanleiding gee tot 'n geredeliker verdeling na oksidasieplekke soos die lewer. Hierdie teorie word beproef deur studies oor die uitskeiding van fekale sterol en galsuur in bogenoemde dieetproef. Die resultate word in die volgende paragraaf beskryf.

Uitskeiding van Fekale Lipiede

Die metabolismestudie in die gevangenis is voortgesit in verband met die fekale uitskeiding van vet- en galsure na wisseling in die vet- en veselgehalte van die dieet. Uit die resultate blyk dat die aard van die dieet 'n beduidende uitwerking op die uitskeiding van fekale lipiede kan hê.

By veselryk diëte veroorsaak isokaloriese vervanging van koolhidraat deur vet 'n daling in die fekale hoeveelheid; die natgewig neem naamlik met 10 tot 15% af. Die fekale uitskeiding van sterol neem aanmerklik toe, waarby die verandering by sonneblomsaadolie die sterkste is, minder by gedeeltelik gehidrogeneerde sonneblomsaadolie wat geen linoleïensuur bevat nie en die minste by botter. In alle gevalle was die steroluitskeiding groter by die vetryk as by die vetarm dieet. Die fekale uitskeiding van galsuur by bogenoemde diëte het 'n ander patroon gevolg. Hier was die aanvanklike uitskeiding van galsure by die vetarm veselryk dieet hoër as wat by ander studies berig is. Isokaloriese vervanging van koolhidraat deur sonneblomsaadolie het 'n geringe vermeerdering, gedeeltelik gehidrogeneerde olie 'n geringe vermindering en botter 'n aanmerklike vermindering in galsuuruitskeiding veroorsaak.

By al die proefpersone is die vetsuuruitskeiding nie verander deur bogenoemde isokaloriese vervangings van koolhidraat deur vet nie. Die vetsuuruitskeiding het laag gebly, wat dui op goeie absorpsie van vet in die dieet, hoewel die verhouding van die vetkorieë verhoog is van 15 tot 38%.

Latere verwydering van vesel uit die vetryk dieet het 'n onmiddellike groot verandering in die aard van die uitskeidings veroorsaak. Die natgewig het met meer as 50% verander, terwyl die stoelgang hard was teenoor die sagte sponsagtigheid daarvan by die vetarm veselryk soel as die vetryk veselryk dieet.

Die galsuuruitskeiding het nie by die sonneblomsaadoliedieet verander nie, maar het effens afgeneem met die gehidrogeneerde olie en heelwat met botter. Die steroluitskeiding het in alle gevalle aanmerklik gedaal: die meeste met botter, minder met gehidrogeneerde olie en die minste met sonneblomsaadolie.

fatty acid levels fell significantly, paralleling similar falls in serum total cholesterol and phospholipide levels.

These findings appear to suggest that dietary linoleic acid leads to a more rapid transport of the blood lipides from the serum, possibly due to a greater stabilization of the lipo-proteins by linoleic acid leading to a more ready distribution to sites of oxidation such as the liver. This theory is being tested by studies on faecal sterol and bile acid excretion in the above dietary experiment, and the results are reported in the next section.

Faecal Lipid Excretion

Investigations have been continued in the prison metabolic study on the faecal excretion of stools, fatty acids, and bile acids following dietary fat and fibre manipulation. Results have shown that the nature of the diet can markedly alter faecal lipid excretion.

On high fibre and roughage diets, isocaloric substitution of fat for carbohydrate causes a decrease in faecal bulk; the wet weight decreasing by 10% to 15%. Faecal sterol excretion increases materially, the change being most marked for sunflower-seed oil, less so for partially hydrogenated sunflower-seed oil containing no linoleic acid, and least of all for butter. In all cases however, the sterol excretion was greater on the high fat than on the low fat diet. Faecal Bile acid excretion on the above diets followed a different pattern. Here, moreover, the initial excretion of bile acids on the low fat, high fibre diet was at a higher level than reported in other studies. Isocaloric substitution of sunflower-seed oil for carbohydrates caused a slight increase, partially hydrogenated oil caused a slight decrease, while butter produced a more marked decrease in bile acid excretion.

In all subjects fatty acid excretion was not altered by the above isocaloric substitutions of fat for carbohydrate. Fatty acid excretion remained low indicating good absorption of dietary fat although the proportion of fat calories was raised from 15% to 38%.

Subsequent removal of fibre from the high fat calorie diet caused an immediate gross change in the character of the faeces. The wet weight changed by more than 50%, and the stools became hard, whereas they were soft and spongy on both the low fat-high fibre, and high fat-high fibre diets.

Bile acid excretion did not change on the sunflower-seed oil diet, but decreased slightly with the hydrogenated oil, and appreciably with butter. Sterol excretion decreased appreciably in all cases but most markedly on butter, less so on the hydrogenated oil,

In die geval van botter was die uitskeiding van sterol op dieselfde peil as aanvanklik by die veselryk vetarm dieet.

Die uitskeiding van vetsure het in alle gevalle sterk afgeneem by verlaging van die dieet se veselgehalte.

'n Vermindering in fekale hoeveelheid loop dus ewewydig met 'n vermindering in die uitskeiding van alle soorte fekale lipiede, behalwe in die geval van fekale galsure by die sonneblomsaadolie-dieet.

Serumlipiedpeile

In die metaboliese studie in die gevangenis waaroor daar in die voorgaande paragrafe berig is, is die ondersoek na die langtermynuitwerking van dieetwisseling op die serumlipiedpeil voortgesit. Gevangenes is byna nege maande lank op 'n gevangenis-dieet gehou wat veselryk en vetarm is (ongeveer 15 gm. vesel per dag in 'n dieet van 3000 kalorieë, waarvan 15% afkomstig was van vet van dierlike en plantaardige herkoms) voordat statisties geldige basiese serumlipiedpeile vasgestel kon word. Die dieet is toe verander net deur isokaloriese vervanging van koolhidraat deur vet. Die veselgehalte is naamlik op die basiese peil gehou. Hiermee is 22 weke voortgegaan voor die volgende verandering gemaak is. In die laaste geval is die hoeveelheid en aard van die kalorieë nie verander nie, maar die veselgehalte is verminder van 15 gm. tot 3 gm. per dag.

30 Blanke en 30 nie blanke vrywilligers wat 'n lang termyn in die gevangenis uitdien, is in drie groepe van tien verdeel met die oog op oorskakeling van die basiese dieet tot 'n ander een wat 38% vetkalorieë bevat. Vir die eerste groep is koolhidraat isokalories vervang deur sonneblomsaadolie (wat ongeveer 60% linoleïensuur bevat). Vir die tweede groep is gedeeltelik gehidrogeneerde sonneblomsaadolie (wat linoleïensuur bevat) gebruik, en vir die derde groep is die ekstra vetkalorieë deur botter bygebring.

Die gemiddelde basiese lipiedpeil van die twee rasse-groepe was gelyk en heelwat laer as by 'n vergelykbare „normale” blanke bevolking buite die tronk. Dit kom veel meer ooreen met dié van 'n „normale” Bantoebevolking.

Na die eerste dieetverandering het die gemiddelde totale serumcholesterolpeil vir die groepe op sonneblomsaadolie (blank en nie blank) met ongeveer 10% gedaal. Die ooreenstemmende veranderings vir die groepe op gehidrogeneerde olie en botter was toenames van 20 en 45% onderskeidelik. Die serumfosfolipiedpeil het soortgelyke maar kleiner veranderings getoon, nl. onderskeidelik -15%, +5% en +20%. Die gevolg was dat die verhouding cholesterol-fosfolipied by al die vetryk diëte toegeneem het. Die verandering was die grootste by die bottergroepe, die minste vir die groep op sonneblomsaadolie en tussenin vir die groep op gehidrogeneerde vet. Hierdie veranderings het op gelyke wyse geblyk uit veranderings in

and least of all on the sunflower seed oil. In the case of butter the sterol excretion was at the same level as initially on the high fibre - low fat diet.

Fatty acid excretion dropped materially in all cases when fibre content of the diet was decreased.

Decrease in stool bulk has therefore been paralleled by a decreased excretion of all classes of faecal lipids, except in the case of faecal bile acids on the sunflower seed oil diet.

Serum Lipid Levels

In the prison metabolic study reported in the previous sections, the investigation of the long term effects of dietary manipulation on serum lipid levels was continued. Prisoners were maintained for almost nine months on a prison diet high in fibre and low in fat content (approximately 15 gms. of fibre per day on a 3000 calorie diet of which 15% was derived from fat of animal and vegetable origin) before statistically valid basal serum lipid levels could be assessed. The diets were then changed only by isocaloric substitution of fat for carbohydrate, the fibre content being maintained at the basal level. This diet was continued for 22 weeks before a further change was made. In the latter case the amount and nature of the calories was unaltered, but the fibre content was reduced from 15 gms. to 3 gms. per day.

Thirty European and thirty Non-European volunteer long-term prisoners were divided into three groups of ten each for change from the basic diet to a second containing 38% of calories from fat. For the first group sunflower-seed oil (containing approximately 60% linoleic acid) was substituted isocalorically for carbohydrate; for the second group partially hydrogenated sunflower-seed oil (containing linoleic acid) was used, and for the third group the additional fat calories were derived from butter.

The mean basal lipid levels of both racial groups of prisoners were similar, and very much lower than for a comparable “normal” European population not in prison, agreeing more closely with those of a “normal” Bantu population.

After the first dietary change the mean total serum cholesterol level for the sunflower-seed oil groups (both European and Non-European) had fallen by approximately 10%. The corresponding changes for the hydrogenated oil and butter groups were increases of 20% and 45% respectively. Serum phospholipid levels showed similar, but smaller, changes of -15%; +5% and +20%, respectively. As a result, the cholesterol/phospholipid ratios were increased on all the

die cholesterol- en fosfolipiedpeil van betalipoproteïen, wat weer verhoogde cholesterol-fosfolipiedverhoudings tot gevolg gehad het. Oor die algemeen was die persentasie van totale cholesterol en totale fosfolipied by die beta-lipoproteïen geneig om effens by die botterdiëet op te gaan, konstant te bly op die diëet van gehidrogeneerde olie en effens te bly op die diëet van gehidrogeneerde olie en effens te daal by die sonneblomsaadolie diëet. Die persentasie totale serumlipiede by die beta-lipoproteïen het dieselfde patroon as die ander lipiede getoon.

Die verhouding serumcholesterolester tot totale cholesterol is deur geeneen van die diëetveranderings aangetas nie.

Verwydering van vesel uit veselryk vetryk diëet het bogenoemde uitkomst ten opsigte van serumlipiede nie beduidend verander nie, hoewel daar aanmerklike veranderings in die uitskeiding van fekale sterol was, wat daarop dui dat ten minste 'n gedeelte van die fekale sterol van eksogene oorsprong moet wees. Oor die algemeen het die lipiedpeil egter effens hoër by die veselarm as by die veselryk diëet gestyg.

Die Nasionale Voedingnavorsingsinstituut het reëlings getref vir die bepaling van kaloriebehoefte en werklewering en ook vir statistiese toetsing, beplanning en beheer.

PUBLIKASIES

Daar is nog nie tot publikasie oorgegaan nie, maar heelwat materiaal is versamel.

Die Komitee meen dat die werk nog 'n stap verder moet vorder voordat die resultate gepubliseer word.

Die eerste verhandelings is opgestel en 'n gesaghebbende, uitvoerige reeks publikasies sal binnekort verskyn. Die konsekwensies van party van bogenoemde bevindings is vanselfsprekend. Ingrypende veranderings in ons gewoontes en gevolglik in die struktuur van die boerdery en die nywerheid word daardeur in die vooruitsig gestel.

high fat-calorie diets. The change was greatest for the butter groups, and least for sunflower-seed oil, the hydrogenated fat ratios being intermediate. These changes were similarly shown by changes in the Beta-lipoprotein cholesterol and phospholipide levels, again resulting in raised cholesterol phospholipide ratios. In general, the percentage of total cholesterol and total phospholipide in the Beta-lipoprotein tended to rise slightly on the butter diet, remain steady on the hydrogenated oil diet, and fall slightly on the sunflower seed oil diet.

The percentage of serum total lipids in the Beta-lipoprotein showed the same pattern as the other lipids. Serum cholesteryl ester/total cholesterol ratios were unaffected by any of the dietary changes.

Removal of fibre from the high fibre-high fat diet did not significantly alter the above findings on serum lipids, even though there have been significant changes in the faecal sterol excretion, suggesting that part, at least, of the faecal sterol must be of exogenous origin. In general, however, lipid levels rose slightly higher on the low fibre diet than on the high fibre diet.

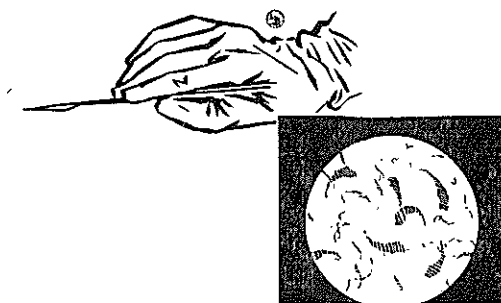
The National Nutrition Research Institute made arrangements for the estimation of calorie requirements and work output estimations and also for statistical supervision, planning and control.

PUBLICATIONS

No publications have been made yet but a considerable amount of data has been collected.

The Committee feels that the work should be carried a step further before publication.

The first papers have been prepared and an authoritative and detailed series of publications will be made soon. The implications of some of the findings mentioned above are obvious and fundamental changes in our habits and hence in the structure of farming and manufacturing are implied.





*Mnr. D. G. Kingwill, Hoof van die Departement
Inligting en Spesiale Dienste*

*Mr. D. G. Kingwill, Head of the Information and
Special Services Department*

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL XIII

DEPARTEMENT INLIGTING
EN SPESIALE DIENSTE

PART XIII

INFORMATION
AND SPECIAL SERVICES
DEPARTMENT

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. Box 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)



DEPARTEMENT INLIGTING EN SPESIALE DIENSTE

Hoof van Departement: D. G. KINGWILL

Die integrasie van die voormalige Skakelafdeling en die Afdeling Biblioteek en Inligting is feitlik afge-loop. Hoewel sekere belangrike vakatures ongevul bly, is die personeelposisie beter. Binne die raamwerk van 'n groter departement kon die funksies van elke pos noukeuriger omlyn word, wat tot doeltreffender diens en werwing aanleiding gegee het.

BIBLIOTEEK

Die afgelope jaar is bestee aan konsolidasie na die inskaking onder die Departement Inligting en Spesiale Dienste.

Boekbereiding

Daar is veral probeer om die bestellingsdiens so doeltreffend as moontlik te maak. Altesame 3,360 boekwerke is aangeskaf. Die Onderafdeling Bestellings het 694 fotokopieë bestel. Die getal publikasies wat geklassifiseer is, was 2,565; 2,832 is gekatalogiseer, terwyl 848 wat vroeër op kaartjies aangeteken was, in die aanwinstelyst opgegee is. Die getal boekwerke wat geklassifiseer en in die versameling opgeneem is, was gemiddeld 250 per maand. Die boekvoorraad is nou 39,029. Die annoteer van publikasies, wat as die eindstadium van boekbereiding beskou word, en die saamstel van die aanwinstelyste vir die maandbulletin *C.S.I.R. Information* is aan die Onderafdeling Boekbereiding opgedra.

Ontvange publikasies, behalwe dié wat bestel was (hoofsaaklik deur bemiddeling van die buitelandse Wetenskaplike Skakelkantore), het 3,217 bedra en is deur die Onderafdeling Boekbereiding behartig.

Boeklenings

Die takbiblioteek in Visagiestraat (oorspronklik inigerig as die biblioteek van die S.A.B.S.) word gereorganiseer om in die hoofbiblioteek opgeneem te word wanneer die laboratoriums wat nog in Pretoria is, na Scientia trek. Met die oortrek van die Nasionale Voedingsnavorsingsinstituut na Scientia is al die boekwerke van dié Instituut aan die hoofbiblioteek afgegee.

Altesame 43,307 publikasies is aan persone en inrigtings uitgereik, terwyl 3,646 aanmanings uitgestuur is.

INFORMATION AND SPECIAL SERVICES DEPARTMENT

Head of Department: D. G. KINGWILL

Integration of the former Liaison Division and Library and Information Division is reasonably complete. Although some important vacancies remain unfilled, the staff position has improved. Within the framework of a larger department it has been possible to define the functions of each post more specifically through which greater efficiency and more effective recruitment has become possible.

LIBRARY

The past year has been a period of consolidation following reorganization under the Information and Special Services Department.

Processing

Special efforts were made to make the ordering services as effective as possible. Altogether 3,360 publications were acquired. Orders for photographic copies, which are handled by the Order Section amounted to 694. The number of publications classified was 2,565; 2,832 were catalogued and 848 publications previously recorded were accessioned. The number of publications classified and added to the collection averaged 250 per month. The bookstock has reached a total of 39,029. The annotation of publications, which is regarded as the final stage of processing, and the compilation of the accessions lists for the monthly bulletin *C.S.I.R. Information* has been made the responsibility of the Processing Section.

Publications received other than those which were ordered (mainly through the Scientific Liaison Offices overseas) dealt with by the Processing Section, numbered 3 217.

Loans

The branch library in Visagie Street (originally organized as the library of the S.A.B.S.) is being reorganized with a view to being taken into the main library when the laboratories which are at present in Pretoria move to Scientia. With the moving of the National Nutrition Research Institute to Scientia all publications held by that laboratory have been handed over to the main library.

Altogether 43,307 publications were issued to individuals and institutions and 3,646 reminders sent out.

Om tydskrifte vir leners buite die W.N.N.R. met die minste vertraging beskikbaar te maak, is alles in die werk gestel om die inbindwerk te bespoedig. Altesame 890 jaargange is na die binders gestuur, waarvan 630 voltooi en in die versameling opgeneem is.

Met die oog op groter oorsigtelikheid vir die gebruikers van die biblioteek is minder belangrike publikasies wat uit allerlei bronne ontvang is (veral dié wat nie bestel is nie), uit die versameling verwyder.

Katalogus van tydskrifte in die Unie

Die getal inskrywings wat daar van medewerkende biblioteke en inrigtings op die gebied van wetenskap en tegnologie ontvang is, is 7,293. Hierdie registers word gedurig nageslaan, selfs nog voor publikasie daarvan.

INLIGTING

Nog 'n reorganisasie gedurende die jaar het daartoe gelei dat al die werksaamhede van die Raad op die gebied van dokumentasie nou in die Biblioteekgebou saamgetrek is. Die Inligtingsafdeling is belas met 'n tegniese en bibliografiese navraagdiens, die uitgee van wetenskaplike gidse, tegniese verslae en reklamestukke en die lewering van 'n wetenskaplike vertaaldienst in die landstale en in vreemde tale.

Navrae

As gevolg van die reorganisasie kan die W.N.N.R. nou 'n omvattender tegniese navraagdiens lewer. Navrae word beantwoord met behulp van die gegewens in die gedrukte literatuur in die biblioteek, aangevul deur die gesamentlike kennis en ervaring van wetenskaplikes in die Raad se laboratoriums en elders. Sowat 97 navrae is gedurende die jaar beantwoord. Dit het gegaan oor inbraakalarms, toringdraaikrane, die anodiseer van aluminium en 'n verskeidenheid ander onderwerpe, bv. die gebruik van walvismeel vir pluimveevoeding. Party het uitgebreide literatuursoektogte afgegee en tot gevolg gehad dat 41 geannoteerde literatuurlyste uitgee is. Boonop is iets oor die honderd versoeke ontvang om nadere inligting oor opsommings wat in die weeklikse samevatting van buitelandse berigte, *Keur van Wetenskaplike Nuus*, verskyn.

Nog 'n diens wat gedurende die jaar deur hierdie onderafdeling ingestel is, is die verskaffing van kataloguskaartjies van biblioteekaanwinste, sodat die navorser sy eie gespesialiseerde bibliografie kan opbou. Hierdie diens hang saam met die uitgee van die Biblioteek se maandblad *C.S.I.R. Information*.

With a view to making periodicals available to non-C.S.I.R. borrowers with the minimum possible delay, strenuous efforts have been made to speed up the binding of journals. Altogether 890 volumes were sent for binding and 630 returned and added to the collection.

With a view to improving the display of publications for users of the library, less important publications received from various sources (particularly those which are not ordered) have been eliminated from the collection.

Catalogue of Union Periodicals

The number of entries in the field of science and technology received from co-operating libraries and institutions is 7,293. These records are in constant use for reference purposes even in the pre-publication stage.

INFORMATION

A further re-organisation during the year has resulted in all the Council's activities in the field of documentation being concentrated in the Library building. The Information Division has been made responsible for providing a technical and bibliographical enquiry service, for the publishing of scientific directories, technical reports and publicity matter, and for providing a scientific translation service in the official languages of the Union and foreign languages.

Enquiries

As a result of the reorganization it has become possible for the C.S.I.R. to offer a more comprehensive technical enquiry service than in the past. Enquiries are answered with the aid of information which can be found in the printed literature in the library and this is supplemented by drawing on the accumulated experience of scientists in the Council's laboratories and elsewhere. Some 97 of these enquiries were answered during the year. They ranged from burglar alarms, tower cranes, the anodizing of aluminium and a variety of other subjects to the utilization of whale meat meal for poultry feeds. Many of them involved extensive literature searches and resulted in the publication of 41 annotated reference lists. In addition to this, a little over a hundred requests were received for further information on summaries published in the weekly digest of foreign reports, *Science News Selections*.

A further new service established during the year by this section is the provision of catalogue cards of library accessions to enable individual scientists to build up their own specialized bibliographies. This service is run in conjunction with the publication of *C.S.I.R. Information*, the monthly library journal.

Publikasies

'n Spesiale poging is aangewend om die druk van die *Register van Huidige Wetenskaplike Navorsing aan Suid-Afrikaanse Universiteite* te bespoedig, met die gevolg dat die 1957-uitgawe teen die middel van 1958 en die 1958-uitgawe vroeg in 1959 verskyn het. 'n Nuwe formaat is toegepas, sodat die *Register* nou makliker nageslaan kan word. Die 1958-uitgawe gee al nie minder as 636 persoonlike navorsingsprojekte op nie, wat wel 'n aanduiding daarvan is hoe vinnig navorsing aan die universiteite in die laaste paar jaar toegeneem het.

Nog 'n publikasie met 'n nuwe formaat is die *C.S.I.R. Information*, wat nou nie alleen die maandelikse biblioteekaanwinste aangee nie, maar ook lyste bevat van vertalings wat die W.N.N.R. onderneem, lyste van aanstaande internasionale wetenskaplike konferensies en 'n samevatting van buitelandse navorsingsberigte wat nie maklik beskikbaar is vir die wetenskaplike in Suid-Afrika nie.

Onder die reklamepublikasies van die Afdeling is: *Loophane in die W.N.N.R., C.S.I.R. Research for Government and Industry, Besoekersgids, Die waarneming van satelliete* en 'n beskrywende pamflet oor die Nasionale Voedingsnavorsingsinstituut. Twee tegniese verslae, 'n *Volkskaalse Padeksperiment met Bitumineuse Voormengseloppervlakke* en *Design Criteria for Sewage Purification Works*, is onderskeidelik vir die Nasionale Padnavorsingsinstituut en die Nasionale Waternavorsingsinstituut geredigeer en uitgegee.

Vertaling

Die Onderafdeling Vertalings is gedurende die jaar versterk en kan nou uit vyftien vreemde tale behalwe die twee landstale vertaalwerk onderneem. Die werksaamhede blyk uit die volgende staat, waarin die eenheid 'n bladsy tikskrif van ongeveer 300 woorde is.

STAAT VAN VERTALINGS—1958/59

| Taal | Eenhede |
|-----------------------|---------|
| Engels in Afrikaans | 2185 |
| Afrikaans in Engels | 34 |
| Frans in Engels .. | 604 |
| Duits in Engels ... | 412 |
| Sweeds in Engels .. | 169 |
| Italiaans in Engels.. | 66 |
| Russies in Engels .. | 16 |
| Spaans in Engels .. | 6 |

Bogenoemde syfers weerspieël net die volledige vertalings wat die vertalers skriftelik gedoen het. 'n Groot

Publications

A special effort was made to speed up the printing of the annual *Register of Current Research in South African Universities* with the result that the 1957 issue appeared towards the middle of 1958 and the 1958 issue early in 1959. A new format was adopted and the *Register* is now easier to use as a work of reference. The 1958 issue contained no less than 636 individual research projects—an indication of the rapid increase of research in the universities over the past few years.

Another publication which has been given a new format is *C.S.I.R. Information* which, in addition to the monthly library accessions list, now contains lists of translations undertaken in the C.S.I.R., lists of forthcoming international scientific conferences and a digest of foreign research reports not readily available to scientists in South Africa.

Publicity publications by the Division included *Careers in the C.S.I.R., C.S.I.R. Research for Government and Industry, Visitor's Guide, The Tracking of Satellites* and a descriptive booklet dealing with the National Nutrition Research Institute. Two technical reports, *A Full-Scale Road Experiment with Premixed Bituminous Carpets* and *Design Criteria for Sewage Purification Works* were edited and published for the National Institute for Road Research and the National Institute for Water Research, respectively.

Translations

The Translation Section was strengthened during the year and can now undertake translations from fifteen foreign languages in addition to translations between the official languages of the Union. This is reflected in the following table in which the unit is one page of typescript of approximately 300 words.

TABLE OF TRANSLATIONS—1958/59

| Language | Units |
|-------------------------|-------|
| English to Afrikaans .. | 2,185 |
| Afrikaans to English .. | 34 |
| French to English .. | 604 |
| German to English .. | 412 |
| Swedish to English .. | 169 |
| Italian to English .. | 66 |
| Russian to English .. | 16 |
| Spanish to English .. | 6 |

The above figures include only the detailed translations which were written out by the translators. A

aantal wetenskaplikes in die Raad se laboratoriums is aan mondelinge vertalings van wetenskaplike verhandelings gehelp en bygestaan in verband met tegniese terminologie. Daarby is 13 eenhede uit Engels of Afrikaans in 'n vreemde taal gemaak.

Die Onderafdeling Vertalings bedien net die Raad se eie personeel, maar daar word 'n lys van beroepsvertalers aangehou ten einde persone buite die W.N.N.R. te help om in aanraking te kom met vreemde-talekenners om hulle vertaalprobleme op te los. Die lys is gedurende die jaar hersien en bestaan nou uit 29 name.

Gedurende die verslagjaar is byna 5,000 kaartjies bygevoeg tot die Statebondsindex van Vertalings wat in die Biblioteek gehou word. Hierdie indeks is ten behoeve van W.N.N.R.-personeel sowel as ander wetenskaplikes nageslaan om te verseker dat geen nuwe vertaling van 'n bepaalde wetenskaplike verhandeling gemaak word as daar reeds een elders in die Gemenebes bestaan nie.

Lede van die personeel het in drie buitekomitees gedien wat ingestel is om gespesialiseerde lysste van Afrikaanse tegniese terme op verskeie gebiede op te stel.

WETENSKAPLIKE SAMEWERKING

Die Raad se wetlik opgelegde taak om as skakel te dien tussen Suid-Afrika en ander lande ten opsigte van wetenskaplike en nywerheidsnavorsing, word deur die Afdeling Wetenskaplike Samewerking uitgevoer. Hierdie kantoor maak die skakel uit tussen die Internasionale Raad van Wetenskaplike Verenigings en sy geaffilieerde verenigings, wetenskaplike organisasies in ander lande, internasionale wetenskaplike liggame en konferensies, die Departement van Buitelandse Sake en ander staatsdepartemente in verband met die internasionale politieke aspekte hieraan verbonde en binnelandse wetenskaplike organisasies en universiteite in dié verband.

Hierdie Afdeling lewer die sekretariaat vir die Suid-Afrikaanse Nasionale Komitee van die I.G.J. en is verantwoordelik vir die uitvoering en koördinasie van die Suid-Afrikaanse program. Gedurende 1957/58 is die grootste gedeelte van die Afdeling se tyd deur I.G.J.-werk in beslag geneem.

'n Internasionale konferensie oor pneumokoniose is in Februarie 1959 in Johannesburg gehou. Nagenoeg twee maande is hierdie Afdeling ter beskikking van die Sekretaris-generaal van die Konferensie gestel.

Ten behoeve van die Verenigde State se National Academy of Sciences is 'n komitee deur die W.N.N.R. in die lewe geroep om geskikte persone uit te soek vir die American Visiting Research Scientists Program. Die komitee het gedurende die jaar byeengekom en vyf toekennings aan Suid-Afrikaanse wetenskaplikes gedoen.

large number of scientists in the Council's laboratories were helped with verbal translations of scientific papers, and advice on technical terminology. In addition to this, 13 units of translation from English or Afrikaans into a foreign language were made.

The Translation Section caters only for the Council's own staff, but a panel of professional translators is maintained to assist persons outside the C.S.I.R. to make contact with foreign language experts who can help them with their translation problems. The panel was revised during the year and now has 29 names.

During the period covered by this report nearly 5,000 cards were added to the copy of the Commonwealth Index of Translations held in the Library. This index was consulted on behalf of both C.S.I.R. staff and other scientists to ensure that no new translation of a particular scientific paper would be made if one was available elsewhere in the Commonwealth.

Members of the staff served on three outside committees established to draw up specialized lists of Afrikaans technical terms in various fields.

SCIENCE CO-OPERATION

The Council's statutory duty to act as liaison between South Africa and other countries in matters relating to scientific and industrial research is discharged through the Science Co-operation Division. This office provides the co-ordinating link with the International Council of Scientific Unions and its affiliated unions, scientific organizations in other countries, international scientific bodies and conferences, the Department of External Affairs and other government departments in relation to the international political aspects relating to the above activities and local scientific organizations and universities in relation to these activities.

This Division provides the secretariat for the South African National Committee of the I.G.Y. and is responsible for the administration and co-ordination of the South African programme. During 1957/58 the major portion of this Division's time was taken up with I.G.Y. work.

An International conference on Pneumoconiosis was held in Johannesburg in February, 1959, and for a period of approximately two months the services of this Division were placed at the disposal of the Secretary-General of the Conference.

On behalf of the United States National Academy of Sciences a committee was set up by the C.S.I.R. to select suitable persons for the American Visiting Research Scientists Program. The committee met during the year and five awards were made to South African scientists.

Die Internasionale Raad van Wetenskaplike Verenigings (ICSU)

Die W.N.N.R. het by die ICSU as nasionale lid aangesluit namens die Regering. Die ICSU is in die eerste plek 'n organisasie wat die werksaamhede van 'n aantal geaffilieerde verenigings koördineer.

Hier volg 'n lys van die ICSU se geaffilieerde verenigings:

- Internasionale Astronomiese Vereniging (IAU)
- Internasionale Vereniging vir Suiwer en Toegepaste Skeikunde (IUPAC)
- Internasionale Wetenskaplike Radiovereniging (URSI)
- Internasionale Vereniging vir Suiwer en Toegepaste Fisika (IUPAP)
- Internasionale Vereniging vir Biologiese Wetenskappe (IUBS)
- Internasionale Vereniging vir Kristallografie (IUCR)
- Internasionale Vereniging vir Geodesie en Geofisika (IUGG)
- Internasionale Geografiese Vereniging (IGU)
- Internasionale Vereniging vir Teoretiese en Toegepaste Meganika (IUTAM)
- Internasionale Vereniging vir Fisiologiese Wetenskappe (IUPS)
- Internasionale Vereniging vir Biochemie (IUBC)
- Internasionale Wiskundige Vereniging (IMU)
- Internasionale Vereniging vir Wetenskapsgeskiedenis (IUHS)

Suid-Afrika is lid van al hierdie internasionale verenigings behalwe die laaste ses. Die W.N.N.R. het aansoek om lidmaatskap van die Internasionale Geografiese Vereniging gedoen. Die aansoek sal op die vergadering van dié liggaam wat in 1960 in Stockholm gehou word, bespreek word.

Die ICSU het 'n aantal spesiale komitees gestig om bepaalde projekte op gebiede wat die terrein van meer as een vereniging beslaan, uit te voer. Die grootste van hierdie projekte, die Internasionale Geofisiese Jaar, is deur CSAGI (Comité Spécial Année Géophysique Internationale, 1957-58) behartig.

Suid-Afrika is op die volgende vergaderings van ICSU en sy geaffilieerde verenigings verteenwoordig:

- Algemene Vergadering van die IUBS in Londen deur professor J. H. Day van die Universiteit van Kaapstad;
- Algemene Vergadering van IUPAC in Parys deur dr. J. P. van Zyl, Wetenskaplike Skakelbeampte in Keulen;
- Algemene Vergadering van die IAU in Moskou deur dr. W. S. Finsen, Unie-astronoom;
- Vyfde Reünie van CSAGI in Moskou deur dr. T. E. W. Schumann, Voorsitter van die Suid-Afrikaanse Nasionale Komitee vir die I.G.J.,

The International Council of Scientific Unions (ICSU)

The C.S.I.R. adheres to ICSU as a National member on behalf of the Government. Primarily ICSU is an organization co-ordinating the activities of a number of affiliated unions.

The following are affiliated Unions of ICSU:

- International Astronomical Union (IAU)
- International Union of Pure and Applied Chemistry (IUPAC)
- International Scientific Radio Union (URSI)
- International Union of Pure and Applied Physics (IUPAP)
- International Union of Biological Sciences (IUBS)
- International Union of Crystallography (IUCR)
- International Union of Geodesy and Geophysics (IUGG)
- International Geographical Union (IGU)
- International Union of Theoretical and Applied Mechanics (IUTAM)
- International Union of Physiological Sciences (IUPS)
- International Union of Biochemistry (IUBC)
- International Mathematical Union (IMU)
- International Union of History of Science (IUHS).

South Africa adheres to all of the International Unions with the exception of the last six. The C.S.I.R. has made application to become a member of the International Geographical Union—this will be discussed at the IGU Assembly to be held in Stockholm in 1960.

ICSU has set up a number of special committees to carry out specific projects in fields covering the activities of more than one Union. The largest of these projects, the International Geophysical Year, was administered by CSAGI (Comité Spécial Année Géophysique Internationale 1957-58).

South Africa was represented at the following meetings of ICSU and its affiliated Unions:

- General Assembly of the IUBS in London by Professor J. H. Day of the University of Cape Town;
- General Assembly of the IUPAC in Paris by Dr. J. P. van Zyl, Scientific Liaison Officer in Cologne;
- General Assembly of the IAU in Moscow by Dr. W. S. Finsen, Union Astronomer;
- Fifth Reunion of CSAGI in Moscow by Dr. T. E. W. Schumann, Chairman of the South African National Committee for the I.G.Y., Dr. W. S.

dr. W. S. Finsen, Unie-astronoom; mnr. M. P. van Rooy, Direkteur van die Weerburo;
Algemene Vergadering van ICSU in Washington
deur dr. R. G. Shuttleworth, Suid-Afrikaanse
Wetenskaplike Skakelbeampte in Washington.

Finsen, Union Astronomer, Mr. M. P. van
Rooy, Director of the Weather Bureau;
General Assembly of ICSU in Washington by
Dr. R. G. Shuttleworth, South African Scientific
Liaison Officer in Washington.

Internasionale Geofisiese Jaar (I.G.J.)

Die Internasionale Geofisiese Jaar het op 1 Julie 1957 begin en op 31 Desember 1958 amptelik ten einde geloop.

Sowat 30,000 wetenskaplikes en tegnisi in 66 lande het aan hierdie geweldige program van wêreldwye waarneming en proefneming deel gehad.

Die Suid-Afrikaanse program onder leiding van die Suid-Afrikaanse Nasionale Komitee vir die Internasionale Geofisiese Jaar is ten bedrae van £295,000 aan direkte koste deur die Regering gesteun, maar die totale Suid-Afrikaanse inset, met inbegrip van die Amerikaanse uitrusting in die land, word op 'n halfmiljoen pond geskat. Suid-Afrika het aan al veertien dissiplines behalwe die glasiologie deelgeneem. Nagenoeg tagtig I.G.J.-poste is in Suid-Afrika, Suidwes-Afrika, Marioneiland, Tristan da Cunha en Gough-eiland ingerig. Die sukses van die onderneming in Suid-Afrika is grotendeels toe te skryf aan die steun van staatsdepartemente, die Suid-Afrikaanse Spoorweë, universiteite, sterrewagte, private organisasies en die laboratoriums van die W.N.N.R.

Teen die einde van 1958 het al die poste gegewens begin instuur na die vernaamste Wêreldgegewenssentrums in die V.S.A., Rusland en verskeie ondergeskikte sentrums in Europa, die Verenigde Koninkryk, die V.S.A., Kanada, Duitsland en Frankryk.

Wêrelddae en -kommunikasies — Die wêrelddae was tydperke van drie of vier dae elke maand, na gelang van die maanstande, toegewys vir spesiale gelyktydige waarneming van geofisiese verskynsels op die aarde. Hulle is gewoonlik so gekies om sonsverduistering en meteorreëns in te sluit.

Die I.G.J.-waarskuwingstelsel om wetenskaplikes op hulle hoede te stel wanneer besondere verskynsels soos sonvlamme gesien kan word, het goed gewerk op die wêreldkommunikasienet. Suid-Afrika het sy waarskuwings op die Jan Smuts-weerstasie oor Nairobi ontvang. Daarby is waarskuwings uit die W.W.V.H.-radiostasie op Honoloeloe onderskep.

Wanneer belangrike geomagnetiese steurings binne 24 uur verwag is, het die Wêreldwaarskuwingsorgaan 'n spesiale Wêreld interval omtrent 8 uur voor die tyd uitgeroep.

In Suid-Afrika is verklarings van spesiale Wêreldintervalle gedurende die I.G.J. na die Suid-Afrikaanse Uitsaaikorporasie gestuur vir opname in die nuusdiens.

International Geophysical Year (I.G.Y.)

The International Geophysical Year which began on July the 1st, 1957, ended officially on the 31st December, 1958.

Some 30,000 scientists and technicians in 66 countries participated in this vast programme of worldwide observation and experiment.

The South African programme directed by the South African National Committee for the International Geophysical Year was supported by the Government at a cost of £275,000 in direct expenses, but the total South African effort, including the American equipment in the country, is estimated at about half a million pounds.

South Africa participated in all fourteen disciplines with the exception of Glaciology. Approximately eighty I.G.Y. stations were set up in South Africa, South West Africa, Marion Island, Tristan da Cunha and Gough Islands. The success of the undertaking in South Africa has been largely due to the support received from Government departments, the South African Railways, universities, observatories, private organizations and the C.S.I.R. laboratories.

By the end of 1958 all the operating stations were submitting data to the main World Data Centres in the U.S.A., Russia and various ancillary centres in Europe, United Kingdom, U.S.A., Canada, Germany and France.

World Days and Communications — World Days were periods of three or four days of each month, dependent on phases of the moon, assigned for special simultaneous observation of geophysical phenomena of the earth. They were usually adjusted to include solar eclipses and meteor showers.

The operation of the IGY warning system for alerting scientists to take special observations when special phenomena, such as solar flares were sighted, operated successfully on the world communications network. South Africa received alerts at the Jan Smuts weather station via Nairobi. In addition, during the IGY, alerts were intercepted from W.W.V.H. radio station at Honolulu.

When important geomagnetic disturbances were expected within 24 hours, the World Warning Agency called a special World Interval at about 8 hours' notice.

In South Africa declarations of special World Intervals during the IGY were sent to the South African Broadcasting Corporation for inclusion in their news services.

Meteorologie—Spesiale sinoptiese waarnemings in verband met die I.G.J. is op dertig uitgesoekte weerwagte, met inbegrip van Tristan da Cunha en Gough en Marioneiland, volgehou.

Die Suid-Afrikaanse Lugmag het spesiale weer-
verkenningsvlugte in Shackleton-vliegtuie na en van Marioneiland en ten suidweste van Kaapstad op Wêrelddae of gedurende Wêreldweerintervalle onderneem.

Met die oog op die koördinasie van 'n gedeelte van die geweldige hoeveelheid weerkundige gewens wat gedurende die I.G.J. ingewin is, het die CSAGI die Suid-Afrikaanse Weerburo verantwoordelik gestel vir die weerkaarte van die suidelike halfrond. Die noordelike halfrond is die verantwoordelikheid van die Verenigde State se Weerburo, terwyl die Wes-Duitse Weerburo ingestaan het vir die ewenaarstreek. Werk wat twee jaar sal kos, is in verband met hierdie projek in Suid-Afrika op tou gesit.

Die Unie se Weerburo het nie alleen sy weerkundige waarnemingsprogram behartig nie, maar ook deelgeneem aan die Gemenebes se Transarktiese Ekspedisie in die persoon van mnr. Hannes la Grange van die Weerburo wat twee winters in die Suidpoolstreek deurgebring het en die eerste Suid-Afrikaner is wat die Pool bereik het.

Geomagnetisme—Geomagnetiese waarnemings by die Magnetiese Observatorium op Hermanus is baie sterk vermeerder gedurende die I.G.J. Die Observatorium het sy normale verpligtings in verband met die I.G.J. nagekom en daarby 'n assistent gestuur om 'n spesiale vaart mee te maak op die S.A.S. Natal na Tristan da Cunha en Gough-eiland, waar magnetiese waarnemings gedoen is met medewerking van amptenare van die Suid-Afrikaanse Vloot se Afdeling Hidrografiese Opname. Die doel van hierdie besoek was om 'n pos vir sekulêre variasie op elke eiland op te rig. Verdere waarnemings sal al om die vyf jaar gedoen word om die veranderinge in sekulêre variasie wat vir die seevaart van belang is, te bepaal.

Poellig en luggloed.—Die Direkteur van die Magnetiese Observatorium op Hermanus het hierdie program gekoördineer. Waarskuwings is uitgereik aan amateurwaarnemers en in tye van intense sonaktiwiteit deur die S.A.U.K. uitgesend.

'n Treffende gebeurtenis in dié verband was die bekanning van 'n poellig in die nag van 29 op 30 September 1957 deur 'n ervare waarnemer naby Colesberg in Kaapland. Dis die noordelike punt waarop 'n poellig ooit in Suid-Afrika beken is.

Ionosfeer—Hierdie dissipline was veral gemoeid met die studie van die geïoniseerde lae in die boonste atmosfeer.

Die poste vir ionosferiese registrasie in Suid-Afrika en in Salisbury, waar 'n Suid-Afrikaanse instrument met medewerking van die Rhodesiese Nasionale I.G.J.-komitee bedien is, het roetinegewens geregistreer.

Meteorology—Special IGY synoptic observations at thirty selected meteorological stations including Tristan da Cunha, Gough and Marion Islands, continued on a routine basis.

The South African Air Force made special weather reconnaissance flights in Shackleton aircraft to and from Marion Island and South-west of Cape Town on World Days or during World Meteorological Intervals.

To co-ordinate part of the vast amount of meteorological data obtained during the IGY, the South African Weather Bureau was made responsible by the CSAGI for the southern hemisphere weather maps. The northern hemisphere is the responsibility of the U.S. Weather Bureau and the equatorial region that of the West German Weather Bureau. Work which will take two years to complete has begun on this project in South Africa.

In addition to its meteorological observing programme the Union Weather Bureau participated in the Commonwealth Trans-Antarctic Expedition through Mr. Hannes le Grange, of the Weather Bureau, who spent two winters in the Antarctic and was the first South African to reach the Pole.

Geomagnetism—Geomagnetic observations at the Magnetic Observatory at Hermanus were very much increased during the IGY. In addition to their normal IGY commitments an assistant on their staff made a special trip on the S.A.S. "Natal" to Tristan da Cunha and Gough Islands where magnetic observations were carried out with the assistance of Hydrographic Survey officials of the South African Navy. The object of this visit was to establish a secular variation station on each island. Further observations will be carried out at five year intervals to determine changes in secular variation which are important for navigation purposes.

Aurora and Airglow—The Director of the Magnetic Observatory at Hermanus co-ordinated this programme. Alerts were issued to amateur observers and broadcast by the S.A.B.C. during intense solar activity.

A remarkable event in this field was the sighting of an aurora during September 29/30, 1957, by an experienced observer near Colesberg in the Cape Province. This is the farthest North that an aurora has ever been sighted in South Africa.

Ionosphere—This discipline was primarily concerned with the study of the ionized layers of the upper atmosphere.

The ionospheric recording stations in South Africa and at Salisbury, where a South African instrument was operated in co-operation with the Rhodesian I.G.Y. National Committee, recorded data on a routine basis.

Op versoek van die CSAGI is 'n ionosferiese pos op Marioeneiland ingerig. 'n Lid van die Nasionale Instituut vir Telekommunikasienavorsing is daarheen gestuur om die uitrusting te installeer. Weens gebrek aan deskundige personeel op die eiland om die uitrusting in stand te hou, moes die projek opgegee word.

Die ruisregistreerder wat gedurende die I.G.J. by Derdepoort, naby Pretoria ingerig is, word nou op lang termyn gebruik.

Die Departement Fisika van die Universiteit van Natal het sy 'fluitsteurings' met sukses voortgesit. Hierdie projek is teen die einde van die I.G.J. aanmerklik uitgebrei na aanleiding van die nuttige resultate wat dit afgewerp het. Planne word oorweeg om 'n pos op Marioneiland te stig om met Kopenhagen in te skakel.

Die Wes-Duitse I.G.J.-komitee het onder beskerming van die Max-Planck-Instituut vir Aëronomie 'n ionosferiese pos op Tsumeb gevestig en met sukses bedien. Die W.N.N.R. het 'n mate van administratiewe hulp hierby verleen.

Sonaktiwiteit—Die Lyot-spektroheliograaf by die Koninklike Observatorium, Kaapstad, was in diens van begin 1958 af. Elke dertig sekondes is outomaties 'n foto van die son geneem (as dit sigbaar was). Die doel van hierdie projek was om die voorkoms en die ontwikkeling van sonvlamme te bestudeer.

Hierdie pos is deur die Royal Society ingerig en werk saam met die Koninklike Observatorium van Edinburg.

Die sonruisregistreerder met baie hoë frekwensie by die Rhodesuniversiteit op Grahamstad was gedurende die laaste gedeelte van die I.G.K. in werking en het 'n belangrike skakel uitgemaak in die ionosferiese en geomagnetiese program.

Kosmiese strale—Hoewel kosmiese strale uit die buiteruimte kom en nie in die eerste plek 'n saak vir die geofisika is nie, bring die wisselwerking daarvan met die magnetiese veld van die aarde en die atmosfeer soveel verandering in hulle eienskappe te weeg dat die bestudering van hierdie strale 'n baie belangrike dissipline vir die I.G.J. uitmaak.

Die Universiteit van Stellenbosch se mesoteleskoop en die Universiteit van Potchefstroom se neutrone-monitor wat deur hierdie universiteite vir die I.G.J. gebou is, is in die Magnetiese Observatorium by Hermanus ingerig en bedien.

Die Universiteit van Kaapstad se mesoteleskoop het baie gepla weens fotoëlektriese effekte van die Geigerbuise. Die moeilikheid is egter te bowe gekom.

Oseanografie.—Die Departement Elektrotegniese Ingenieurswese van die Universiteit van Kaapstad het vir 'n gedeelte van die I.G.J. 'n installasie vir die meet van watersnelheid en deining naby Witsandbaai aan die gang gehou. Ongelukkig het die ondersese kabel van die instrument gepla deurdat die kus so rotsagtig is.

At the request of CSAGI an ionospheric station was set up on Marion Island. A member of the National Institute for Telecommunications Research was sent to Marion Island to install the equipment. Due to the lack of suitably qualified staff on the island to maintain the equipment, the project had to be abandoned.

The Noise Recorder which was set up during the I.G.Y. at Derdepoort near Pretoria, has now become a long-term project.

The Department of Physics of the University of Natal successfully continued its 'whistling atmospherics' programme. This project was considerably expanded towards the end of the I.G.Y. in view of the useful results obtained. Plans are under way to establish a station on Marion Island to 'line-up' with Copenhagen.

The West German I.G.Y. Committee, under the auspices of the Max-Planck Institute for Aeronomy, established and successfully operated an ionospheric station at Tsumeb. The C.S.I.R. assisted with certain administrative services.

Solar Activity—The Lyot spectroheliograph at the Royal Observatory, Cape Town, was in operation from the beginning of 1958, automatically photographing the sun at 30 second intervals (when visible). The object of this project was to detect and study the development of solar flares.

This station was provided by the Royal Society and works in co-operation with the Royal Observatory, Edinburgh.

The Solar Noise V.H.F. Recorder at Rhodes University, Grahamstown, was in operation during the latter part of the I.G.Y. and was an important link in the ionospheric and geomagnetic programmes.

Cosmic Rays—Although cosmic rays come from outer space and are not primarily a geophysical problem, their interaction with the magnetic field of the earth and the atmosphere changes their characteristics so profoundly that the study of these rays constitutes a very important I.G.Y. discipline.

The Stellenbosch University meson telescope and the Potchefstroom University neutron monitor which were built by these universities for the I.G.Y. were housed and operated at the Magnetic Observatory, Hermanus.

The University of Cape Town's meson telescope gave considerable trouble due to photo-electric effects of the geiger tubes. This problem was, however, successfully overcome.

Oceanography—The Department of Electrical Engineering, University of Cape Town, had in operation for part of the I.G.Y. a water velocity and swell measuring unit near Witsandbaai. Unfortunately, the undersea cable which is part of the instrument gave considerable trouble due to the rocky nature of the coast.

Langgolf-registrering is deur middel van twee Van Doorn- (Tsunami-) registreerders by Witsandbaai en Port-Elizabeth onderneem. Na heelwat inspanning is die instrument by Port-Elizabeth prysgegee weens die ruheid van die kus.

Gereelde fisiese oseanografiese gegewens het gedurig van die Afdeling Visserye, die S.A. Vloot se hidrografiese kantoor en die W.N.N.R. se Eenheid vir Fisiese Oseanografie in Kaapstad by die Wêreld-gegewensentrums binnegekom.

Oseanografiese en biologiese gegewens is ingewin deur lede van die Departement Dierkunde van die Universiteit van Kaapstad op die S.A.S. Natal gedurende plaaslike en aflosvaarte na Gough- en Marion-eiland.

Gedurende die jaar het wetenskaplikes op oseanografiese en suidpoolvaartuie uit Rusland, Japan, die V.S.A., die V.K., Duitsland en Frankryk, wat by Kaapstad aangedoen het, besoek gebring aan party van ons I.G.J.-poste. Hulle het ook die Magnetiese Observatorium op Hermanus besoek om hulle magnetiese instrumente te kalibreer.

Op versoek van die Lamont Geological Observatory van Columbia University, New York, om 'n vaartuig te gee wat hulle oseanografiese navorsingsvaartuig, die Vema, sou vergesel by die uitvoer van 'n beplande reeks seismiese profiele langs die kus van die Unie van Suid-Afrika, het ons Regering die fregat Vrystaat beskikbaar gestel. Aan Suid-Afrikaanse wetenskaplikes is so die geleentheid gebied om saam te werk met die manne van die Lamont Geological Observatory.

Satellietwaarneming.—Die Satellietbestuur het vir die laaste keer op 30 Oktober 1958 byeengekom en besluit dat die W.N.N.R. 'n komitee vir ruimte-navorsing moet benoem.

Die Suid-Afrikaanse Prime Minitrack-stasie vir radiovolging op Esselenpark het in April 1958 in werking gekom. Die personeel van hierdie stasie bestaan geheel en al uit lede van die W.N.N.R. se Nasionale Instituut vir Telekommunikasienavorsing. Die uitrusting is aan ons Regering geleen deur die Vlootnavorsingslaboratoriums van die V.S.A.

Die stasie het volgingsgegewens verstrek oor heelwat meer as 1000 oorgange van die ses Amerikaanse satelliete wat gelanseer is.

Die stasie is strategies goed geleë, waardeur dit 'n belangrike monitorpunt na lansering is. Twee satelliete van die V.S.A. is 40 minute na lansering bespeur, terwyl daar by 'n derde geleentheid seine ontvang is van 'n satelliet wat nie sy loopbaan om die aarde voltooi het nie. Die stasie se gegewens was dus nuttig om die lot van die satelliet te bepaal.

Die Optiese Presisievolgstasie wat vir die Smithsonian Astrophysical Laboratory, Cambridge, Mass., by Olifantsfontein opgerig is, het die eerste foto's geneem wat daar nog ooit gemaak is van die V.S.A. se satelliet Explorer I.

Long wave recording was undertaken by means of two Van Doorn (Tsunami) recorders, at Witsandbaai and at Port Elizabeth. After considerable effort the latter instrument had to be abandoned due to the rugged nature of the coast.

Routine physical oceanographic data continued to flow from the Division of Fisheries, the S.A. Naval Hydrographic office and the C.S.I.R.'s Physical Oceanography Unit at Cape Town to the World Data Centres.

Oceanographic and biological data was obtained by members of the Zoology Department of the University of Cape Town on the S.A.S. 'Natal' during local and relief trips to Gough and Marion Islands.

During the year scientists on Oceanographic and Antarctic vessels from Russia, Japan, U.S.A., U.K., Germany and France calling at Cape Town, visited some of our I.G.Y. stations and made visits to the Magnetic Observatory at Hermanus to calibrate their magnetic instruments.

As a result of a request from the Lamont Geological Observatory of Columbia University, New York, for a vessel to accompany their oceanographic research vessel 'Vema' in carrying out a planned set of seismic profiles off the coast of the Union of South Africa, the South African government made available the frigate 'Vrystaat'. South African scientists were thus afforded an opportunity of working together with scientists from the Lamont Geological Observatory.

Satellite Observations.—The Satellite Management Committee met for the last time on the 30th October 1958 and resolved that the C.S.I.R. should appoint a committee to deal with space research.

The South African Prime Minitrack radio tracking station at Esselen Park became operational in April 1958. This station is staffed and operated entirely by personnel of the National Institute for Telecommunications Research of the C.S.I.R. The equipment is on loan to the South African Government from the United States Naval Research Laboratories.

The station has provided tracking data on well over 1,000 transits by the six American satellites which have been launched.

Geographically the station is strategically placed and this makes it an important monitoring point after launching. Two U.S. satellites were detected 40 minutes after launching while on a third occasion signals were received from a satellite that failed to make a complete orbit of the earth and thus the station results were instrumental in determining the fate of this satellite.

The Precision Optical Tracking station which was set up for the Smithsonian Astrophysical Laboratory, Cambridge, Mass., at Olifantsfontein, was brought into operation and succeeded in obtaining the first photographs ever taken of the U.S. test satellite Explorer I.

Hierdie stasie het die tegniese en administratiewe stasie van die Bernard Price Institute, die Poskantoor en die Departement Landmeetkunde van die Universiteit van die Witwatersrand geniet. Aanvanklik het die Unie-astronom, dr. W. S. Finsen, groot hulp verleen met noukeurige voorspellings totdat die Amerikaanse voorspellingdiens op dreef gekom het.

Gedurende die jaar het die Verenigde State se Vlootnavorsingslaboratoriums sterk apogeunteleskope aan die Suid-Afrikaanse maanwagspanne by Kaapstad, Bloemfontein, Johannesburg en Pretoria uitgedeel. Hierdie teleskope is by al die stasies ingerig ter aanvulling van die maanwagteleskope wat van spesiaal ingevoerde optiese onderdele gebou is. Die vier Suid-Afrikaanse spanne is onder die eerste twaalf spanne in die wêreld geplaas. Johannesburg was eerste en Kaapstad tweede. Dit is geen geringe prestasie nie as 'n mens in aanmerking neem dat daar ruim oor die 200 geregistreerde maanwagspanne in die wêreld is. Mnr. R. F. Smith van die Pretoriase Maanwagspan was die eerste in die wêreld om die satelliet 1958 Epsilon waar te neem.

Seismologie—Die Suid-Afrikaanse seismologiese net het vier poste, voorsien van vertikale seismometers met sterk vergroting, en drie met langduur-seismografe. Hierdie instrumente is vier maal per dag gedurende die I.G.J. en gedurende mikro-seismiese storms afgelees. Die hoop bestaan dat die ingesamelde gegewens 'n leidraad sal wees tot die gebruik van mikro-seismiese aantekeninge om gegewens van weerkundige belang vir die suidelike oseaan te verstrek.

Swaartekrag—Die Afdeling Geologiese Opname van die Unie van Suid-Afrika het 'n program van gravimetrie se waarnemings in die buurgebiede van die Unie onderneem, d.w.s. in die Protektoraat Betjoeanaland en in Basoetoeland, Swaziland en Suidwes-Afrika. Die uitkomst van hierdie opname is vasgelê in 'n anomaliekaart van Bouger, met hoogtelyne op intervale van 10 milligal, opgedruk op die nuwe Geologiese Kaart van die Unie van Suid-Afrika.

Kernstraling—As deel van die wêreldwye studie onder leiding van die Verenigde Volke se Wetenskaplike Komitee vir die Uitwerking van Atoomstraling is 'n program vir die meet van natuurlike en kunsmatige radioaktiwiteit van die atmosfeer deur die Nasionale Fisiese Navorsingslaboratorium van die W.N.N.R. op tou gesit. Uiteens nuttige resultate is verkry. Hierdie resultate bevestig dat reënval, breedtegraad en moontlik ook hoogte 'n belangrike rol speel in die verspreiding van radioaktiewe neerslag.

Internasionale Geofisiese Samewerking 1959

Die Vyfde Reünie van CSAGI het besluit dat die werk in verband met die I.G.J. nog 'n jaar lank op soveel gebiede as moontlik voortgesit moet word. Hierdie

This station had the technical and administrative help of the Bernard Price Institute, the Post Office and the Department of Surveying of the University of the Witwatersrand. In the early days the Union Astronomer, Dr. W. S. Finsen, assisted greatly with accurate predictions until the American prediction service was fully organized.

During the year the United States Naval Research Laboratories distributed powerful apogee telescopes to the South African moonwatch teams, at Cape Town, Bloemfontein, Johannesburg and Pretoria. These were installed at all the stations in addition to "moonwatch" telescopes built with specially imported optical components. The four South African teams were placed within the first twelve most successful teams in the world: the Johannesburg and Cape Town team being rated first and second respectively. This is no mean achievement considering that there are well over 200 registered moonwatch teams in the world. Mr. R. F. Smith of the Pretoria Moonwatch team was first in the world to observe the satellite '1958 Epsilon'.

Seismologie—The South African seismological network has four stations equipped with high magnification vertical seismometers and three with long period seismographs. These instruments were read four times a day during the I.G.Y. and during microseismic storms. It is hoped that the data collected will be a guide to the possibility of using microseism recordings to supply information of meteorological significance for the southern ocean.

Gravity—The Geological Survey of the Union of South Africa undertook a programme of gravimeter observations in territories adjoining the Union, i.e. Bechuanaland Protectorate, Basutoland, Swaziland and South West Africa. The results of this survey have been presented in the publication of a Bouger anomaly map with contours at 10 milligal intervals overprinted on the new Geological Map of the Union of South Africa.

Nuclear Radiation—As a part of the worldwide study under the United Nations Scientific Committee on the Effects of Atomic Radiation, the National Physical Research Laboratory of the C.S.I.R. initiated a programme for measuring natural and artificial radioactivity of the atmosphere. Some extremely useful results have been obtained. These results confirm that rainfall, latitude, and possibly altitude play an important part in the distribution of radioactive 'fallout'.

International Geophysical Co-operation 1959

The Fifth Reunion of CSAGI resolved that I.G.Y. work should be continued for a further year in as many fields as possible. This resolution was accepted by the

besluit is bekragtig deur die Internasionale Raad van Wetenskaplike Verenigings op die vergadering van September 1958 te Washington, bygewoon deur die Suid-Afrikaanse Wetenskaplike Skakelbeampte in Washington.

Op aanbeveling van die reëlingskomitee van die Suid-Afrikaanse Nasionale Komitee vir die I.G.J. word die groot projekte van die Suid-Afrikaanse program wat gedurende die I.G.J. op tou gesit is, nog 'n jaar voortgesit onder beskerming van International Geophysical Co-operation (1959).

Voortsetting van Projekte

Voortspruitende uit die I.G.J. het die Internasionale Raad van Wetenskaplike Verenigings vier organisasies gestig om sekere rigtings van geofisiese navorsing vir onbepaalde tyd voort te sit.

Spesiale Komitee vir Oseanografiese Navorsing (SCOR)—Hierdie liggaam is in die lewe geroep om oseanografiese navorsing op internasionale peil te koördineer, in die besonder om 'n grootskeepse opname van die Indiese Oseaan in 1961-62 te organiseer. Tot nog toe het SCOR net wetenskaplike lede, nog nie nasionale lidmaatskap nie.

Spesiale Komitee vir Suidpoolnavorsing (SCAR)—Suid-Afrika is een van die twaalf ledenasies van hierdie komitee. Die doel is om navorsing in die Suidpoolstreek te intensiveer na die I.G.J. 'n Nasionale Komitee onder voorsitterskap van die Direkteur van die Weerburo is gestig. Twee Suid-Afrikaanse afgevaardigdes (prof. Hales, Direkteur van die Bernard Price Institute en 'n lid van die Weerburo, mnr. Taljaard) het die vergadering van SCAR in Canberra in Maart 1959 bygewoon, terwyl twee Suid-Afrikaanse weerkundiges in November 1958 vir een jaar toegevoeg is aan die basis van die Royal Society by Halleybaai.

Komitee vir Ruimtenavorsing (COSPAR)—Hierdie liggaam is ingestel om ruimtenavorsing te koördineer. Suid-Afrika is vir drie jaar as lid daarvan gekies. Die Direkteur van die Nasionale Instituut vir Telekommunikasienavorsing het in Maart 1959 'n vergadering van COSPAR in 's-Gravenhage bygewoon.

Internasionale Wêrelddagdiens—'n Permanente Internasionale Wêrelddagdiens (I.W.D.S.) is deur ICSU ingestel om die I.G.J. se werk verbonde aan die projekte vir wêrelddae en -kommunikasies voort te sit.

SUID-AFRIKAANSE WETENSKAPLIKE SKAKELKANTORE IN DIE BUITELAND

Wetenskaplike Skakelkantoor, Londen

Veertig besoekers uit die W.N.N.R. het van die dienste van hierdie kantoor gebruik gemaak (teenoor 51 in 1957-58). Party van hulle het lank gebly. Twee

International Council of Scientific Unions at its meeting held in Washington in September 1958, which was attended by the South African Scientific Liaison Officer in Washington.

On the recommendation of the Steering Committee of the South African National Committee for the I.G.Y. major projects of the South African programme initiated during the I.G.Y. are being continued for a further year under the auspices of International Geophysical Co-operation (1959).

Continuing Projects

Arising out of the I.G.Y., the International Council of Scientific Unions established four organizations to continue certain aspects of geophysical research for an indefinite period.

Special Committee on Oceanographic Research (SCOR)—This body was set up to co-ordinate oceanographic research at the international level and, in particular, to organize a large scale survey of the Indian Ocean in 1961-62. As yet SCOR consists only of scientific members with no National membership.

Special Committee on Antarctic Research (SCAR)—South Africa is one of twelve member nations of this Committee. Its purpose is to continue research at an increased level in the Antarctic after the I.G.Y. A National Committee under the Chairmanship of the Director of the Weather Bureau has been set up. Two South African delegates (Prof. Hales, Director of the Bernard Price Institute and a member of the Weather Bureau, Mr. Taljaard) attended the SCAR meeting in Canberra in March 1959 and two South African meteorologists were attached to the Royal Society base at Halley Bay in November 1958 for a period of one year.

Committee on Space Research (COSPAR)—This body was set up to co-ordinate space research. South Africa was elected to serve on the committee for three years. The Director of the National Institute for Telecommunications Research attended a meeting of COSPAR at The Hague in March 1959.

International World Day Service—A permanent International World Day Service (IWDS) was set up by the ICSU to carry on the work of the I.G.Y. World Days and Communications Project.

SOUTH AFRICAN SCIENTIFIC LIAISON OFFICES OVERSEAS

Scientific Liaison Office, London

The facilities of the office were used by 40 visitors from the C.S.I.R., (compared with 51 for the year 1957-58) several of whom stayed for long periods;

en twintig ander besoekers uit die Unie is op verskillende maniere gehelp. Verder is uitvoerige reëlings getref vir 'n toer deur twee senior beamptes van die Brandstofnavorsingsinstituut.

Versoeke om inligting oor maniere om voëls te belet om in geboue nes te maak, die beter benutting van steen- en kleiprodukte, die korrosie van vliegtuie in opberging, die struktuur van die grafiet- en koolstofnywerheid en die aanskaffing van eksperimentele koolstookgasturbines is 'n paar van die 71 navrae wat die kantoor behandel het.

In antwoord op 'n reeks van ongeveer twaalf advertensies van vakante poste in die Raad se laboratoriums is 84 aansoeke ontvang. Boonop is 65 aansoeke of navrae in verband met tewerkstelling in wetenskaplike poste in die Unie behandel. Vyftien kandidate is ondervra en oor verslag gedoen op versoek van laboratoriumdirekteurs. Die oorvaart na die Unie is vir sewe nuwe aangesteltes met hul gesinne gereël.

Pogings is in die werk gestel om los fotokopieë van wetenskaplike verhandelings en artikels wat nie in die Unie beskikbaar is nie, spoediger te verkry. Inderdaad is 'n groot gedeelte van die versoeke binne veertien dae nagekom. 'n Beter fotokopieëdiens is in die Britse Gemenebes se Wetenskaplike Kantoor ingestel. Met die oog op die toenemende vraag na fotokopieë of vertalings van Russiese wetenskaplike artikels is spesiale aandag gegee aan die bevordering van voeling met organisasies in die V.K. wat begin het om dienste van onskatbare waarde op dié gebied te lewer. Gedurende die jaar is 207 versoeke om kopieë van artikels behandel. Verder is 'n aanmerklike stroom van ander berigte van aktuele wetenskaplike belang na die Unie volgehou. Die uitknipseldiens uit die *Times* en die *Financial Times* is voortgesit.

Die Hoof-wetenskaplike Skakelbeampte het voortgegaan om die Unie in 'n aantal wetenskaplike komitees van die Gemenebes, die Beheerraad van die Imperial College of Science and Technology en die reëlingskomitee van die Internasionale Demineralisasieprojek te verteenwoordig. In Parys het hy 'n vergadering van die Komitee vir Toegepaste Navorsing van die Europese Produktiwiteitsorgaan van die Organisasie vir Europese Ekonomiese Samewerking bygewoon. Op uitnodiging van die Verenigde Koninkryk se Tesourie het hy ook die prikkelende ondervinding gehad om 'n residensiële konferensie van senior wetenskaplikes oor Bestuur en Organisasie vir tien dae by te woon.

Weereens is die Raad dankbaar vir die hulp wat hierdie kantoor geniet het van Suid-Afrikahuis se personeel en wil hy sy erkentlikheid uitspreek teenoor die baie wetenskaplike en ander organisasies in die Verenigde Koninkryk en op die Vasteland van Europa vir hulle volgehoue bystand.

22 other visitors from the Union were assisted in various ways and in addition detailed arrangements were made for a tour by two senior officers from the Fuel Research Institute.

Requests for information on methods of preventing birds roosting in buildings, the better utilization of brick and clay products, the corrosion of aircraft in storage, the structure of the Graphite and Carbon Industry and the procurement of Experimental Coal Burning Gas-turbine equipment were some of the 71 enquiries dealt with by the office.

In response to some 12 series of advertisements for vacant posts in the Council's laboratories, 84 applications were received. In addition, 65 applications for or enquiries about scientific employment in the Union were dealt with. Fifteen candidates were interviewed and reported upon at the request of directors of laboratories. Passages to the Union were arranged for seven new appointees and their families.

Efforts were made to speed up the procurement of single photographic copies of scientific papers and articles not available in the Union. Indeed, a large proportion of the requests were completed within a fortnight of their receipt. Better photocopying facilities became available in the British Commonwealth Scientific Office and in order to deal with the growing demand for photocopies or translations of Russian scientific articles, special attention was given to promoting contact with agencies in the U.K. which have begun to provide invaluable facilities in this field. During the year, 207 requests for copies of articles were dealt with in addition to maintaining the considerable flow to the Union of other reports of current scientific interest. The press cutting service from the "Times" and the "Financial Times" was continued.

The Chief Scientific Liaison Officer continued to represent the Union on a number of Commonwealth scientific committees, the Governing Body of the Imperial College of Science and Technology and the Steering Committee of the International Demineralization Project. He attended in Paris a meeting of the Applied Research Committee of the European Productivity Agency of the Organisation for European Economic Co-operation and, at the invitation of the United Kingdom Treasury, had the stimulating experience of joining a ten-day residential conference for senior scientists on "Management and Organization".

Once again the Council is grateful for the assistance given to this office by the staff at South Africa House and indebted to the numerous scientific and other organizations in the United Kingdom and on the Continent of Europe for their continued assistance.

Wetenskaplike Skakelkantoor, Washington

Miskien die betekenisvolste kenmerk van die afgelope jaar is die aantal sake wat wetenskaplik sowel as politiek van aard was. Dikwels was selfs hoë politiek daarby betrokke, wat in die reël innige samewerking met die Ambassade meegebring het. Onder die behandelde sake was die aanname van beurse beheer deur die International Co-operation Administration van die U.S. State Department; 'n uitnodiging aan die regering van die Verenigde State om 'n deskundige op die gebied van waterdemineralisasie na Suid-Afrika te stuur; die verreikende ontwikkelings wat daar gedurende die jaar in die wetenskaplike beleid van die V.S.A. plaasgevind het, bv. die stigting van 'n federale raad vir wetenskap en tegnologie; vrae betreffende die voortsetting van die I.G.J.; verdere navorsing in die Suid-poolstreek en sake in verband daarmee; sake rakende die aanstelling van 'n wetenskaplike komitee vir Afrika besuide die Sahara deur die V.S.A.; die implikasies van die tellurometerkontraknavorsing in Suid-Afrika vir die V.S.A. se leër; die aanstelling van wetenskaplike attachés deur die V.S.A. in die buiteland; 'n aantal werksaamhede in verband met atoomkragbeveiliging; die uitbreiding van die Minitrack-ooreenkoms met die V.S.A. en die daarmee gepaard gaande voorgestelde stigting van 'n pos vir die volging van ruimtevaartuie.

Altesame een honderd en vyftig tegniese navrae en projekte is gedurende die jaar behandel. Party hiervan het wel nie veel tyd en moeite gekos nie, maar ander het heelwat werk meegebring, wat soms oor weke en maande gestrek het.

Hulp op die een of ander manier, soms selfs in die mate dat 'n volledige reisplan opgestel en alle reëlings in verband daarmee getref is, is aan sowat vyf en twintig besoekende wetenskaplikes van die W.N.N.R. en sy verskillende institute en navorsingseenhede, universiteite en ander organisasies soos die Afdeling Opvoeding vir Volwassenes, Yskor en die Nywerheidsontwikkelingskorporasie verleen. Daar moet ook melding gemaak word van die President se besoek in Augustus in verband met die vergadering in Kanada van die hoofde van die Gemenebes se navorsingsorganisasies. Hulp is ook verleen aan lede van die groep universiteitshoofde en professore wat middel 1958 deur Kanada en die Verenigde State getoer het.

Die Wetenskaplike Skakelbeampte het Suid-Afrika by die inwyding van die Shippingport-atoomkragreaktor verteenwoordig, op die vergaderings van die Internasionale Raad van Wetenskaplike Verenigings en by die halfeeufees van die American Institute of Chemical Engineers. Onder die bygewoonde konferensies is die internasionale konferensie oor wetenskaplike inligting, 'n konferensie van die National Science Foundation oor navorsing en ontwikkeling

Scientific Liaison Office, Washington

Perhaps the most significant feature of the past year was the number of matters handled which have been both scientific and political in character, often involving questions of high policy, and generally requiring close collaboration with the Embassy. Included in these are such matters as the acceptance of fellowships financed by the International Co-operation Administration of the U.S. State Department; an invitation to the U.S. Government to send an expert to study water demineralization developments in South Africa; the far-reaching developments which have taken place during the year in U.S. scientific policy such as the setting up of a Federal Council for Science and Technology; questions concerning the continuation of the I.G.Y.; future research in and other questions and matters involving the Antarctic; matters relating to the appointment of a U.S. scientific committee on Africa South of the Sahara; the implications of tellurometer contract research in South Africa for the U.S. Army; the appointment of U.S. science attachés abroad; a number of activities concerning atomic energy safeguards; the expansion of the Minitrack agreement with the U.S. and the proposed erection of a space-vehicle tracking station in association therewith.

A total of about one hundred and fifty technical enquiries and projects were dealt with during the year. While some of these involve no very serious expenditure of time and effort, in the case of others a great deal of activity is required, and this may cover a period of several weeks or months.

Assistance of one kind or another up to the preparation of a detailed itinerary and all associated arrangements, was given to some twenty-five visiting scientists from the C.S.I.R. and its various institutes and research units, universities, and such other organizations as the Department of Adult Education, Iscor, and the Industrial Development Corporation. Mention must also be made of the visit of the President in August in connection with the meetings in Canada of the heads of Commonwealth research organizations. Assistance was also rendered to members of the group of university principals and professors which toured Canada and the United States during mid-1958.

The Scientific Liaison Officer represented South Africa at the dedication of the Shippingport Atomic Power Reactor, at the meetings of the International Council of Scientific Unions, and at the 50th anniversary celebrations of the American Institute of Chemical Engineers. Conferences attended included the International Conference on Scientific Information, a National Science Foundation conference on research and development and its impact on the economy, a

en die uitwerking daarvan op die ekonomie, 'n konferensie oor haaiafskrikmiddels wat in New Orleans gehou is en 'n simposium wat deur die geniekorps van die V.S.A. se leër oor sonenergie gehou is by die opening van hulle sonoond naby Boston.

In Ottawa is die vergaderings, amptelike besoeke en ander werksaamhede wat in verband met die besoek van die Gemenebes se Wetenskaplike Komitee gereël is, saam met die President bygewoon. Twee verdere besoeke is gedurende die jaar aan Kanada gebring om die vergadering van die Gemenebes se Komitee vir Brandstofnavorsing in Montreal by te woon en as die Suid-Afrikaanse tegniese afgevaardigde na 'n vergadering oor atoomkragbeveiliging in Ottawa.

'n Aantal plaaslike besoeke is gebring aan navorsings- en ander organisasies in verband met navrae en projekte. Daarby is die vergaderings van die Highway Research Board bygewoon en twee referate namens die Nasionale Instituut vir Padnavorsing gelewer.

Die kantoor het voortgegaan met sy veelvuldige werksaamhede, o.a. die aanstuur van uitknipsels uit die *New York Times* en die *Washington Post*, die verkry van dokumente, fotostate, mikrofilms ens. in antwoord op versoeke van die Biblioteek en van elders (346 stukke aangestuur), die opstel en uitstuur van aanwinstelyste van beskikbare oordrukke aan V.S.A.-instansies, die aanstuur van persberigte en gereelde dokumentêre materiaal van allerlei aard aan verskeie instansies in Suid-Afrika, en so verder.

Wetenskaplike Skakelkantoor in Keulen

Hulp aan Suid-Afrikaanse wetenskaplikes op studieverlof in Europa is een van die vernaamste werksaamhede van die kantoor. Gedurende die jaar was baie wetenskaplikes uit ons tegniese en industriële inrigtings in aanraking met die kantoor, persoonlik of per brief. In mindere of meerdere mate is hulp verleen aan 25 lede van die W.N.N.R. se personeel in verband met die reëling van besoeke aan inrigtings en reis- en verblyfsake, aan 8 lede van staatsdepartemente of universiteite en aan 6 lede van nywerheidsondernemings. In party gevalle wou die besoekers net adresse of algemene inligting hê, maar oor die algemeen moes heelwat tyd en moeite bestee word aan die reisplan.

Herhaalde kere is gedurende die jaar probeer om geskikte kandidate se belangstelling op te wek vir wetenskaplike en tegniese poste in Suid-Afrika. Advertisies is in tien gevalle (een tot drie poste elk) in Nederland en Duitsland in tegniese en ander tydskrifte ten behoeve van die W.N.N.R. geplaas. By verskeie ander geleenthede is amptelike werkverskaffingskantore, universiteite of tegniese hoër skole geraadpleeg. 'n Aantal direkte versoeke is ook ontvang van persone wat uit hulle eie belang stel in 'n betrekking in Suid-Afrika. Onder hulle was daar ingenieurs, skeikundiges, geoloë, landboukundiges, laboratoriumassistentes, nywerheidstegnici, ekonome en ander.

conference on shark repellents held in New Orleans, and a symposium held by the U.S. Army Corps of Engineers on solar energy in connection with the opening of their solar furnace near Boston.

In Ottawa the meetings, official visits and other activities arranged in connection with the visit of the Commonwealth Scientific Committee were attended, together with the President. Two further visits to Canada were made during the year—to attend the meeting of the Commonwealth Committee on Fuel Research in Montreal, and as the South African technical delegate to a meeting on atomic energy safeguards in Ottawa.

A number of local visits were paid to research and other organizations in connection with enquiries and projects. In addition, the annual meetings of the Highway Research Board were attended, when two papers were delivered on behalf of the National Institute for Road Research.

The Office has continued its many and varied activities in such matters as forwarding newspaper cuttings from the *New York Times* and the *Washington Post*, obtaining documents, photostats, microfilms, etc. in response to requests from the Library and elsewhere (346 items forwarded), drawing up and distributing to U.S. agencies an accessions list of available reprints, forwarding news releases and routine documentary material of various kinds to various destinations in South Africa, and so on.

Scientific Liaison Office, Cologne

Assistance to South African scientists on study leave in Europe is one of the main activities of the office. During the year many scientists from our technical and industrial institutions were in touch with the office, either in person or by letter. Assistance was given, to a greater or lesser degree, to 25 staff members of C.S.I.R. in respect of arrangements for visits to institutions, travelling and hotel accommodation, to eight members of Government departments or universities and six members of industrial concerns. In some cases visitors only required addresses or general information, but on the whole it was necessary to devote considerable time and effort to an itinerary before it could be finalised.

Repeated efforts were made during the year to interest suitable candidates in scientific and technical posts in South Africa. In Holland and Germany advertisements were placed in technical journals or suitable papers in ten instances (one to three posts each) on behalf of the C.S.I.R. On several other occasions, official employment offices, universities or technical "Hochschulen" were consulted. A number of direct requests was also received from persons who on their own account were interested in employment in South Africa. These included engineers, chemists, geologists, agriculturalists, laboratory assistants, industrial technicians, economists and others.

In antwoord op advertensies is 222 aansoeke of versoeke om nadere inligting ontvang. Die indruk is gewek dat uitnemende manne selde of ooit reageer en dan blykbaar slegs met die doel om ons aanbod as hefboom ter verbetering van hulle huidige posisie te gebruik. Uit Nederland en Duitsland is omtrent 100 aansoeke ontvang, maar daar was ook 'n paar uit België, Switserland en ander lande. 'n Groot aantal onderhoude is gevoer. Verdienstelike navraers is sover moontlik met advies en inligting en aan skakels in Suid-Afrika gehelp. In 'n paar gevalle is betrekkinge gevind.

Dit was baie ontmoedigend om te vind dat kandidate wat vaste aanbiedings van betrekkinge uit Suid-Afrika ontvang het, uiteindelik hulle kandidatuur teruggetrek het na die uitgerekte onderhandelings.

In hoofsaak is wetenskaplike navrae gedoen deur inrigtings van die W.N.N.R., maar 'n paar is ook ontvang van staatsdepartemente (hoofsaaklik deur bemiddeling van die Ambassade) of van die Suid-Afrikaanse of die Duitse nywerheid. 'n Verskeidenheid onderwerpe is in 46 navrae gedek. Daaronder was navrae van die Nasionale Chemiese Navorsingslaboratorium omtrent die prys van kaolien en 'n versoek om monsters daarvan, van die Natalse Universiteit omtrent die gebruik van swaar kleiprodukte in die boubedryf, van die Nasionale Bounavorsingsinstituut omtrent laaghout en van die Inligtingsafdeling omtrent populêrwetenskaplike tegniese tydskrifte.

Versoeke om 41 artikels, of fotokopieë of oordrukke, is uit die Biblioteek van die W.N.N.R. ontvang. Hoewel die grootste meerderheid maklik verkrygbaar was, was party al baie oud en het ander in tydskrifte verskyn wat nie so maklik bekombaar is nie. Die *Photostelle* van die Universiteitsbiblioteek in Keulen doen baie moeite om aangevraagde artikels in die hande te kry.

BEDRYFSEKONOMIE

Inleiding

Die hoofsaak van die Afdeling Bedryfseconomie is om ondersoek van die tipe operasienavorsing in verband met die ekonomiese aspekte van sekere navorsingsprobleme van toegepaste industriële aard te onderneem met die oog daarop om wetenskaplike navorsing in die voordeligste rigtings te help lei.

Die vraag na die dienste van hierdie Afdeling het aanmerklik toegeneem. Studies is onderneem ten behoeve van W.N.N.R.-navorsingsinstitute waarin onderafdelings van die Afdeling reeds werksaam is, asook ten behoeve van ander W.N.N.R.-institute, die nywerheid en ander buiteorganisasies. Die belangrikste van hierdie studies het betrekking op ondersoek na

In reply to advertisements, 222 applications or requests for more details were received. The impression was created that outstanding men only rarely offered their services and then sometimes apparently only with the object of using our offer as a lever for improvement of their position here. From Holland and Germany about 100 applications were received, but there were also a few from Belgium, Switzerland and other countries. A large number of interviews were granted. Deserving enquirers were helped as far as possible with advice, information or contacts in South Africa. In a few cases posts were found.

It was very disappointing to find in several cases that candidates who had obtained a firm offer of employment from South Africa withdrew their candidature after protracted negotiations.

In the main, scientific enquiries were submitted by institutions of the C.S.I.R., but a few were also obtained from Government departments (chiefly through the Embassy) or from South African and German industry. Many different subjects were dealt with in 46 enquiries. Among these were queries from the National Chemical Research Laboratory about kaolin prices and samples, from Natal University about the use of heavy clay products in building, from the National Building Research Institute about laminated timber, and from the Information Division about semi-popular technical journals.

Requests for 41 articles, either photocopies or reprints, were received from the C.S.I.R. Library. Although the large majority were readily obtainable, some requested articles had been published very long ago and in other cases they appeared in journals which were not easy to procure. The "Photostelle" of the University Library in Cologne takes great trouble in obtaining articles requested.

INDUSTRIAL ECONOMICS

Introduction

The primary function of the Industrial Economics Division is to undertake 'operations research' type investigations into the economic aspects of certain research problems of an applied industrial nature with a view to assisting in directing scientific research into the most fruitful channels.

The demand for the services of this Division has increased considerably and studies were undertaken on behalf of those C.S.I.R. Research Institutes in which the sections of the Division are already active as well as from other C.S.I.R. institutes, industry and other outside organizations. The more important of these studies involved investigations of the economic aspects

die ekonomiese aspekte van sekere probleme in die boubedryf, in stedelike Bantodorpe, op die gebied van die bou en die onderhoud van paaie, die houtnywerheid en in verband met die surplus aartappelproduksie.

Bouwerk

Die Onderafdeling by die Nasionale Bounavorsings-instituut was gedurende die jaar besig met twee groot projekte, naamlik 'n studie oor boukoste in die algemeen 'en, minder direk in verband met die boubedryf self, 'n ondersoek na die koste van stedelike Bantodorpe.

Die boukostestudie beoog die ondersoek van middele om boukoste in die Unie te verminder en om norme vas te stel vir die bepaling van die kostedoeltreffendheid van ontwerpe. Hierdie studies het veral gegaan om die doeltreffende beplanning en kosteberekening van bouwerk en ook om verskeie geleentheidsprobleme waarmee die Instituut se navorsingsafdelings te kampe het.

Die studies in verband met stedelike Bantodorpe word deur die Nasionale Behuisingskommissie ondersteun. Die doel is 'n ontleding van die bestuurskoste in verband met stedelike Bantodorpe en, indien moontlik, die vermindering van dié koste. Gedurende die afgelope jaar het hierdie studies hoofsaaklik gegaan om 'n metode vir koste- en huurbepaling, die ekonomiese aspekte van sekere gelewerde dienste in hierdie dorpe en die ekonomiese sy van aanleg en digtheid.

Nadere besonderhede oor hierdie studies word verstrekk in die verslag oor die werkzaamhede van die Nasionale Bounavorsingsinstituut.

Bou en Onderhoud van Paaie

Die doel van die studies van die onderafdeling by die Nasionale Padnavorsingsinstituut is om padbouowerhede te help aan metodes vir die bepaling van die moontlike ekonomiese gevolge van die een of die ander beleidsbeslissing op alle peile en om te help met die rigting en voorrangsbepaling van tegniese navorsing deur die moontlike ekonomiese gevolge van navorsing in alternatiewe rigtings te bestudeer.

Die hele gebied van padbou in breë sin is met die oog op ekonomiese studies in drie aparte, chronologiese fases beskou, nl. die fase voor ontwerp, die ontwerpfasie en die boufasie. Die aanvangstudie is beperk tot die boufasie, veral met die betrekking tot die koste van masjinerie en uitrusting, wat 'n belangrike onderdeel van die totale boukoste is. Die volgende studies is onderneem: die ontwikkeling van metodes vir die bepaling van die kapasiteit en die benutting van masjinerie (voltooi); die ontwikkeling van 'n statiese monsternemingsmetode vir die reëling van materiaalverdigting (aan die gang); en 'n sistematiese studie van norme vir die vervanging van masjinerie (aan die gang).

of certain problems in the building industry, in urban Bantu townships, in the field of road construction and maintenance, the timber industry and in connection with surplus potato production.

Building

The Section in the National Building Research Institute was engaged on two main projects during the last year, i.e. a study of building costs generally and, less directly related to the building industry as such, an investigation into the costs of urban Bantu townships.

The building cost studies have as their object the investigation of ways and means of reducing building costs in the Union and the establishment of criteria for assessing the cost efficiency of designs. These studies were mainly concerned with the development of a scheme for the effective planning and costing of building operations and also with various *ad hoc* problems on behalf of the Institute's research divisions.

The studies undertaken in connection with the urban Bantu townships project, which is being sponsored by the National Housing Commission, have as their object the analysis of the costs of running urban Bantu townships and, if possible, the reduction of these costs. During the past year these studies were mainly concerned with the development of a method for cost and rent determination, a study of the economic aspects of certain services rendered in these townships and a study of the economics of layout and densities.

Further details of these studies are given in the report on the activities of the National Building Research Institute.

Road Construction and Maintenance

The object of studies by the section in the National Institute for Road Research is to provide road authorities with methods for evaluating the probable economic consequences of alternative policy decisions at all levels and to assist in the direction and priority determination of technical research by studying the probable economic consequences of research alternatives.

The entire field of road construction (in the broad sense) has been considered for the purpose of economic studies in three separate and chronological phases, i.e., pre-design, design and construction. The initial studies have been confined to the construction phase with particular reference to the costs of plant and equipment which are an important component of total construction costs. The following studies were commenced and completed: the development of methods for the determination of plant capacity and utilization (completed); the development of a statistical sampling method for compaction control (in progress); and a systematic study of plant replacement criteria (in progress).

'n Vollediger beskrywing van die doel en werk van die onderafdeling word in die verslag oor die Nasionale Instituut vir Padnavorsing gegee.

Houtnywerheid

Die onderafdeling by die Navorsingsinstituut vir Meganiese Ingenieurswese het hom veral besig gehou met studies ten behoeve van die S.A. Lumber Millers' and Shook Manufacturers' Association. Hierdie studie is die uitvloeisel van 'n Navorsingsbeurs vir Houtverpakking wat die Association by die Instituut ingestel het. Gedurende die afgelope jaar was die Onderafdeling besig met 'n opname van die afsetgeleentheid vir hout en houtprodukte in die Unie. Hiermee sal teen die einde van die jaar klaargemaak word.

Ondersoek ten behoeve van die Aartappelraad

Die Sentrale Onderafdeling van die Afdeling het onlangs begin met 'n voorlopige ekonomiese ondersoek ten behoeve van die Aartappelraad. Die doel van die ondersoek is om die belowendste rigtings vir toekomstige wetenskaplike navorsing na die benutting en bewaring van surplus aartappels vas te stel.

Algemeen

Behalwe die bogenoemde hoofprojekte is 'n paar geleentheidstudies ook deur die Afdeling onderneem. Dit het hoofsaaklik gegaan om die inwendige organisasie van die W.N.N.R.

'n Literatuurindeks is gedurende die jaar opgestel. Dit dek die gebiede sosiale ekonomie, industriële ekonomie, operasienavorsing en toegepaste statistiek.

PATENTE

Die werksaamhede van die Afdeling Patente is met soveel welslae bekroon dat die Raad besluit het om 'n Patentontwikkelingskorporasie te stig om die verantwoordelikheid vir die ontwikkeling van die Raad se uitvindsels oor te neem. Hierdie ontwikkeling is reeds in die vooruitsig gestel toe die Afdeling Patente geskei is van die Departement Inligting en Spesiale Dienste en deur die invoering van die nuwe naam Afdeling vir die Ontwikkeling van Uitvindsels, wat eintlik 'n noukeuriger beskrywing van sy funksies en verantwoordelikhede is.

Daar kan gesê word dat dit gedeeltelike regverdiging vir die uitgawe van openbare geld aan 'n staatsnavorsingsorganisasie is as die voordele van die navorsing vir die hele volk beskikbaar gestel word. Erkenning van die bydrae tot die mens se kennis deur die afsonderlike wetenskaplike en deur die Raad word by wyse van publikasie nagestreef. 'n Patentebeleid skakel nie publikasie uit nie en sorg boonop vir groter erkenning by 'n wyer publiek. In die geval van sekere ontdekkings in verband met nuwe prosesse of toestelle

A more detailed description of the objects and work of the Section is given in the report on the activities of the National Institute for Road Research.

Timber Industry

The Section in the Mechanical Engineering Research Institute has been mainly concerned with studies undertaken on behalf of the S.A. Lumber Millers' and Shook Manufacturers' Association. These studies resulted from the establishment of a Wooden Packaging Research Fellowship by the Association in the Institute. During the past year the Section has been engaged on a survey of the market for timber and timber products in the Union. This will be completed towards the end of this year.

Investigations on behalf of the Potato Board

The Central Section of the Division recently commenced a preliminary economic investigation on behalf of the Potato Board. The object of this investigation is to establish the most promising directions for future scientific research into the utilization and preservation of surplus potatoes.

General

In addition to the abovedescribed main projects, a number of *ad hoc* studies were also undertaken by the Division. These were mainly concerned with the internal organization of the C.S.I.R.

A literature index was compiled during the past year, covering the fields of social economics, industrial economics, 'operations research' and applied statistics.

PATENTS

Development of the activities of the Patents Division has been so successful that the Council has recommended that a Patent Development Corporation should be formed to take over responsibility for the development of the Council's inventions. This development has been foreshadowed by the separation of the Patents Division from the Information and Special Services Department and by changing the name to the Inventions Development Division, which is considered to be a more accurate description of its functions and responsibilities.

It can be said that, in part, the justification for the expenditure of public funds in a state research organization is to be found in the expectation that the benefits of the research will be made available to the nation. Recognition of the contribution to human knowledge by the individual scientist and by the Council is sought by way of publication. A patent policy does not prohibit publication and furthermore ensures increased recognition amongst a wider public. In the case of certain discoveries relating to new processes or devices,

het die ondervinding geleer dat publikasie op sigself onvoldoende is om toepassing te verseker. Dit is begryplik as 'n mens in aanmerking neem hoe groot die geldelike risiko's verbonde aan die kommersialisasie van nuwe uitvindings is. Min besigheidsmense sal bereid wees om kapitaal in ondernemings van dié aard te belê sonder die versekering dat hulle 'n gedeeltelike monopolie van die uitvinding sal geniet as teenprestasie vir die risiko wat hulle loop. Hierdie waarborg kan deur middel van 'n patent gegee word. Hoewel 'n patent op sigself geen waarborg vir die kommersiële aanwending van 'n uitvinding is nie, skep dit tog die toestand wat die nywerheid sal aanmoedig om sekere resultate van die Raad se navorsing toe te pas. 'n Patent verseker ook dat die Raad die toepassing van sy uitvindings en die gehalte van die vervaardigde produk in die openbare belang kan kontroleer.

Die doel was nog altyd om die toepassing van die resultate van die W.N.N.R. se navorsing te beheer en indien moontlik geldelike vergoeding vir die aanvanklike belegging te verkry. Patente maak die basis van onderhandeling uit, maar hulle is niks meer as 'n middel tot 'n doel nie. Hulle is 'n nuttige maar geensins 'n onmisbare element nie in die ontwikkeling en toepassing van navorsingsresultate. Die belangstelling van die Afdeling strek dus verder as die registreer van patente. Dit behels ook: tegniese-ekonomiese waardebeoordeling van uitvindings; die koördinasie van verdere navorsing en ontwikkeling om die patent uit te bou en kommersiële aanwending te verseker; die voer van onderhandelings ten opsigte van lisensieooreenkomste; onderhoud en toesig in verband met patente, ooreenkomste, skendings, ens. Hierdie funksies word in noue oorleg met die laboratoriums uitgevoer.

Sedert die begin van die Raad se patentbeleid het die Afdeling sowat 45 uitvindings vir ontwikkeling en eksplorasie aangeneem. Hiervan is uitgesluit 'n aantal voorstelle wat al in die vroeë stadiums verwerp is, omdat hulle tegniese waardeloos of kommersieel nutteloos is. Op die oomblik is daar twee en dertig uitvindings in die boeke van die Afdeling, waarvan twee en twintig deur lisensieooreenkomste gedek is. Die Raad het vyf en sewentig patente geregistreer of patentaansoeke gedoen, met reg op nog twaalf wat deur die T.N.O. (Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek) ingedien is.

'n Beleid van uitvindingsontwikkeling is noodwendig 'n belegging op lang termyn. Die tydsverloop tussen die ontstaan van die oorspronklike idee en die kommersiële aanwending daarvan op vol skaal kan lank wees. Die National Research Development Corporation van die Verenigde Koninkryk skat dit op 5 tot 10 jaar. Op die oomblik het slegs twee uit die agt lisensieooreenkomste die winsgewende stadium bereik, maar

experience has shown that publication alone is insufficient to ensure the application of the work. This is understandable if one considers the financial risks associated with the commercialization of new inventions. Few businessmen would be prepared to invest capital in enterprises of this nature without the assurance that they would enjoy a partial monopoly on the invention in compensation for the risks taken. This safeguard can be provided by means of a patent. While a patent does not automatically guarantee the commercialization of an invention, it does create the conditions under which industry is encouraged to apply certain of the results of the Council's research. A patent also ensures that the Council is able to control the application of its inventions and the quality of manufacture in the public interest.

The objective has always been to secure the application of the results of C.S.I.R. research and if possible to secure a financial return on the initial investment. While patents provide a basis for negotiation, they are no more than a means to an end. They are a useful but not indispensable element in the development and application of research results. Thus the interests of the division extend beyond the filing of patents to include the following: techno-economic assessment of inventions; co-ordination of further research and development to strengthen the patent and ensure commercialization; negotiation of licence agreements; maintenance and supervision of patents, agreements, infringements, etc. These functions are carried out in close consultation with the laboratories.

Since the inception of the Council's patent policy, the division has accepted some 45 inventions for development and exploitation. This figure excludes a number of propositions submitted for consideration but rejected at the preliminary stages as being without technical merit or commercial significance. At present the division has thirty-two inventions "on its books" of which twenty-two are covered by licence agreements. The Council has seventy-five patents or patent applications filed, with rights on an additional twelve filed by T.N.O. (Nederlandse Centrale Organisatie voor toegepast natuurwetenschappelijk onderzoek).

A policy of invention development is essentially a long-term investment. The gap between conception of the original idea and full-scale commercialization can be extensive—the National Research Development Corporation in the United Kingdom estimates between 5 and ten years. At present only two of the eight existing licence agreements have reached the profitable

'n mens kan redelik verwag dat ten minste 'n gedeelte van die ander ook 'n opbrengs op die aanvangsbelegging sal lewer.

Daar is in die laaste jare baie geskrywe oor die noodsaaklikheid om uitvoermarkte te ontwikkel. In die geval van die gevestigde nywerhede wat 'n betreklik gestandaardiseerde produk vervaardig, kan 'n afset alleen verkry word deur randverskynsels soos prys, leweringsdatum, diens ens. Die sukses waarmee gevestigde produkte in konkurrensie verkoop kan word, sal op sy beste maar beperk wees. Hierdie beperkings geld nie in gelyke mate vir nuwe produkte nie, veral as hulle deur patente beskerm is. So kan die Raad se navorsingspotensiaal, as dit reg ingespan word, help om nuwe uitvoer nywerhede te ontwikkel. Die Tellurometer, wat aan 'n Suid-Afrikaanse firma bo een uit verskeie groot buitelandse ondernemings van gevestigde naam en sterk hulpbronne in lisensie gegee is, het as pragtige voorbeeld gedien, want ander projekte wat nou in die ontwikkeling stadium is, belowe ewe goed.

Die voortgesette toepassing van die Raad se patentbeleid kan ook uit onverwagte hoeke vrugte afwerp. Die opkoms van die Suid-Afrikaanse tegnologie en kundigheid kan heel goed omstandighede meebring wat gunstiger is vir 'n aandeel van ons land se kapitaal in nuwe ondernemings deur buitelandse belange.

OPENBARE BETREKKINGS

By geleentheid van die Raad se besoekdae, wat op 3, 4 en 5 September 1958 gehou is, was daar 5,362 besoekers aan die laboratoriums by Scientia en 3,000 aan die laboratoriums in die stad. Spesiale reëlings is getref om 1,600 skoolkinders in standerd 9 en 10 in georganiseerde groepe deur die laboratoriums te neem.

Besoekers—Die navorsingslaboratoriums is nie oop vir die algemene publiek nie, behalwe op besoekdae, maar daar is geleentheid vir besoekers, o.a. groepe skoolkinders, om die laboratoriums van die Buro vir Standaard te besigtig. Spesiale reëlings word getref vir vakkundige en tegniese groepe as hulle die navorsingslaboratoriums van die S.A.B.S. wil besoek. Onder laasgenoemdes was die afgevaardigdes na die Suid-Afrikaanse Veeartsenykongres, die Noord-Transvaalse Kamer van Mynwese, die Vereniging van Buitelandse Korrespondente, afgevaardigdes na die Internasionale Pneumokoniosekonferensie, die Bankiersinstituut en baie ander. 'n Klein funksie is gehou om die Zebra, die elektroniese rekenmasjien by die Nasionale Fisiese Navorsingslaboratorium, in te wy.

Uitstallings—Uitstallings van die S.A.B.S. is gehou op die Suid-Afrikaanse Handelstoonstelling, Bulawayo, en op die Randse Paastoonstelling, terwyl

stage but it is reasonable to assume that at least a portion of the remainder will also yield a return on the initial investment.

In recent years, much has been written about the need to develop export markets. In the case of traditional industries manufacturing a relatively standardized product, markets can be gained only on such marginal advantages as price, delivery date, service, etc. The success with which traditional products can be sold in competition will at best be limited. These limitations do not apply to the same extent with new products particularly if they are protected by patents. Thus the Council's research potential, if correctly harnessed, can assist in the development of new export industries. The Tellurometer which was licenced to a South African firm in preference to one of several large overseas concerns of established reputation and resources has proved an outstanding example and other projects which are now under development offer prospects of similar success.

The continued application of the Council's patent policy may also yield results in unexpected directions. For example, the growth of South African technology and "know-how" may well bring about circumstances more favourable to increased participation of local capital in new ventures launched by overseas interests.

PUBLIC RELATIONS

During the Council's annual open days which were held on the 3rd, 4th and 5th September, 1958, there were 5,362 visitors to the laboratories at Scientia and 3,000 to the laboratories in the City. Special arrangements were made for 1,600 school children in Standards 9 and 10 to be taken through the laboratories in organized groups.

Visitors—The research laboratories are not open to the general public except during the open days but facilities are provided for visitors, including groups of school children, at the laboratories of the Bureau of Standards. Special arrangements are made for professional and technical groups to visit the research laboratories or the S.A.B.S. These included delegates to the South African Medical Veterinary Congress, the Northern Transvaal Chamber of Industries, the Foreign Correspondent Association, delegates to the International Pneumoconiosis Conference, the Institute of Bankers and many others. Arrangements were made for a small function to mark the inauguration of Zebra, the electronic computer at the National Physical Research Laboratory.

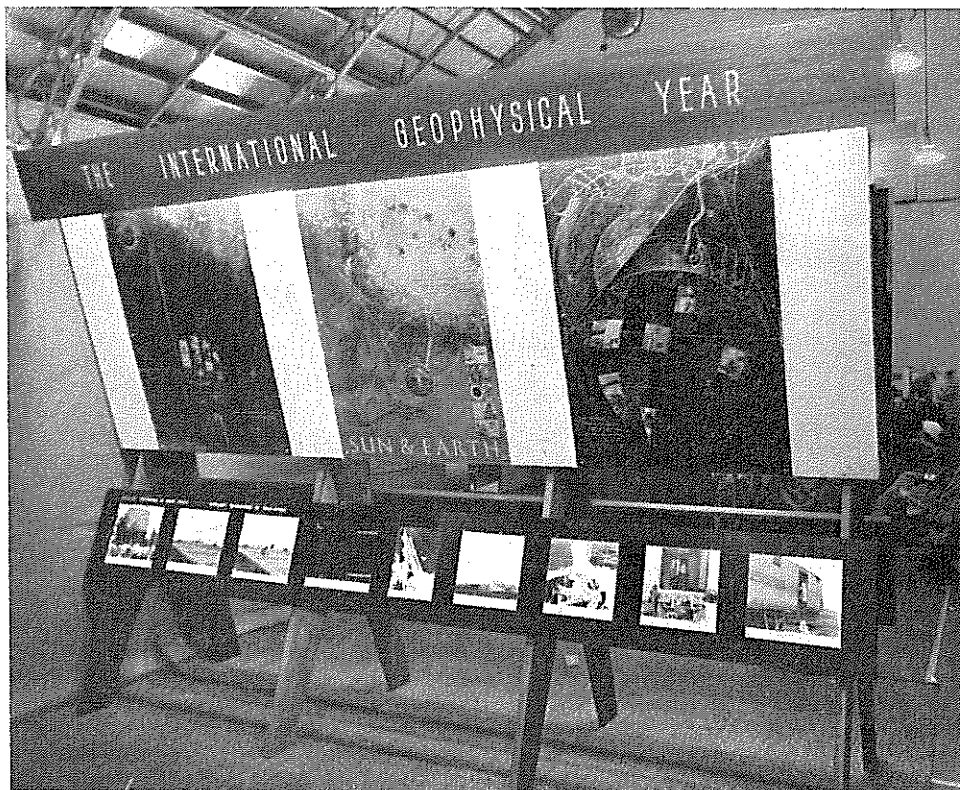
Exhibitions—Exhibits on the S.A.B.S. were staged at the South African Trade Exhibition, Bulawayo, and the Rand Easter Show, and general exhibits on the

algemene uitstallings van die W.N.N.R. by die Pretoriase Nywerheidstentoonstelling en die Wetenskaplike Tentoonstelling in Kaapstad gedoen is. Die Raad is bekroon met die Hollywood-wissel-trofee vir die beste ontwerp op die Pretoriase Tentoonstelling.

Inligting aan die Pers—53 persberigte is uitgereik oor gebeurtenisse wat as van openbare belang beskou

C.S.I.R. at the Pretoria Industrial Exhibition and the Science Exhibition in Cape Town. The Council was awarded the Hollywood Floating Trophy for the best designed stand at the Pretoria Show.

Information for the Press—Fifty-three “press releases” were issued on events considered to be of



Deel van die I.G.J.-uitstalling op die Wetenskaplike Tentoonstelling 1959

Part of the I.G.Y. Stand at the 1959 Science Exhibition in Cape Town

is. Verder is verteenwoordigers van die pers, die S.A.U.K., tydskrifte en blaaië altyd gehelp as hulle inligting uit die eerste hand van die Raad se personeel gevra het.

public interest. In addition, representatives of the Press, S.A.B.C., magazines and other journals were assisted whenever requested to obtain first-hand information from the Council's staff.

STREEKNAVORSINGSKOMITEES

Een van die maniere waarop hierdie Afdeling aktief kontak behou tussen die S.A. Wetenskaplike en Nywerheidsnavorsingsraad en verafgeleë streke van die Unie, is deur sy stelsel van Streeksnavorsingskomitees wat volgens ons mening 'n unieke ontwikkeling op hierdie gebied is. Hierdie Komitees wat tans Natal, die Middellande en Grens en die Westelike Kaapprovinsie onderskeidelik bedien, is saamgestel uit persone wat gekies is op grond van hulle nywerheids- en wetenskaplike ervaring en hul belangstelling in navorsing. Die Komitees wat vrywilliglik dien, is 'n wedersydse „brug” tussen die W.N.N.R. en hul streeksgebiede. Hulle lig plaaslike nyweraars, owerhede en wetenskaplike werkers in oorfasiliteite wat deur die W.N.N.R. beskikbaar gestel word en hulle verwittig die W.N.N.R. van sake wat hul aandag verg. Hulle doen ook waardevolle openbare skakelwerk waardeur hulle hul onderskeie gemeenskappe op die hoogte hou van wetenskaplike ontwikkelings in die Unie en in die buiteland, nie alleen deur die pers en ander publikasies nie maar ook deur te reël dat vooraanstaande wetenskaplikes van die W.N.N.R. wetenskaplike en tegniese organisasies in hul respektiewe gebiede toespreek.

In elke gebied tree die W.N.N.R.-vertegenwoordiger op as Sekretaris vir die Komitee.

W.N.N.R. SE GEREELDE PUBLIKASIES

Navorsingsoorsig—Kwartaalliks.

Jaarverslag.

W.N.N.R.-Inligting—maandelikse byvoegingslys.

Keur van Wetenskaplike Nuus—weekliks vir die tegniese en daaglikse pers.

Register van Huidige Navorsing in Suid-Afrikaanse Universiteite—Jaarliks.

REGIONAL RESEARCH COMMITTEES

One of the means used by this Division to maintain active contact between the S.A. Council for Scientific and Industrial Research and distant regions of the Union is its system of Regional Research Committees, believed to be a unique development in this field. These Committees, which at present serve Natal, the Midlands and Border and the Western Cape respectively, consist of men chosen on the basis of their industrial and scientific experience and their interest in research. The Committees, which serve voluntarily, act as a two-way bridge between the C.S.I.R. and their regional area. They acquaint local industrialists, authorities and scientific workers with facilities available through the C.S.I.R. and they bring to the notice of the C.S.I.R. matters requiring attention. They also carry out valuable public relations work, helping to keep their respective communities informed of scientific developments in the Union and abroad, not only through press and other publications, but also by arranging for leading C.S.I.R. scientists to address scientific and technical organizations in their respective areas.

In each area the regional C.S.I.R. representative acts as Secretary to the Committee.

C.S.I.R. PERIODICAL PUBLICATIONS

Research Review—Quarterly.

Annual Report

C.S.I.R. Information—monthly list of accessions.

Science News Selections—weekly for the technical and daily press.

Register of Current Research in South African Universities.—Annually

DEPARTEMENT TEGNIJSE DIENSTE

Departementele Hoof: J. VAN DER STAAY

Met die oog op groter doeltreffendheid is voortgegaan met die sentralisasie van beheer oor afdelings wat tegniese dienste lewer, wat tot gevolg gehad het dat die naam van die destydse Sentrale Werkplaas op 1.4.1958 verander is na Departement Tegniese Dienste.

DEPARTMENT OF TECHNICAL SERVICES

Head of Department: J. VAN DER STAAY

With a view to greater efficiency the centralization of the control of Divisions rendering technical services was continued, culminating in the changing of the designation of the Central Workshops into that of Department of Technical Services.

'n Afdeling vir Grafiese Kunste is ingestel om die tegniese en kuns-standaard van publikasies van die W.N.N.R. meer in ooreenstemming te bring met die algemene wetenskaplike standaard. 'n Voorlopige beraming dui daarop dat hierdie reëlings 'n besparing sal meebring.

Die glasblaaswerkplase van die Nasionale Chemiese Navorsingslaboratorium en die Nasionale Fisiese Navorsingslaboratorium is saamgevoeg en 'n sentrale glasblaaswerkplaas word in die nuwe gebou van die Nasionale Chemiese Navorsingslaboratorium opgerig. Voorsiening is ook gemaak vir die opleiding van 'n vakleerling in hierdie vak wat in Suid-Afrika nog betreklik onbekend is.

Die werwing van goed gekwalifiseerde instrument-makers in die buiteland was so suksesvol dat alle vakante poste in die instrumentmakery nou gevul is. Deurdat die aantal vakleerlinge vergroot is, sal vakatures wat in die toekomst mag ontstaan, gevul kan word deur vakmanne wat ter plaatse opgelei is.

Dienste in die vorm van tegniese advies, advies oor ontwerp en vervaardiging van instrumente is ook gelewer aan instansies buite die W.N.N.R., soos die Weerburo, Universiteit van Pretoria, Departement van Landbou, Departement van Vervoer, Universiteit van die Oranje-Vrystaat, Universiteit van Stellenbosch en die Departement van Bosbou.

Vir die Nasionale Fisiese Navorsingslaboratorium is 'n instrument gemaak vir die studie van die elektronebaan tussen twee of meer elektrodes; 'n meetinstrument vir lengtebepaling in terme van die golfte van lig; 'n yk-apparaat vir die kalibrasie van hoë- en laetemperatuur-termometers, en, vir kernfisiese navorsing 'n apparaat om die ionebundel in die siklotron van buite die siklotronsaal te kan beheer.

'n Modelmynskag vir die toets van mynhysbakke wat gebruik word vir die vervoer van mense en materiaal in mynsgate is vir die Nasionale Instituut vir Meganiese Ingenieurswese gemaak, asook 'n sleepkragbalans vir lugstroommetings; 'n vogtigheidsbeheerapparaat; 'n optiese instrument vir die bestudering van die rotsformasies in boorgate 50 voet diep en 'n spanningsmeter van vereenvoudigde ontwerp vir die bepaling van spanninge in rotsformasies.

Vir die Nasionale Bounavorsingsinstituut is 'n model van 'n draaiende klaskamer vir die bepaling van die ideale lig- en ventilasiekondisies vervaardig; asook 'n sentrifuge vir die bepaling van die voggehalte van keramieke materiaal by hoë temperatuur en vogtigheidskaste vir die toets van boumateriaal onder verskillende vogtigheidskondisies.

A division of Graphic Arts was instituted to bring the technical standard of C.S.I.R. publications into line with the general scientific level reached in these publications. A preliminary estimate showed that these arrangements might bring about a saving.

The glass-blowing shops of the National Chemical Research Laboratory and the National Physical Research Laboratory were amalgamated. A central glass-blowing workshop is being equipped in the new National Chemical Research Laboratory building. Provision was also made for the training of an apprentice in this trade which is still in its infancy in South Africa.

The recruiting of fully qualified instrument makers overseas was highly successful. All the vacancies were filled. As a result of the increase in the number of apprentices it will be possible to fill all future vacancies by locally trained artisans.

Services in the form of technical advice and advice on the design and manufacture of instruments were rendered to outside bodies such as the Weather Bureau, the University of Pretoria, the Department of Agriculture, the Department of Transport, the University of the Orange Free State, the University of Stellenbosch, and the Department of Forestry.

On behalf of the National Physical Research Laboratory an instrument was made for studying the trajectory of the electrons between two or more electrodes; a measuring instrument for length determination in terms of the wave-length of light; and apparatus for calibrating high and low temperature thermometers; and, for nuclear physics research, an apparatus to control the ion beam in the cyclotron from outside the cyclotron hall.

A model mine shaft for testing skips used for the transport of personnel and material in mine shafts was made for the National Mechanical Engineering Institute, in addition to a drag balance for measuring air currents; a humidity control apparatus; an optical instrument for studying rock formations in bore-holes 50 feet deep, and a tensometer of simplified design for determining stresses in rock formations.

For the National Building Research Institute a model revolving class room was constructed for determining ideal conditions of lighting and ventilation, in addition to a centrifuge for determining the moisture content of ceramic materials at high temperature, and humidity cabinets for the testing of building materials under varying conditions of humidity.

Vir die Nasionale Chemiese Navorsingslaboratorium is 'n ontsoutingsapparaat vir die elektrolitiese verwydering van sout uit brakwater gemaak en bierbekerwasmasjiene is ontwerp en vervaardig vir die gelyktydige skoonmaak aan die binne- en buitekant van bierbekers wat deur Munisipaliteitsbiersale gebruik word.

'n Mobiele laboratorium vir veldtoetse in Suidwes-Afrika is gebou vir die Suidwes-eenheid van die Nasionale Waternavorsingsinstituut. Vir die mikroskopiese ondersoek van rivier- en damwatermonsters is 'n instrument vervaardig wat die wetenskaplikes in staat stel om organismes en hulle verskillende spesies te klassifiseer en te tel.

Vir die Nasionale Instituut vir Personeelnavorsing is 'n driehoekvergelykingstoetsapparaat om 'n driehoek van verstelbare grootte met een van konstante grootte te vergelyk, en ook 'n ligflikkerapparaat vir breinreaksietoetse gemaak.

'n Padmonstertoetsapparaat vir die vasstel van die Young-modulus van bitumineuse padmonsters is gebou vir die Nasionale Padnavorsingsinstituut.

Spesiaal ontwerpte meubels ter waarde van ongeveer £9,000, asook 'n aansienlike hoeveelheid kleiner of minder belangrike apparaat, is vir die verskillende laboratoria vervaardig.

For the National Chemical Research Laboratory a desalting device for the electrolytic removal of salt from water was made, and beer mug washing machines were designed and manufactured for simultaneously cleaning the inside and outside of beer mugs used by municipal beer halls.

A mobile laboratory for field tests in South-West Africa was built for the South-West Unit of the National Water Research Institute. For the microscopic investigation of water samples from rivers and dams an instrument was manufactured which will enable scientists to classify and count organisms and their species.

For the National Personnel Research Institute a triangle comparatory test apparatus was made for comparing a triangle of adjustable size with one of constant size, in addition to a flashing device for testing brain reactions.

A road sample testing apparatus for determining Young's modulus of bituminous road samples was constructed for the National Road Research Institute.

Specially designed furniture at a cost of £9,000 and an appreciable quantity of minor equipment were manufactured for the different laboratories.

DIE SUID-AFRIKAANSE WETENSKAPLIKE EN NYWERHEIDNAVORSINGSRAAD
POSBUS 395, PRETORIA: VEERTIENDE JAARVERSLAG (1958-1959)

DEEL XIV
NYWERHEID-
NAVORSINGSINSTITUTE

PART XIV
INDUSTRIAL
RESEARCH INSTITUTES

THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
P.O. BOX 395, PRETORIA: FOURTEENTH ANNUAL REPORT (1958-1959)

NYWERHEIDNAVORSINGSINSTITUTE INDUSTRIAL RESEARCH INSTITUTES

Ten einde voorsiening te maak vir navorsing in verband met Suid-Afrika se sekondêre nywerhede, het die W.N.N.R. die verskillende groepe probeer aanspoor om heelwat verantwoordelikheid op hulle te neem deur institute te skep wat as nie-winsgewende maatskappye geïnkorporeer word en deur beheerrade bestuur word, waarin verteenwoordigers van die W.N.N.R. dien. Hierdie institute word gefinansier deur vyfjaarlikse waarborge van die nyweraarondertekenaars, waarvolgens die W.N.N.R. toekennings op die £-vir-£-stelsel betaal.

In 1946 het die W.N.N.R. die verantwoordelikheid vir die subsidiëring van die Navorsingsinstituut vir die Leernywerheid aanvaar en die volgende jaar het hy onderhandelings gevoer met die treilvisserij- en inmaakbelange vir die oprigting van die Navorsingsinstituut vir die Visnywerheid in Kaapstad. Later is die Navorsingsinstituut vir die Verfnywerheid en die Navorsingsinstituut vir die Suikervervaardigingsnywerheid in Durban ingestel. Die vyfde navorsingsinrigting van hierdie aard was die Suid-Afrikaanse Woltekstielnavorsingsinstituut in Grahamstad. In elke geval word hierdie institute deur die meeste van die firmas in die nywerheid wat bedien word, geldelik gesteun met 'n ooreenkomstige bydrae van die Raad. Hulle is outonome liggame wat elk afsonderlik onder die beheer is van 'n beheerraad, waarin die ledefirmas 'n meerderheidsverteenvoordiging het en vry is om hulle eie navorsingsprogramme te kies. Die Raad se subsidiëring van nywerheidsnavorsing het geleidelik gestyg na gelang van die verhoogde steun wat hulle van die nywerheid ontvang het.

By die oprigting van hierdie institute is die betrokke industrieë voorsien van uitstekende navorsingsgeriewe wat ongetwyfeld geweldig baie bygedra het tot die oorheersende plek wat hulle vandag in Suid-Afrika se ekonomie inneem. Miskien is dit nie sonder betekenis nie dat Suid-Afrika se grootste uitvoerders vier van die bedrywe wat die navorsingsinstitute steun, onder hulle gelede tel.

Die kort opsommings in die verslag wat hieronder volg, gaan oor die werksaamhede van hierdie Nywerheidsnavorsingsinstitute. Nadere besonderhede van hulle werk word gevind in die jaarverslae wat afsonderlik deur hierdie institute uitgegee word.

In order to provide for research in South African secondary industry, the C.S.I.R. has endeavoured to stimulate the various industrial groups to accept a considerable measure of responsibility in setting up institutes incorporated as non-profitmaking companies managed by Boards of Control on which the C.S.I.R. is represented. These institutes are financed by five-yearly guarantees from the industrial subscribers, on the basis of which C.S.I.R. pays £ for £ grants.

The C.S.I.R. became responsible for subsidizing the Leather Industries Research Institute in Grahamstown during 1946, and the following year concluded negotiations with trawling and canning interests for the establishment of the Fishing Industry Research Institute in Cape Town. Later the Paint Industry Research Institute and the Sugar Milling Industry Research Institute were established in Durban. The fifth research association of this kind was the S.A. Wool Textile Research Institute in Grahamstown. In each case these Institutes are supported financially by the majority of the firms in the industry served, with a corresponding contribution from the Council. They are autonomous bodies, each of which is governed by a board of control on which member firms have majority representation, and are free to select their own research programmes. The Council's subsidy to industrial research institutes has risen steadily in proportion to the increased support they have received from Industry.

With the formation of these institutes, the industries concerned were provided with first-class research facilities which, without doubt, have contributed much to their commanding position in South Africa's economy today. It is perhaps not without significance that among South Africa's major exporters are four of the industries which support research institutes.

The brief summaries included in the report that follows are of the activities of these Industrial Research Institutes. More detailed descriptions of their work can be found in the Annual Reports published separately by these Institutes.

NAVORSINGSINSTITUUT VIR DIE VISNYWERHEID

Direkteur: DR. G. M. DREOSTI

Geen skitterende ontwikkelings het die afgelope twaalf maande gekenmerk nie, maar die N.I.V.N. het nogtans 'n besige, produktiewe jaar beleef. Die werk is gedurig onder hoë druk voortgesit. Nywerheidsaangeleenthede het hoë eise aan die Instituut gestel en het weereens in verband met dringende wetenskaplike en tegniese probleme geweldige inspanning geverg. Tog is daar in groot mate gevorder met die beperking van navorsing tot minder probleme as in die verlede, waardeur dit moontlik was om individuele probleme intensiewer aan te pak en om dieper in te gaan op die talle aspekte van hierdie besondere projekte.

Ondersoeke

Soos in 1957 is die werk in verband met die preservering en hantering van vars vis in ys voortgesit. Dit het geblyk dat die gebruik van antibiotika goed beantwoord om bederf deur bakterieë in die vervoer- en bewaringstoestande wat in Suid-Afrika heers, heelwat te vertraag. Die wet laat nog geen gebruik van antibiotika toe nie, maar die nodige verhoë hieroor, deur die toepaslike wetenskaplike gegewens gestaaf, is reeds gerig.

Fundamentele ondersoek van die bakterieflora van Suid-Afrikaanse stokvis, in 1957 ingestel, het getoon dat daar 'n verskil is tussen die huidflora van stokvis van die visgrond van die oos- en die westkus. Die vis uit warmer waters het 'n groter persentasie Gram-positiewe tipes (soos die *Micrococcus* en die *Corynebacterium*) as dié uit kouer visseryplekke aan die westkus, waar spesies van *Pseudomonas* en *Achromobacter* blykbaar oorwegend voorgekom het. Hierdie verskil kan miskien tot verskille in bederfsyfers en -patrone lei.

Verskeie soorte vis in die handel, soos stokvis, sardyne en snoek is onderhewig aan aantasting van die liggaamspiere deur 'n protoesoëparasiet wat aan die geslag *Chloromyxum* behoort. Hierdie organisme, hoewel vir die mens onskadelik, veroorsaak groot verliese aan vismateriaal weens vervloeiing nie alleen in die varsvisnywerheid nie, maar ook in die visinmaak- en die vismeelbedryf. Hierdie probleem bly taai en ontwyk nog steeds oplossing. Histologiese ondersoek is met chemiese studies gekorreleer en die meganisme van vleisontbinding word stadigaan deur die mikroskoop en die proefbuis aan die lig gebring. 'n Interessante bevinding in verband met sardyne is dat jong vis, wat gewoonlik naby die kus gevind word, blykbaar nie aangetas word nie.

FISHING INDUSTRY RESEARCH INSTITUTE

Director: DR. G. M. DREOSTI

The twelve months were not characterized by any spectacular developments, but F.I.R.I. nevertheless had a full and productive year. Work has continued under high pressure. The exigencies of industry taxed the Institute heavily and again claimed much effort in connection with urgent scientific and technical problems. Nevertheless, considerable advance was made in restricting research to fewer problems than in the past, thus permitting concentration of more effort on individual problems and deeper penetration into the many facets of these specific projects.

Investigations

As in 1957, work on the preservation and handling of fresh fish in ice was continued. The use of antibiotics was shown to be effective in substantially retarding spoilage by bacteria, under the conditions of transport and storage prevailing in South Africa. The use of antibiotics is not permitted by law yet, but the necessary representations supported by relevant scientific data have been made.

Fundamental investigations of the bacterial flora of South African hake, which were initiated in 1957, showed that there is a difference between the skin floras of hake from east and west coast fishing grounds. The fish from warmer waters have a higher proportion of Gram positive types (such as *Micrococcus* and *Corynebacterium*) than those from the colder west coast fishing areas, in which species of *Pseudomonas* and *Achromobacter* were found to predominate. This difference might result in differences in spoilage rates and patterns.

Various commercial fish such as hake, pilchards and snoek are subject to infestation of the somatic muscles by a protozoal parasite, belonging to the genus *Chloromyxum*. This organism, while harmless to human beings, results in substantial losses of fish material due to liquefaction, not only in the fresh fish industry but also in the fish canning and fish meal industries. The solution to this problem is proving stubborn and elusive. Histological investigations have been correlated with chemical studies and the mechanism of the breakdown of the flesh is being slowly revealed through the microscope and the test-tube. One interesting finding in relation to pilchards is that juvenile fish, which are generally found close inshore, are apparently free from infestation.

Die probleem van gerookte en gesoute vis het gedurende die jaar aandag geniet, veral ten opsigte van die meer ekonomiese gebruik van sout, waarvan ontsaglike hoeveelhede deur albei industrieë verbruik word. Verder is rookmetodes in beheerde toestande, met geforseerde sirkulasie, nader bestudeer en die nuttige bevindings wat verlede jaar bekend gemaak is, is bevestig en uitgebrei.

'n Intensiewe ondersoek na die voorkoms en sterk vermindering van bruinwording van die Maillard-tipe by ingemaakte wit vis is met welslae aangepak. Die Instituut het gedurende die jaar hom ook besig gehou met werk in verband met sulfiedverkleuring in blikke by Walvisbaai, met die kruie van tomatiepasta vir visinmakery en met die meer akkurate bepaling van die konsistensie van tomatiepasta deur middel van die N.I.V.N. se bobbeltoets.

Werk ten behoeve van die vismeelbedryf het onder andere omvat: ondersoekwerk in verband met die vermindering van visreuk, die hersirkulering van pomp- en afloopwater, selfverwarming van vismeel, allerlei sakmateriaal vir vismeel, digtheid van die deeltjies en die massadigtheid van vismeel en verskillende faktore wat die biologiese waarde en verteerbaarheid van vismeel beïnvloed. Die Afdeling Visserie is, in verband met stelsels van herwinning van merkplaatjies, in hul projek vir die merk van vis bygestaan, soos in vorige jare. In so 'n verkorte verslag is dit onmoontlik om aan hierdie uitgebreide program reg te laat geskied, maar hieronder word iets aangehaal van die interessantheid en betekenis van 'n paar van die projekte.

In die visbedryf aan die kus is dit gewoonlik die gebruik om sardyne van die vissersbote af te pomp en langs geute in water na die inmaak- of vismeelfabriek te voer. Afval uit die inmaakfabrieke word ook langs watergeute na die vismeelfabriek vervoer. Hierdie praktyk veroorsaak verlies aan 'n sekere hoeveelheid proteïene weens uitloping, 'n verlies wat nie baie groot is wanneer die vis heel en in goeie toestand is nie, maar wat van aansienlike omvang kan wees as die vis „pap” of stukkend is, soos in die afvalgeute van die inmaakfabrieke. Die N.I.V.N. het sy ondersoek voortgesit na die moontlikheid om met die oog op hierdie proteïenverlies, pomp- en afvalgeutwater te hersirkuleer, en na die voordele wat moontlik daaruit kan voortvloei. Uit die bevindings lyk dit of aansienlike hoeveelhede vaste visstowwe uit die hergesirkuleerde afvalwater verhaal kan word, maar of die nywerheidsaspekte van die saak—veral die meganiese vervoer van vis en visafval in plaas van vervoer langs watergeute—nader oorweeg moet word.

Die neiging by vismeel tot selfverhitting met die daarmee gepaard gaande skeepsgevaar is in vorige verslae reeds nagegaan en die probleem hoef nie hier herhaal te word nie. Dit verduidelik egter een van die redes vir die ondersoek van sakmateriaal wat in die plek van goiing, (waardeer die lug maklik die meel

Some attention was given to the problems of the smoked and salt fish industries during the year, especially with regard to the more economical use of salt, which is consumed in vast quantities by both industries. Smoking procedures under controlled conditions with forced circulation were further studied and the useful findings reported last year were confirmed and extended.

On behalf of the canned fish industry an intensive investigation into the occurrence and very substantial reduction of Maillard type browning in canned white fish was successfully undertaken. Work on sulphide staining of cans at Walvis Bay, on the spicing of tomato paste for fish canning and on improved accuracy in the measurement of “consistency” of tomato paste by the F.I.R.I. blob test also occupied the Institute's attention during the year.

Work on behalf of the fish meal industry included investigational work on fish odour abatement, of recirculation of pumping and fluming water, spontaneous heating of fish meal, of various bagging materials for fish meal, of particle density and bulk density of fish meal, and of various factors influencing the biological value and digestibility of fish meal. The Division of Fisheries was assisted in the recovery systems of their fish-tagging project, as in previous years. It is not possible to do justice to this large programme in the space of an abbreviated report but the interest and significance of a few of the projects is mentioned below.

It is normal practice in the inshore fishing industry to pump pilchards from the fishing boats and to flume them in water to the cannery or fish meal plant. Cannery waste is also sent to the fish meal plant in water flumes. This practice results in the loss of a certain amount of protein through leaching, a loss which is not very great when the fish are intact and in good condition, but which may reach substantial proportions when the fish are “pap” or broken up, as in offal flumes from canneries. F.I.R.I. has continued its investigations into the feasibility and possible advantages of recirculating pump and flume water to reduce these protein losses. The findings indicate that considerable fish solids may be recovered from recirculated flume water, but that further consideration must be given to the industrial aspects of the question—particularly to the mechanical conveyance of fish and fish offal in preference to conveyance in water.

The tendency of fish meal, with its attendant shipping hazards, to heat spontaneously was reviewed in previous reports, and the problem need not be restated here. It explains, however, one of the reasons for investigating bagging materials that might be used as alternatives to hessian, which permits free access of the air to the

in die sakke kan bereik) gebruik kan word. As suurstof deur middel van die gebruik van minder deurdringbare materiaal uitgesluit kon word, sou die gevaar van verhitting aansienlik verminder. Die belowendste materiaal uit 'n reeks moontlikes (soos goiing met 'n laag „polythene”, gewone „polythene”, „celluflux”, „glassine”-papier) wat ten opsigte van deurdringbaarheid en as vismeelhouer in adiabatiese toestande getoets is, was 'n gebitumeniseerde kraftpapier. 'n Proeflading van vismeel verskeep in papiersakke met 'n laag gebitumeniseerde kraftpapier het getoon dat die gebruik van hierdie materiaal gedeug het om die mate van verhitting wat in die meel voorkom, te verminder.

Die studie van selfverhitting in die Instituut se elektronies beheerde adiabatiese kalorimeters is voortgesit en aan aspekte soos suurstofabsorpsie en die ontwikkeling van koolsuurgas tydens verwarming en die uitwerking van die toevoeging van antioksideermiddels by vismeel; is aandag geskenk. Hoewel daar in sommige plekke groot gewag gemaak is van die voordele van die gebruik van antioksideermiddels, het die werk van die N.I.V.N. 'n ontstellende feit aan die lig gebring, nl. dat die gebruik van antioksideermiddels die reaktiwiteit van behandelde meel wel verlaag, maar nie altyd in veilige mate nie, sodat daar by dié meel nog selfverhitting kon ontstaan tot 'n hoogte waarop die antioksideermiddel onaktief word of vervlugtig. Aangesien verduursaming deur die antioksideermiddel vertraag word, kan daar verwag word dat die meel in so 'n geval meer reaktief sal wees as verduursaamde, onbehandelde meel. Op lang seereise deur die trope kan hierdie toestande moontlik ontstaan en die N.I.V.N. het die nywerheid in kennis gestel dat die gebruik van antioksideermiddels nie sonder nadere ondersoek aanbeveel kan word nie.

Die studie van die uitwerking van verhoogde temperatuur op die voedingswaarde van vismeel het tot interessante resultate gelei. Dit het geblyk dat verteerbaarheid *in vitro* as nuttige aanduiding van beskadiging deur hitte dien. Die vernaamste resultate in hierdie verband is vervat in 'n tesis vir die D.Sc.-graad aan die Universiteit van Stellenbosch deur 'n student wat met welslae navorsing by die N.I.V.N. onderneem het. Die N.I.V.N. verwelkom die geleentheid om vir die Universiteite 'n tesis vir nagraadse studente aan die hand te doen en hy sou bereid wees om weer sy volle medewerking daaraan te skenk en die fasiliteite vir sulke werk beskikbaar te stel.

Fundamentele werk in verband met die samestelling en eienskappe van stinkwater, konsentraat, distillaat en skubbe word uitgevoer en het verskeie aangeleenthede van praktiese belang opgelewer. Konsentraatverdikking en die „verstopping” van die konsentrators kan mettertyd as gevolg van hierdie werk teen geringe koste verhelp word. Die saak is hoofsaaklik van twee kante aangepak: (a) deur die gebruik van derm-ensieme

meal in the bags. The exclusion of oxygen, by the use of less permeable materials, would substantially reduce the risk of heating. Of a series of possible alternative materials investigated (such as polythene coated hessian, plain polythene, celluflux, glassine paper) a bitumenized kraft paper held out the greatest promise when tested both for permeability and as a fish meal container under adiabatic conditions. A trial shipment of fish meal in paper sacks, having a layer of bitumenized kraft, showed that in practice this material was effective in reducing the amount of heating occurring in the meal.

Studies of spontaneous heating in the Institute's electronically controlled adiabatic calorimeters were continued, attention being given to such aspects as oxygen absorption and carbon dioxide evolution during heating, and the effect of adding anti-oxidants to fish meal. While great claims have been made for the use of anti-oxidants in some quarters overseas, F.I.R.I. work has revealed a disquieting feature. It was found that use of anti-oxidants reduced the reactivity of treated meals, but not always to a safe level, so that it might still be possible for such meals to heat spontaneously to the point at which the anti-oxidant would be inactivated or volatilized. In such an event, as curing is retarded by the anti-oxidant, the meal could be expected to be more reactive than cured, untreated meals. These conditions could possibly arise during long voyages through the tropics, and consequently F.I.R.I. has informed industry that the use of anti-oxidants cannot be recommended without further investigation.

Studies of the effect of elevated temperature upon the nutritional value of fish meal have brought interesting results. Digestibility *in vitro* has proved to serve as a useful index of heat damage. The main results in this connection are contained in a thesis for the D.Sc. degree of the University of Stellenbosch by a student who successfully undertook research with F.I.R.I. F.I.R.I. welcomes the opportunity of suggesting theses for postgraduate students for the Universities and would again co-operate in the work to the fullest extent and make facilities available for such work.

Fundamental work in regard to the composition and properties of stickwater concentrate, distillate and scale is being pursued and has given rise to several aspects of practical importance. For instance, the thickening of concentrate and the “gumming up” of concentrators may, in due course, be overcome at low cost, as a result of this work. The two main lines of attack have been: (a) the use of gut enzymes to reduce the “viscosity” of

om die „viskosititeit” van stinkwater en konsentrate te verlaag, en (b) deur die gebruik van ’n proefverdam-pingstoestel, wat aan die N.I.V.N. ontwerp en hoof-saaklik daar gebou is, om aangeleenthede te bestudeer soos vloei-stofsnelheid in calandria-buise in toestand wat dié van die nywerheid naboots.

Die werk in verband met vismeelblom het ’n ander wending geneem. Na afloop van die studie van die metodes van ekstraksie deur middel van oplossing, is daar aandag geskenk aan ander metodes waaraan die werk ’n paar jaar gelede gestaak is. Daar is bv. aanbeveel dat ondersoekwerk, in samewerking met die Nasionale Voedingsnavorsingsinstituut, volgens ’n mikrobiologiese metode onderneem word, en ook volgens ’n nuwe sogenaamde fisiese N.I.V.N.-metode. Albei metodes het reeds in laboratoriumtoestand tegnies geslaag. Bevindings in verband met die fisiologiese metode het interessante aanduidings opgelewer oor die aard en samestelling van visreuke en -geure wat op hul beurt in belangrike mate kan saamhang met ander bestaande visprosesse. Trouens, dit wil voorkom of ’n hele werkgebied, met allerlei vertakings in verband met die proteïen- en vetbestanddele van vis en ook met dié wat reuke en geure veroorsaak, algaande deur hierdie studie blootgelê word.

Die Instituut het, soos in vorige jare, roetine-inspek-sies, chemiese ontledings en bakteriologiese ondersoeke uitgevoer. Die nywerheid maak nog steeds in toenemende mate gebruik van die geriewe en dienste wat verskaf word.

Publikasies

Die Instituut het in 1958 ’n jaarverslag, tien vorderingsverslae, agt memoranda, vier bulletins en vyf oorsigte van die literatuur uitgegee. Daarbenewens is ’n inhoudsopgawe opgestel en uitgegee van die publi-kasies van die N.I.V.N. oor tien jaar en ’n geïllustreerde brosjure met ’n beskrywing van die nuwe laboratorium gemaak.

stickwater and concentrates, and (b) the use of a pilot-scale evaporator, designed by and largely built at F.I.R.I. to study such aspects as liquid velocity in calandria tubes under conditions simulating those which occur in industry.

Work on the fish flour project has taken a new turn. Having concluded studies of solvent extraction methods, some attention was devoted to other methods on which work was temporarily suspended some years ago. Exploratory work has, for instance, been recommenced in connection with a micro-biological method, in collaboration with the National Nutrition Research Institute, and in connection with a novel, so-called F.I.R.I. physical method. Both methods have proved technologically successful under laboratory conditions. Findings in connection with the physical method have yielded interesting pointers in regard to the nature and composition of fish odours and flavours, which, in turn, may have an important bearing on other existing fish processes. Indeed, a whole ramified field of work concerning the protein and fat constituents of fish, as well as those responsible for odours and flavours, appears to be opening up by virtue of these studies.

Routine inspections, chemical analyses and bacterio-logical examinations were carried out by the Institute, as in previous years. The industry continues to make ever-increasing use of the facilities and services pro-vided.

Publications

During 1958 the Institute issued an Annual Report, ten Progress Reports, eight Memoranda, four Bulletins, and five Literature Surveys. In addition a ten-year index to F.I.R.I. publications was prepared and pub-lished and an illustrated brochure, describing the new laboratory, was produced.

NAVORSINGSINSTITUUT VIR DIE LEERNYWERHEID

Direkteur: DR. S. G. SHUTTLEWORTH

Die N.I.L.N.-geboue is vergroot deur die toevoeging van nog 2,500 vierkante voet om die simmetrie van die gebou in sy geheel af te rond. Daardeur kon twee

LEATHER INDUSTRIES RESEARCH INSTITUTE

Director: DR. S. G. SHUTTLEWORTH

The L.I.R.I. buildings were extended by the addition of a further 2,500 square feet to complete the main symmetry of the buildings. This enabled two additional

bykomende laboratoria met proefinstallasies bygevoeg word aan die reeds bestaande vier en is die omvang van toegepaste proefnemingswerk ten opsigte van looiery sowel as skoeisel uitgebrei.

Die N.I.L.N. het steeds die ewewig behou tussen navorsing oor 'n lang termyn wat die grondprobleme van die bedryf probeer oplos en korttermynwerk van betreklik onmiddellike praktiese waarde. Personeellede word aangemoedig om werk te laat publiseer in gekeurde gesaghebbende buitelandse wetenskaplike tydskrifte en hierdie beleid het 'n groeiende mate van erkenning vir die werk van die N.I.L.N. meegebring. Dit word gestaaf deur die onlangs gepubliseerde American Chemical Society se „Monograph on the Chemistry and Technology of Leather”, waarin die hoofstukke oor die teoretiese en praktiese aspekte van chroom- en plantaardige looistowwe en looimetodes meer aanhalings uit werk van die N.I.L.N.-wetenskaplikes bevat as uit dié van enige ander navorsingsorganisasie en baie van die gevolgtrekkings en aanbevelings die resultate is van die werk aan hierdie instituut gedoen. Talle werkers op allerlei wetenskaplike gebiede en uit die meeste oorsese lande het oordrukke van ons publikasies aangevra.

Een personeellid (mnr. L. M. Hill) het Australië en Nieu-Seeland en 'n ander (dr. D. G. Roux) het Brittanje en Europa besoek, albei op uitnodiging om verhandelings daar voor te dra en kennis van besondere belang en waarde wat verwerf is, oor te bring.

Hierdie oorsese kontakte is van tweërlei waarde, omdat oorsese vordering onder die aandag van plaaslike nywerhede gebring word en werk aangemoedig word wat nog verdere uitwerking kan veroorsaak. Die N.I.L.N. het by die nywerhede wat hy op alle moontlike maniere dien wetenskaplike en tegniese vordering gedurig aangemoedig en hy het gelukkig ondertekenaars wat nie alleen wetenskaplike navorsing geldelik steun nie, maar wat ook sonder versuim voordeel trek uit nuwe idees en prosesse wat ontwikkel word.

Fundamentele Navorsing

Die omvang van die fundamentele werk wat in die afgelope jaar verrig is, kan bepaal word uit die feit dat 22 verhandelings in gekeurde buitelandse wetenskaplike tydskrifte gepubliseer is, wat ongeveer uitwerk op 2 verhandelings per kop van die gegradueerde personeel en heelwaarskynlik die totaal van enige ander Suid-Afrikaanse laboratorium oortref.

Baie van hierdie verhandelings het gegaan oor die struktuur van gekondenseerde looistowwe, met looi-stof uit die wattle as hooftema. Op hierdie gebied het die N.I.L.N. se wetenskaplikes belangrike vordering gemaak en neem hulle nog steeds die leiding. Tegniese vir die hantering en uitkenning van minimale hoeveelhede van produkte is verbeter, 'n paar natuurprodukte

pilot plant laboratories to be added to the existing four and has extended the scope of the applied experimental work on both tanning and footwear.

The L.I.R.I. continued to strike a balance between long range research, aimed at solving the more fundamental problems of the industry, and short range work of relatively immediate practical value. Staff are encouraged to publish work in refereed overseas scientific journals of good standing and this policy has led to increasing overseas recognition of L.I.R.I. work. Evidence of this can be found in the recently published American Chemical Society Monograph on the Chemistry and Technology of Leather, where the chapters on the theoretical and practical aspects of chrome and vegetable tannins and tanning methods contain more references to work done by L.I.R.I. scientists than to those from any other research organization, and many of the conclusions and recommendations are the result of work at this Institute. Reprints of our publications have been requested from a large number of workers in a wide range of scientific fields and most overseas countries.

One member of staff (Mr. L. M. Hill) visited Australia and New Zealand and another (Dr. D. G. Roux) visited Britain and Europe, both as the result of invitations to deliver papers and contribute knowledge gained of special interest and value.

These overseas contacts are of value in their two way effect, whereby overseas advances are brought to the notice of local industries and also stimulate work which will have a further impact. The L.I.R.I. continued to encourage scientific and technical progress of the industries served in all possible ways and is fortunate in having subscribers who not only support scientific research financially, but are quick to take advantage of new ideas and processes developed.

Fundamental Research

The extent of fundamental work carried out during the past year can be judged from the fact that 22 papers were published in refereed overseas scientific journals, which averages approximately 2 papers per head of graduate staff and probably exceeds the total of any other South African laboratory.

Many of these papers were on the structure of condensed tannins, with the wattle tannins as the main theme. In this field L.I.R.I. scientists achieved a major breakthrough and have continued to hold the initiative. Techniques for handling and identifying extremely small quantities of products have been improved, several naturally occurring products were isolated and identified for the first time, and further light was

is vir die eerste keer geïsoleer en uitgeken en verdere lig is gewerp op die struktuur van die vernaamste gekondenseerde looistowwe en die sintese daarvan in die boom. By hierdie werk het die spesiale metodes op grond van molekulêre gewig, wat die N.I.L.N. vir looistowwe ontwikkel het, baie nuttig gelyk. Hierdie tegnieke is toegepas op die studie van die looimeganisme en die ontwikkeling van metodes om die verskillende looimiddels wat in looiery met plantaardige stowwe gebruik word, uit te ken.

Fundamentele ondersoek van die oplosbare proteïene van huide en velle is voortgesit. Apparaat is gebruik wat vir dié doel in N.I.L.N. geïnstalleer is en wat as spesiale toerusting in die sentrale laboratoria van die W.N.N.R. gehuisves is. Die reaksie tussen wattle-tannien en velle wat deur 'n chemiese reaksie met verskeie spesifieke groepe in die proteïen gewysig is, is ook bestudeer en die resultate het ooreengekom met die teorie van waterstofbinding van die looiproses wat 'n paar jaar gelede deur N.I.L.N. gepubliseer is.

Fundamentele werk is uitgevoer in verband met die reaksie tussen driewaardige chroomione van verskillende basisiteite en aminosure van verskillende kettinglengtes, en nuttige bevestiging is gevind van stabiliteitsreëls wat die N.I.L.N. in vorige publikasies gestel het. Die werk word uitgebrei om 'n aanduiding te soek van die oorsake van agteruitgang in chroom-gelooide leer wat opnuut met plantaardige looistowwe gelooi is. Werk in verband met die uitwerking van verskeie faktore op die grootte van die deeltjies van sirkoniumchloriedkomplekse het gelei tot resultate wat blykbaar met voordeel toegepas kan word om hierdie materiaal vir die vervaardiging van wit leer te gebruik.

Die werk in verband met die opname van die voetvorms van die bevolking en die korrelasies van die verkreeë gegewens ten opsigte van verskillende ouderdomme en die rasse- en omgewingsfaktore is voortgesit.

Toegepaste Werk in verband met Huide en Velle

Die eerste manuskrip is voltooi vir 'n handleiding vir die Suid-Afrikaanse Huide- en Vellenywerheid. Dit behoort by te dra tot die bevordering van goeie afslag-, bereidings- en bemarkingsmetodes vir huide en velle. Hopelik sal dit in 1959 gepubliseer word.

Daar is voortgegaan met die werk in verband met die kleur van gesoute en ongesoute velle. In die geval van gesoute velle het dit hoofsaaklik gegaan oor tegnieke vir kunsmatige droging, wat veral in die Kaapse gebied nodig is, waar winterreën die droging moeilik maak. In die geval van merinovelle was die doel om sout uit te skakel ter wille van besparing in vervoerkoste en om vir oorsese kopers 'n mark te voorsien waar 'n spesiale produk van verhoogde waarde te verkry is.

'n Metode is ontwikkel om gesoute skaapvelle te

thrown on the structures of the main condensed tannins and on their synthesis in the tree. In this work the special molecular weight methods developed by L.I.R.I. for tannins proved very useful. These techniques were applied to studies on the mechanism of tannage and to the development of methods for identifying the various tanning agents used in vegetable tannage.

Fundamental investigations on the soluble proteins of hides and skins continued, using apparatus installed for the purpose at L.I.R.I. as well as special equipment housed at the C.S.I.R. central laboratories. A study was also made on the reaction between wattle tannin and hide modified by chemical reaction with various specific groups in the protein, and the results were in accordance with the Hydrogen Bond Theory of tannage published by L.I.R.I. some years ago.

Fundamental work was carried out on the reaction between trivalent chromium ions of different basicities and amino acids of various chain lengths and useful confirmation was obtained of stability rules enunciated by L.I.R.I. in previous publications. This work is being extended to give an indication of the causes of deterioration in chrome leather retanned with vegetable tannins. Work on the effects of various factors on the particle sizes of Zirconium chloride complexes gave results which appear to have a valuable practical application which may assist the economics of this useful material for white leather manufacture.

Work has also continued on national foot shape surveys and the correlations of the data obtained with various age, racial and environmental factors.

Applied Work on Hides and Skins

The initial manuscript was completed on a handbook for the South African hides and skins industry, which should assist in stimulating sound methods of take off, curing, and marketing hides and skins. It is hoped that this will be printed during 1959.

Work was carried out on the dyeing of both salted and unsalted skins. In the case of salted skins this was mainly in the direction of techniques for artificial drying needed, particularly in the Cape area where winter rainfall makes drying very difficult. In the case of Merino skins the work was aimed at eliminating salt in order to save transport costs and to market a special product of enhanced value to overseas buyers.

A method was developed for drying pickled sheepskins to avoid the cost of barrels, and trial batches of

droog ten einde die koste van vate te bespaar en proef-besendings velle wat volgens die nuwe metode berei is, word deur oorsese firmas wat handskoene maak, getoets.

'n Gekombineerde insekte- en bakteriedoder is ontwikkel om by die waswater te voeg wat vir Karakoellamvelle gebruik word. 'n Spesiale merkverf is ontwikkel. Eenvoudiger metodes is ondersoek om gebruikte sout te suiwer en om velle te brand voordat hulle in stapels gesout word. 'n Ondersoek is uitgevoer na die gebruik van kwaternêre ammoniumsoute vir die voorkoming van rooi hitte op velle, met belowende resultate.

Wattel- en Looinywerhede

Die probleem van die agteruitgang tydens bewaring van chroomgelooid leer wat met wattelbas nagelooi is, is met die proefinstallasie en ook op groot skaal voortgesit. Die waarskynlike oorsake van die moeilikheid is vasgestel en metodes is uitgewerk om verslegting in normale vogtigheids- en temperatuurtoestande te voorkom. Bewaring in die uiterste vogtigheids- en temperatuurtoestande is tot dusver slegs gedeeltelik opgelos. Die resultate word op groot skaal op die proef gestel. Die werk maak nuwe gebiede vir die gebruik van wattlekstrak oop.

Verdere werk in verband met die looi van sool leer met wattelbas het 'n nuwe, vinnige metode geskep wat in agt tot elf dae putgelooid sool leer van goeie kwaliteit, van rou leer tot die klaar produk lewer en dit vir die looier moontlik maak om die fisiese hoedanighede onder beheer te hou. Die Instituut se snellooiwerk van basgelooid sool leer het wêreldwye belangstelling uitgelok en publikasies het in verskeie tale verskyn, wat die verkoop van Suid-Afrikaanse wattlekstrak ten goede behoort te kom, aangesien die metodes reeds in 'n wye kring gebruik word.

Daar is ook steeds nog gewerk aan metodes om die duursaamheid van basgelooid sool leer te verbeter, onder andere deur middel van voorafgaande looiery met chroom- en sironiumsoute en impregnering met looifikseringmiddels.

'n Studie van die uitwerking van temperatuur en verskeie metodes om huide vir bo leer te week, te kalk en te looi, met die oog op 'n versnelling van die prosesse en ook op egalige resultate in sowel die somer as die winter, het nuttige uitslae tot gevolg gehad.

Een van die vernaamste projekte gedurende die jaar was die produksie van ligte leer wat kan meeding met sintetiese stowwe vir skoensole en lugreistasse d.m.v. vriesdroging gevolg deur impregnering. 'n Proefinrigting is opgestel en het dwarsdeur die jaar aan die werk gebly. Verskeie probleme en die aan-voorwerk in verband met die vriesdroogmetode is aangepak en opgelos en allerlei impregneermiddels, soos wattlekstrak is ondersoek. Sool leer wat volgens hierdie metode gemaak is, blyk besonder duursaam te

skins prepared by the new method are being tested by overseas glove making firms.

A combined insecticide and bactericide was developed for adding to the wash water used for Karakul lambskins, and initial trials with this proved very promising. A special marking paint was developed for the industry.

Simplified methods were explored for cleaning used salt and for brining hides prior to stack salting. An investigation was carried out on the use of quarternary ammonium salts for prevention of red heat on hides, with promising results.

Wattle and Tanning Industries

Pilot plant and large scale tanning investigations continued on the problem of storage deterioration of chrome leather retanned with wattle. The probable causes of this trouble were identified, and methods worked out for preventing deterioration under normal humidity and temperature conditions. Extreme humidity and temperature storage have only been partly solved so far. The results are being tested in large scale trials. This work opens up added uses for wattle extract.

Further work on sole leather tannage with wattle gave rise to a new rapid method which produces good quality pit tanned sole leather in eight to eleven days from raw hide to finished product, and gives the tanner good control over the physical characteristics. World-wide interest was expressed in the Institute's rapid wattle sole leather tannages, and publications appeared in several languages which should assist the sales of South African wattle extract, as the methods are in widespread use.

Work also continued on methods of improving the durability of wattle tanned sole leather, including pretannage with chromium and zirconium salts, and impregnation with tan fixing agents.

Useful results are being obtained in a study of the effects of temperature and various methods of soaking, liming and bating of hides for upper leather with a view to speeding up the processes and also obtaining uniform results in both summer and winter.

A main project during the year was the production of light weighing leather for competition with synthetics in shoe soles and air luggage by freeze drying followed by impregnation. A pilot plant was erected and was in continuous operation throughout the year. The various problems and teething troubles of the freeze drying method were tackled and solved, and a large variety of impregnants, including wattle, were explored. Sole leather produced by this method was found to be

wees, ten spyte van die feit dat die digtheid daarvan slegs 'n derde van normale sool leer is.

Skoelisel

Die gebruik van die Instituut se „Liripuff”-proses vir die neuse en hakke van skoene het sowel hier te lande as oorsee uitgebrei. In Suid-Afrika alleen bespaar die proses die verbruiker jaarliks meer as die totale bedrag wat N.I.L.N. aan navorsing bestee. Onder die spesiale ontwikkelings gedurende die jaar was daar nuwe tegnieke vir modeskoelisel van hoë gehalte wat resultate oplewer wat na bewering beter is as dié wat enige ander metode oplewer. Masjiene vir die aanwending van die tegniek is ook verbeter. Die maatskappy wat deur die skoenedryf gevorm is om die proses toe te pas en as „Liri Components” bekend staan, het sy derde jaar van geslaagde werking agter die rug.

Die aanbou van die N.I.L.N.-gebou het dit moontlik gemaak om 'n proefinrigting vir skoenevervaardiging te installeer en 'n werkprogram is aangepak vir nuwe metodes van vervaardiging en aanmekearsit van die onderdele. Die inrigting word ook gebruik om die duursaamheid van verskillende onderdele in uitgesoekte gebruikstoestande te vergelyk.

In hierdie verband het die N.I.L.N. se verrottingsbestande binnesool leer hom nog steeds in verskeie soorte skoelisel gehandhaaf en is hom uit baie oorde lof toegeswaai vir die manier waarop hy voetgemak behou en vir sy slytweerstand. Daar word gesê dat hierdie binnesool leer voetmoelikhede met skoelisel vir hospitaalverpleegsters baie drasties verminder het en dat die stukkend raak van die randnate van skoelisel met rubbersole uitgeskakel is.

Die wêreldwye neiging om sole aan boleer regstreeks met 'n kleefmiddel te bevestig, is deur die Instituut nagevolg en hulle het 'n raadgewende diens i.v.m. bevestiging met kleefmiddels vir die skoeliselnywerheid ingestel. Plaaslike kleefmiddelfabrikante word aangemoedig om kleefmiddels te ontwikkel wat teen die taak opgewasse is, en wat vir sovel die materiaalsoorte wat aanmekeer geplak moet word as vir die plaaslike klimaat geskik sal wees. Dit is veral belangrik met die oog op die moontlikheid dat hierdie belangrike nuwe ontwikkelings by die verbruiker in onguns kën raak omdat die sool en boleer van mekaar lostrek.

Heelwat werk is verrig in verband met probleme aangaande die duursaamheid van mynwerkerstewels, veral in nat ondergrondse toestande en baie klompies proefstewels is ondergrond geplaas om spesiale middels vir die waterdigmaking van boleer en vir sool leerimpregnering op die proef te stel. Ander werkskoelisel waaraan aandag bestee is, was skoene vir hospitaalverpleegsters, Yskor, die leër en sportdrag.

exceptionally durable in spite of being only one third the density of normal sole leather.

Footwear

The use of the Institute's "Liripuff" process for stiffening toes and heels of footwear continued to expand both locally and overseas. In South Africa this process alone is saving the consumer far more per annum than the total expenditure of L.I.R.I. on research. Special developments during the year included new techniques for high grade fashion footwear which are giving results stated to be superior to those obtained by any other method. Machines for applying the technique were also improved. The company formed by the footwear industry to operate the process, known as "Liri Components" has had a third year of successful operation.

The extension of the L.I.R.I. building enabled a pilot plant to be set up for footwear manufacture, and a programme of work was initiated on novel methods of construction and component preassembly. The plant is also being used to compare durabilities of various components under selected wear conditions.

In this connection the L.I.R.I. rot proof innersole leather continued to prove itself in various types of footwear, and praise for its retention of foot comfort and strength in wear has been received from many quarters. It is said to have reduced foot troubles in hospital nurses' footwear very drastically and has eliminated welt seam breakage in rubber soled footwear.

The world-wide trend towards direct adhesive attachment of soles to uppers of shoes was followed up by the Institute, which set up an advisory service on adhesive attachment for the footwear industry. Local adhesive manufacturers are being encouraged to develop adhesives equal to the task, suited both to the various materials to be joined and to the local climate. This is particularly important in view of the possibility of these important new developments falling into disfavour with the consumer, owing to separation of sole from upper.

Much work was done on problems of durability of miner boots, particularly under wet, underground conditions, and many batches of trial boots were placed underground to test out special upper waterproofing agents and sole leather impregnants. Work on other occupational footwear included footwear for hospital nurses, Iscor, Army and sportswear.

Bedryfsnavorsing

N.I.L.N. was nog steeds besig met die insameling en kollasie van statistieke i.v.m. produksie en indiensneming in die skoeisel- en looiwyerheid en het dikwels verslae gesirkuleer om fabrikante op hoogte te hou van die neigings in die bedryf. Met publikasies „Footwear Facts and Figures 1917-58” en „Statistics of the South African Tanning Industry 1953-58” is die hoë peil gehandhaaf wat die plaaslike skoeisel- en looiwyerheid soveel beter op hoogte hou as die meeste ander bedrywe insake versamelde statistiese inligting en hulle aldus help om hulle beplanning en beleid op koers te hou.

Spesiale werk is uitgevoer om die gegewens in verband met die mediese hulpfonds te ontleed en verskeie verslae is opgestel om die nywerheid by te staan in die beplanning en besteding van die fonds. Die werk lewer ook nuttige gegewens oor diensversuim op.

Daar is ook gewerk aan metodestudie, o.a. ook d.m.v. lesings om fabrieksvoormanne en bestuurslede aan te moedig om hulle eie bydraes tot bewegingsbesparing in hulle fabriek te lewer. Uit die beskikbare statistiese gegewens is ontledings met die oog op produktiwiteitsvergeelyking opgestel en dit sal hopelik mettertyd ook uitgebrei word na individuele fabriekke.

Publikasies

In die afgelope jaar het N.I.L.N. 24 verhandelings tot oorsese tydskrifte, 25 tot Suid-Afrikaanse tydskrifte bygedra en 15 gedrukte en 35 mimeografiese verslae gepubliseer.

Operations Research

L.I.R.I. continued to collect and collate the production and employment statistics of the footwear and tanning industries, and to circulate frequent reports aimed at keeping manufacturers fully up to date with trends. The publication of *Footwear Facts and Figures 1917-58* and of *Statistics of the South African Tanning Industry 1953-58* maintained the high standard which makes the local footwear and tanning industries better informed than most others on collated statistical information, and so assists them to guide their planning and policy.

Special work was carried out on the analysis of Medical Benefit Fund returns and several reports have been prepared to assist the industry in planning the administration of this Fund. The work is also providing useful data on absenteeism.

Work has been carried out on Methods Study, including lecture programmes to stimulate factory foremen and executives to make their own contributions to motion economy in their factories. Comparative productivity analyses have been compiled from available statistical data, and it is hoped to extend this into individual factories in due course.

Publications

During the past year, L.I.R.I. has contributed 24 papers to overseas scientific journals, 25 to South African journals, and has published 15 printed and 35 mimeographed reports.

VERFNYWERHEID- NAVORSINGSINSTITUUT

Direkteur: MNR. G. M. HAMILTON

Die beroep op ondertekenaars om 'n verhoging van 33½% op hul bydraes het allesins geslaag en die Instituut kan, hoewel klein, nou beskou word as voldoende gefinansier. Die ontwerp vir 'n aparte gebou om die Instituut te huisves, het goed gevorder en die gebou sal na verwagting in 1959 klaar wees.

Vergelyking van Natuurlike en Kunsmatige Veroudering van Verf

Die kontrolering en toets van verf wat op grond van 'n spesifikasie gelewer word, is noodsaaklik as die verbruiker verseker moet wees van 'n bevredigende produk. In die meeste gevalle word daar verwag dat

PAINT INDUSTRIES' RESEARCH INSTITUTE

Director: MR. G. M. HAMILTON

The appeal made to subscribing members for a 33½% increase in subscription was uniformly successful, and the Institute, although small, can now be considered to be adequately financed. Satisfactory progress has been made with the design of a separate building to house the Institute and it is expected that this will be completed during 1959.

Comparison of Natural and Artificial Ageing of Paint

Control and testing of paint supplied to specification is essential in order that the consumer may be assured of receiving a satisfactory material. In the majority of cases the protective film is expected to last for several

die beskermingslaag 'n hele paar jaar moet hou en dit spreek dus vanself dat die verbruiker nie so lank behoort te moet wag op die waardebeplanning van die produk nie. Maar aangesien die grondstowwe vir die nywerheid so snel ontwikkel word, bewys die ontdekkingsvinding met verprodukte oor die afgelope paar jaar nie noodwendig watter materiaal vir vandag die beste beantwoord nie. Die Suid-Afrikaanse Buro vir Standaard het hierdie moeilikheid terdeë besef en die Instituut het derhalwe met die Raad se hulp 'n uitgebreide reeks proewe uitgevoer om die veroudering van blootgestelde veroppervlakke met versnelde veroudering in die laboratorium met behulp van gevestigde toerusting te vergelyk. Vir 'n program van hierdie aard moes noodwendig 'n groot aantal monsters ondersoek en die waarde van die resultate statisties bepaal word. Die stadium is tans bereik waar die resultate uit die Instituut se werk versamel, ontleed kan word en die syfers wat in verband met sowat 400 verfsoorte verkry is, is reeds ondersoek. Dit het geblyk dat daar geen eenvoudige verwantskap tussen die twee waardebeplanningsmetodes bestaan nie, maar dat die versnellingsfaktor wat verkry word deur veroudering in die laboratorium, in die eerste plek afhang van die pigment in die verf. Die faktor kan na gelang van die pigment tussen 3 en 12 wissel. Waardebeplanning t.o.v. talle verdere monsters sal uitgevoer word; maar aangesien die besondere pigment wat gebruik word gereedlik met behulp van chemiese middels geïdentifiseer kan word, bestaan daar wel 'n moontlikheid dat hierdie werk geslaagde resultate tot gevolg kan hê. As dit wel gebeur, is die finansiële implikasies van 'n betroubare verftoetsmetode sonder meer duidelik.

Verbleiking van Pastelkleure

Die pigment titaandioksied word baie gebruik sowel vir wit verf as vir vermenging met kleurstowwe en ander kleure om pastelkleure te maak. Titaandioksied (die grondstof waarvan te Umgababa deur die Titanium Corporation geproduseer word) kom hoofsaaklik in twee gewysigde vorms voor, waarvan die kristalliseringsgewoonte verskillend is. Oor die algemeen is dié twee anatase- en rutielvorms. Dit het geblyk dat pastelkleure met 'n basis van een of die ander van hierdie wit pigmente groot verskille toon ten opsigte van stabiliteit teenoor lig. Wanneer anatase met kleurstowwe gekleur word, bleik dit vinnig tot suiwer wit, terwyl die rutielpigmente wat op die mark aangebied word, aansienlike verskille toon. Hierdie feit staan onafhanklik van die verfmiddel en dit gebeur selfs met droog vermengde poeiers. Die verdwyning van die kleurstof en die verbleiking van die kleure word toegeskryf aan fotochemiese oksidering van die kleurstof met titaandioksied as katalisator en dit staan vas dat die katalitiese vermoë van die oksied om hierdie uitwerking te bevorder by anatase op sy sterkste is en

years, and it will be obvious that the consumer cannot be expected to wait for such long periods for the evaluation of the product. At the same time, because of the rapid development of raw materials for industry, experience over past years of paint products does not necessarily indicate the best material for use at the present time. This difficulty was fully realized by the South African Bureau of Standards and with the assistance of Council, the Institute has carried out a very considerable programme of research into the exterior ageing of paints, as compared with the accelerated ageing in the laboratory by means of established equipment. In a programme of this nature it was necessary to examine a large number of samples and to assess the results statistically. The stage has now been reached when the results obtained from the Institute's work can be analysed, and the figures obtained from some 400 paints have now been examined. It was found that there is no simple relationship between the two methods of evaluation, but that the accelerating factor obtained by ageing in the laboratory depends primarily on the pigment in the paint. According to pigment this factor may vary between 3 and 12.

Many more samples have still to be evaluated, but as the particular pigment used can readily be identified by chemical means, there is a possibility that this work may produce successful and useful results. If this is so, the financial implications of a sound method of testing paints rapidly need not be stressed.

Fading of Pastel Shades

The pigment titanium dioxide is very largely used both for white paints and for blending with dyestuffs and other colours to produce pastel shades. Titanium dioxide (the raw material of which is produced at Umgababa by the Titanium Corporation) exists in two principal modifications which differ in crystal habit. Broadly speaking these are Anatase and Rutile. It has been found that pastel shades based on one or the other of these white pigments vary very greatly in stability to light. Anatase when tinted with dyestuffs is rapidly bleached to a pure white, while considerable variations are found among the Rutile pigments offered on the market. This fact is independent of paint medium and takes place even with the dry mixed powders. The disappearance of the dyestuff and bleaching of the colours is ascribed to photo-chemical oxidation of the dyestuff catalysed by titanium dioxide, and it is quite clear that the catalytic ability of the oxide to promote this effect is at a maximum with Anatase and varies considerably among the different Rutile samples. This work is related to that in the

dat dit groot verskille toon by die verskillende rutiel-monsters. Hierdie werk hou verband met dié wat in die voorgaande paragraaf genoem is en bied 'n rigting wat tans opgevolg word en miskien nog tot die ontwikkeling kan lei van verflae wat langer sal hou. Titaandi-oksied se vermoë om oksidasie te bevorder, is nie tot kleurstowwe beperk nie—dit geld ook vir die olie- of harsbindmiddel.

Seisoensuitwerking op die Verslegtingstempo van Verf

'n Verteenwoordigende verfreeks is aangemaak, op panele aangebring en in Durban met tussenpose van twee maande blootgestel. As algemene gevolgtrekking kan gekonstateer word dat die verf wat aanvanklik aan die begin van die droë tyd blootgestel is, 'n baie langer lewensduur gehad het as dié wat aanvanklik in November blootgestel is. Gewoonlik was die lewensduur $1\frac{1}{2}$ maal langer, maar in uitsonderlike gevalle is 'n faktor van 3 aangeteken. Dit ly geen twyfel nie dat die toestand gedurende die eerste dienstyd van 'n verflaag van groot belang vir sy latere duursaamheid is.

Wattlekstrak

Bemoedigende resultate is op staal verkry met grondverf wat lood/wattelderivate bevat. In die soutmistoetse veral, het die materiaal hom goed gedra, maar die finale waardebepaling kan alleen geskied op grond van die resultate wat met blootstelling aan die buitelig verkry word.

Lopende werk omvat o.a. kontrolering van verpoeiëring d.m.v. gemengde pigmente, die uitwerking van pigmentvolumekonsentrate op veroudering en die duursaamheid van verskillende media in die buitelig.

previous paragraph, and offers a line now being pursued, which may result in the development of longer lasting paint films. The ability of titanium dioxide to promote oxidation is not limited to dyestuffs and applies also to the oily or resinous binder.

Effect of Season on Rate of Deterioration of Paint

A representative series of paints were prepared, painted out on panels and exposed in Durban at two monthly intervals. As general conclusion it can be stated that those paints which started their exposure at the beginning of the dry season had a life considerably greater than those started in November. The life was generally $1\frac{1}{2}$ times greater, but in extreme cases a factor of 3 was noted. There is no doubt that conditions during the early life of a paint film are of great importance to its subsequent durability.

Wattle Extract

Encouraging results were obtained with primers on steel containing lead/wattle derivatives. In salt spray tests particularly the material has behaved well, but final evaluation must await the results obtained on exterior exposure.

Work in progress includes the control of chalking by mixed pigments, the effect of pigment/volume concentration on ageing, and the exterior durability of different media.

SUIKERFABRIKASIE- NAVORSINGSINSTITUUT

Direkteur: DR. K. DOUWES DEKKER

Die vernaamste ondersoekaangeleenthede was:

- (1) Die neerslagvermoë van gemengde sap wat met kalk behandel en verwarm is;
- (2) Die gehalte van die Natalse ru-suikers;
- (3) Die verbetering van analitiese metodes;
- (4) Kleurverwydering uit ru-suikeroplossings.

SUGAR MILLING RESEARCH INSTITUTE

Director: DR. K. DOUWES DEKKER

The main subjects investigated were:

1. The settling of limed and heated mixed juice;
2. The quality of Natal raw sugars;
3. The improvement of analytical methods;
4. The removal of colour from raw sugar solutions.

Soos in vorige jare is daar roetinedienste aan lede verskaf, o.a. chemiese en fisiese ontleding van produksiemonsters van die suiker en die bepaling van die polarisasie van ru-suiker vir uitvoer. Monsters van die eindmelasse en die tussenprodukte is ook geanaliseer.

Die Instituut het nog steeds heelwat van sy tyd aan raadgewing bestee. Drie-en-vyftig besoeke is by suikerfabrieke afgelê en sewe-en-sewentig tegniese verslae is opgestel.

Week- en maandverslae is weereens oor vervaardigingsgegewens gepubliseer en die verslag oor die jaarlikse opsomming is vir publikasie in die *Proceedings of the S.A. Sugar Technologists' Association Congress* opgestel.

Vier verhandelings is in die reeks „Communications from the S.M.R.I.” gepubliseer en lede van die Instituut se personeel het drie verhandelings op die jaarkongres van die S.A. Sugar Technologists' Association voorgedra. In die „Quarterly Bulletin” is tien verhandelings gepubliseer.

Die Neerslagvermoë van Gemengde Sap met Kalk Behandel en Verwarm

Die studie van die eienskappe van sap wat met kalk behandel en verwarm word—'n onderwerp waaraan S.F.N.I. 'n paar jaar gelede gewerk het, is hervat.

Ons huidige suiweringsstegniek laat nog heelwat te wense oor. Hoewel die fabriek met beter tegnologiese begrip van die proses beter resultate sou kan behaal, moet erken word dat ons kennis van die grondbeginsels van die suiweringsproses nog lank nie afdoende is nie. Ons weet op die oomblik bv. nog nie watter soort sap slaan goed neer en watter nie.

'n Apparaat is gebou met behulp waarvan die neerslagvermoë van sappe bestudeer kan word, eers in die laboratorium en later in party van die fabriek, en 'n groot aantal proefnemings is gedoen. Die resultate van hierdie eerste gedeelte van die ondersoek, wat later voetgesit sal word, sal in die „Quarterly Bulletin” gepubliseer word.

Die Gehalte van Natalse Ru-Suikers

Navorsing op hierdie gebied is hoofsaaklik beperk gewees tot die verwydering van stysel uit gemengde sap. Blykbaar is daar twee metodes om hierdie verwydering te bewerkstellig: meganiese skeiding met behulp van 'n sentrifugale skeier of deur middel van 'n chemiese proses. Die vernaamste beswaar teen die sentrifugale skeier is die enigsins strawwe erosie van die noodsaaklike masjiendele deur sand wat in die

As in previous years, routine services were provided for members. These included the chemical and physical analysis of production samples of sugar and the determination of the polarization of exported raw sugars. Samples of final molasses and intermediate products were also analysed.

Advisory work continued to occupy a great deal of the Institute's time. Fifty-three visits were paid to sugar factories and seventy-seven Technical Reports were prepared.

Weekly and Monthly Reports on manufacturing data were again published and the report on the Annual Summary was prepared for publication in the *Proceedings of the S.A. Sugar Technologists Association Congress*.

In the series “Communications from the S.M.R.I.”, four papers were published and three papers were read by members of the staff of the Institute at the Annual Congress of the S.A. Sugar Technologists Association. In the Quarterly Bulletins, ten papers were published.

The Settling of Limed and Heated Mixed Juice

The study of the settling characteristics of limed and heated juice—a subject upon which preliminary work was done at the S.M.R.I. some years ago—was taken up again.

There is still room for improvement in our present defecation technique. Although better results could be obtained at the factories by a greater technological appreciation of the process, it must be admitted that our knowledge of the basic principles of the defecation process is by no means complete. For example, we do not know at the moment what is a well settling juice and what is a badly settling juice.

An apparatus was built by means of which the settling of juice could be studied and a large number of experiments were run, first in the laboratory and later in some of the factories. The results of this initial part of the investigation, which will be continued later, are to be published in the Quarterly Bulletins.

The Quality of Natal Raw Sugars

Research into this subject has been concentrated mainly on the removal of starch from mixed juice. To achieve this removal, two methods appear to be available: mechanical separation by means of a centrifugal separator, or by use of a chemical process. The main objection to the centrifugal separator is the rather heavy erosion of essential parts in the machine by sand present in the juice. In connection with this, an

sap aanwesig is. In verband hiermee is 'n ondersoek uitgevoer om te bepaal of dit moontlik sou wees om die sand uit gemengde sap met behulp van hidrosyklone te verwyder. By twee verskillende fabriek is twee tipes siklone in verskillende toestande op die proef gestel. Die twee siklone was albei ewe doeltreffend en albei kon 75-80% van die skadelikste growwe sanddeeltjies verwyder. As gevolg van die verkreeë gegewens sal dit hopelik moontlik wees om gedurende 1959 'n volledige proefneming te doen waarby gemengde sap deur 'n groot sentrifugale skeier gestuur word. Hierdie apparaat sal deur voorafgaande gebruik van 'n hidrosikloon teen sanderosie beskerm word.

Ook die chemiese verwydering van stysel is ondersoek. Resultate in 'n Australiese publikasie berig, het getoon dat wanneer gemengde sap op sy natuurlike pH-waarde vir 'n sekere tyd op 70°C gehou word, 'n groot fraksie van die aanwesige stysel deur die ensieme wat van nature in die sap voorkom, ontbind word. Laboratoriumtoetse wat aan die S.F.N.I. uitgevoer is, het die bewering van die Australiese publikasie gestaaf, behalwe dat die hoeveelheid wat verwyder word hoogstens 60% is (in teenstelling met die Australiese syfer van 90%) en dat dit onder hierdie behandeling blyk dat 'n klein persentasie suiker weens inversie verlore gaan. Twee toetse in 'n fabriek het die laboratoriumtoetse gestaaf en blykbaar kan suiker met 'n laer gehalte aan stysel van 40% op die manier vervaardig word.

Hoewel hierdie resultate minder gunstig is as die wat in Australië verkry is, word die ondersoek verder voortgesit.

Verbetering van Analitiese Metodes

Die toetsmetode om die hoeveelheid beskikbare kalk in handelskalk te bepaal, is ondersoek. Dit het geblyk dat die onsuiverhede aanwesig in die suiker wat gebruik is, die resultaat beïnvloed. Reduseersuiker en mangaansoute het die resultate van hierdie ontleding verswak.

'n Nuwe kolorimetriese metode vir die bepaling van reduseersuikers met trifenieltetrazoliumchloried, 2-3-5, is getoets en het blykbaar goed beantwoord vir gebruik op meulwit en geraffineerde suiker. Die resultate volgens hierdie nuwe metode en die ander bestaande metodes het taamlik ooreengekom.

'n Metode vir die bepaling van gesuspendeerde vaste stowwe in oplossings van ru-suiker is ondersoek. Fyn gesuspendeerde stowwe in ru-suikeroplossings, wat soms as kolloïdaal van aard beskrywe kan word, is die hooforsaak van filtreermoeilikhede in raffinaderye. Die Javaanse Proefstasie het voor die oorlog 'n metode aangewend waarby hierdie fyn gesuspendeerde stof volumetries bepaal is deur oplossings van ru-suiker in buise met 'n smal, gekalibreerde verlenging aan die

investigating was carried out to determine the possibility of removing sand from mixed juice by hydrocyclones. Two types of cyclones were tried at two different factories under different conditions. Both cyclones showed the same efficiency and both were able to remove 75-80% of the most damaging coarser sand particles. As a result of the data obtained, it is hoped that during 1959 it will be possible to conduct a complete test in which mixed juice is passed through a large type of centrifugal separator. This apparatus will be protected from sand erosion by the prior use of a hydrocyclone.

The chemical removal of starch was also investigated. In an Australian publication, results were given which showed that when mixed juice is kept for a certain time at 70°C at its natural pH, a large fraction of the starch present is decomposed by the enzymes naturally present in the juice. Laboratory tests carried out at the S.M.R.I. confirmed the Australian claim, except that the amount of starch removed did not exceed 60% (as opposed to the Australian figure of 90%) and it was found that, under this treatment, a small percentage of sugar is lost due to inversion. The laboratory tests were confirmed in two factory tests and it was found that it is possible to manufacture sugar by this means with a 40% lower starch content.

Although these results are less favourable than those obtained in Australia, the investigation will be continued.

Improvement of Analytical Methods

The method for testing the amount of available lime in commercial lime was investigated. It was shown that the impurities in the sugar used for the determination had an effect on the result. Reducing sugars and manganese salts lowered the results of this analysis.

A new colorimetric method for the determination of reducing sugars with 2-3-5 triphenyl tetrazolium chloride was tested and appeared to be satisfactory for use on mill white and refined sugar. Fair agreement was obtained between this new method and the other existing methods.

A method for the determination of suspended solids in raw sugar solutions was investigated. Finely suspended matter in raw sugar solutions, the nature of which can sometimes be described as colloidal, is the main cause of filtration difficulties in refineries. A method was employed by the Java Experiment Station before the War, by which this finely suspended matter was determined volumetrically by centrifuging solutions of raw sugar in tubes with a narrow, calibrated

onderent te sentrifugeer. In gestandaardiseerde toestand kon die volume van die gesuspendeerde stowwe dus bepaal en die verskillende ru-suikers op dié manier vergelyk word. Die uitslag van die toets is ongetwyfeld van regstreekse praktiese belang. Aangesien die gestandaardiseerde Javaanse metode nie presies gevolg kon word in S.F.N.I. se analitiese laboratorium nie, is 'n nuwe standaardisering van hierdie metode ontwikkel. Die resultate van die toets sal gepubliseer word.

Verwydering van Kleur uit Ru-suikeroplossings

Na aanleiding van klagtes in verband met sekere Natalse ru-suikers, waarvan die kleur tydens normale raffineringswerk moeilik verwyder kan word, is 'n ondersoek aangepak waarby oplossings van geaffineerde ru-suikers met verskillende absorberingsmiddels behandel is. Die verwagting was dat verskille tussen ru-suikers op dié manier opgespoor sou kon word en ook in die aard van die gekleurde verbindings wat verwyder word en dié wat in die suikeroplossing agterbly. Filtrering deur 'n aluminakolom het geen verskil in die aard van die verwyderde gekleurde stof en dié wat in die oplossing agtergebly het, aan die lig gebring nie.

Ander werk wat gedoen is, het gegaan oor ontkleuring met plantaardige koolstof. Die adsorpsie-isoterm het, toe dit logaritmes in 'n grafiek uitgesit is, 'n diskontinuiteit in plaas van 'n reguit lyn gegee, wat moontlik met die aanwesigheid van stysel verband hou. By twee oorsese suikers het hierdie diskontinuiteit nie voorgekom nie. Die ondersoek word later voortgesit.

extension at the bottom. Under standardized conditions, it was thus possible to measure the volume of the suspended matter, and in this way, to compare various raw sugars. There is no doubt that the outcome of the test is of direct practical importance. Since the standardized Java method could not be exactly followed in the S.M.R.I. analytical laboratory, a new standardization of this method has been developed. The results of the test will be published.

Removal of Colour from Raw Sugar Solutions

In connection with complaints concerning some Natal raw sugars, the colour of which is difficult to remove in normal refining operations, an investigation was commenced in which solutions of affined raw sugars were treated with different absorbents. It was hoped that in this way differences between raw sugars could be detected and also between the nature of the coloured compounds which were removed and those which were retained in the sugar solution. Filtering through a column of alumina failed to reveal any difference between the nature of the coloured material removed and that retained in the solution.

Further work involved decolourization with vegetable carbon. The adsorption isotherm, when plotted logarithmically, resulted in a discontinuity instead of a straight line, which might be connected with the presence of starch. Two overseas sugars did not show this discontinuity. The investigations will be continued later.

SUID-AFRIKAANSE WOLTEKSTIEL- NAVORSINGSINSTITUUT

Direkteur: DR. C. C. KRITZINGER

In baie opsigte het die afgelopen jaar 'n keerpunt in die ontwikkeling van die Instituut belewe. Voorheen het daar slegs 'n algemene beeld bestaan van hoe die Instituut die nywerhede wat hy moet dien, tot hulp kan

SOUTH AFRICAN WOOL TEXTILE RESEARCH INSTITUTE

Director: DR. C. C. KRITZINGER

In many respects the past year marked a turning point in the Institute's development. Previously there had existed only a general picture of how the Institute could assist the industries it is to serve and of the

wees en van die fasiliteite wat nodig sou wees. In die jaar het sekere aangeleenthede te voorskyn getree in verband met geldelike steun in die toekoms, wat 'n duidelike, uitvoerige plan vereis het.

Die Beheerraad het heelwat van sy beraadslagings gewy aan 'n hernude uitgebreide en intensiewe ondersoek van die behoeftes aan so 'n instituut in Suid-Afrika. Toe dit buite alle twyfel vasgestel is, is daar beraadslaag oor watter gebied gekies moes word, en ook oor die fisiese fasiliteite wat nodig sou wees in die vorm van geboue, proefinstalleringe, laboratoriumtoerusting en -personeel, en verder oor die finansiering van die heelwat groter skema wat tans beoog word.

In 1957 het prof. J. B. Speakman van die Universiteit van Leeds Suid-Afrika op uitnodiging van die Suid-Afrikaanse Wolraad besoek om raad te gee oor die moontlike oprigting van 'n navorsingsinstituut en sy raad is weer gedurende die afgelope jaar gesoek. Prof. Speakman het 'n hele paar dae aan die Instituut deurgebring om hom op hoogte te bring van al die aspekte van die voorgestelde skema en het daarna met die Beheerraad vergader om sake uitvoerig te bespreek.

Later het die Beheerraad sy planne voorgelê aan die staande Komitee vir Industriële Navorsingsinstitute wat 'n paar jaar gelede ingestel is deur die Wetenskaplike en Nywerheidsnavorsingsraad deur wie se bemiddeling die Instituut geldelike steun van die Regering ontvang. Die Staande Komitee het na 'n uitvoerige ondersoek van die planne besluit dat dit wel die behoeftes van die plaaslike wolwekers- en wolvervaardigingsnywerhede behoorlik sou kon behartig en het daarna die planne vir finale goedkeuring deur die W.N.N.R. aanbeveel. Op die oomblik word onderhandelings gevoer oor spesiale geldelike steun van die Regering deur bemiddeling van die W.N.N.R., ten einde die ontwikkelingskema onmiddellik aan die gang te sit.

Personeel en Toerusting

In afwagting van die uitslag van hierdie ondersoek en die herbeplanning van die Instituut, is 'n konsolideringsbeleid ten opsigte van personeelsterkte en fisiese fasiliteite gevolg. Wat nuwe aanstellings betref, is slegs twee laboratoriumassistentes in diens geneem, terwyl 'n reeds bestaande vakante pos in die navorsingspersoneel voorlopig nie gevul is nie. Gedurende die jaar is laboratorium- en werkwinkeltoerusting ter waarde van slegs £3,000 aangeskaf, wat alleen die noodsaaklikste behoeftes dek.

Finansies

Ten spyte van die feit dat die afgelope jaar in die geval van die meeste ondertekenaars van die Instituut slegs maar 'n derde of 'n vierde van die vyfjaarsiklus verteenwoordig en dat daar geen aanmerklike verhoging was in die bydraes wat normalerwys verwag

facilities that would be required. During the year, however, certain matters arose relating to future financing which necessitated a clear and detailed plan.

The Board of Control devoted much of its deliberations to a renewed extensive and intensive examination of the need for such an Institute in South Africa. When this had been established beyond all doubt, the field of research to be undertaken was considered, as well as the physical facilities required in the form of buildings, pilot plant, laboratory equipment and staff, and the financing of the much larger scheme now envisaged.

In 1957, at the invitation of the South African Wool Board, Prof. J. B. Speakman of Leeds University visited South Africa to advise upon the possible establishment of a research institute, and his advice was again sought during the past year. Prof. Speakman spent several days at the Institute to acquaint himself with all facets of the proposed scheme and then met the Board of Control for detailed discussions.

Later the Board of Control presented its blueprint to the Standing Committee for Industrial Research Institutes set up some years ago by the Council for Scientific and Industrial Research through whom the Institute receives financial support from the Government. The Standing Committee, after examining the plans in detail, was satisfied that they would give proper effect to the needs of the local wool growing and manufacturing industries, and then recommended the plans for final approval by the C.S.I.R. Negotiations are currently in progress to obtain special Government financial support via the C.S.I.R. to enable the development scheme to be embarked upon without delay.

Staff and Equipment

Pending the outcome of these investigations and the replanning of the Institute, a policy of consolidation was followed with regard to the staff complement and physical facilities. New appointments comprised only two laboratory assistants, whilst a previously existing vacancy on the research staff was provisionally allowed to stand. Laboratory and workshop equipment, books and journals and furniture to a value of only £3,000 were acquired during the year, representing essentials only.

Finances

Despite the fact that the past year represented, in the case of most subscribers to the Institute, only the third or fourth of the current five-year cycle, and that therefore no marked increases in contribution could normally be expected, income from contributions increased by

kan word nie, het die inkomste uit bydraes byna 50 persent bo die syfer van die vorige jaar, n.l. £30,000 gestyg tot 'n nuwe rekordtotaal van £44,000, hoofsaaklik as gevolg van spesiale toekennings.

Van hierdie bedrag was £25,000 vir die lopende uitgawes en £3,000 vir kleiner kapitaalgoedere nodig, terwyl die res as reserwe gehou is om kapitaalbedrae af te betaal op geboue wat 'n tyd gelede van Rhodes-universiteit aangekoop is.

Navorsing

Die Instituut het steeds aan sy uitgesproke doel beantwoord, n.l. om as skakel tussen wolkweker en fabrikant te dien, omdat die vernaamste stelling by die navorsingswerk 'n poging behels om die spesiale bewerkingseienskappe van die plaaslike wolskeersel beter te begryp. Besonderhede verskyn in die volledige Jaarverslag van die Instituut.

By die bestudering van die verviltbaarheid van Suid-Afrikaanse wol het dit geblyk dat, in vergelyking met soortgelyke Australiese wol, oormatige verviltbaarheid o.a. aan oormatige verwerking te wyte is, en dat hierdie faktor alle ander faktore in belangrikheid, soos fynheid en skubbigheid, oortref. Dit het geblyk dat wol met minder kartelings per duim vir 'n gegewe veseldiameter gereedliker vervilt.

Na aanleiding van laasgenoemde opmerking het 'n voorlopige ondersoek van sowat 500 wolmonsters aangedui dat die plaaslike wolskeersel tans sterker karteling toon as toe Duerden 'n dertig jaar gelede die verwantskap tussen karteling en veseldiameter ondersoek het. Hierdie beskouing kom daarop neer dat die skeersel gemiddeld heelwat fyner is as wat die karteling aandui. Met die oog op die belangrikheid van so 'n neiging vir die teelbeleid en die bewerkbaarheid van die woloes, word 'n studie onderneem om die omvang en verspreiding van hierdie afwyking vas te stel.

Aangesien wolverwerking o.a. die verspreiding en ook die soort swawelbindings in die keratien beïnvloed, is 'n senior navorsingsbeampte oorsee gestuur om 'n spesiale ondersoek te doen van die metodes wat vir die studie van swawel aangewend word. Daarvoor het hy as grondstof monsters Suid-Afrikaanse wol gebruik.

In die jaar is 'n poging aangewend om deur middel van studie feite te soek wat 'n aanknopingspunt tussen verwerking en spesifieke eienskappe van die ru-wol sou vorm. Uit hierdie werk is dit nou bekend dat wol van die teerpunttipe slegs minimale verwerking ondergaan, wat daarop dui dat die soort wolvet en die verspreiding daarvan miskien van belang kan wees. Aangesien hierdie faktore op hulle beurt verband hou met voeding en klimaatstoestande, is 'n verdere projek in die jaar begin om te bepaal in watter mate 'n verandering in die omgewingstoestande die verweringsneiging by die skaap sou verander.

nearly 50 per cent over the previous year's figure of £30,000 to a new record total of £44,000, largely as a result of special grants.

Of this amount, £25,000 was required for current expenditure and £3,000 for minor capital goods, whilst the remainder was reserved to meet capital payments on buildings acquired some time ago from Rhodes University.

Research

The Institute continued to give effect to its express objective of providing a link between grower and manufacturer, the main theme of the research work being an attempt to more fully understand the special processing characteristics of the local clip. Details can be found in the Institute's complete Annual Report.

In a study of the feltability of South African wools, it was shown that, in comparison with similar Australian wools, excessive feltability was due *inter alia* to excessive weathering, this factor overriding in importance all others, such as fineness and scaliness. It was also found that for a given fibre diameter, wools with fewer crimps per inch felted more readily.

Arising from this latter observation a preliminary investigation of about 500 samples of wool indicated that the local clip shows much stronger crimping now than when Duerden investigated the relationship between crimp and fibre diameter some thirty years ago. In effect this observation means that the clip is on an average considerably finer than the crimp would indicate. In view of the importance of such a tendency to breeding policy and the processing properties of the clip, a detailed study will have to be undertaken to establish the magnitude and the distribution of the deviation.

Since weathering of wool affects *inter alia* the distribution and types of sulphur compounds in the keratin, a senior research officer was sent overseas to make a special investigation of methods used for sulphur studies, using as his raw material selected samples of South African wool.

A fact-finding study was started during the year in an attempt to correlate weathering with specific properties of the raw wool. From this work it is now known that wool of the tar-tip type undergoes only a minimum of weathering, indicating that the type and distribution of the wool grease may be of importance. Since these factors in turn are related to feeding and climatic conditions, a further project was started during the year to establish to what extent a change in environmental conditions would alter the weathering tendency in sheep.

'n Ondersoek na die sorpsie van 'n suur en 'n alkali het bewys dat sybokhaar en wol baie eenders op 'n suur reageer, maar dat wol deur 'n alkali makliker beskadig word. Volgens die groot ooreenkoms tussen die twee krommes wil dit voorkom dat die twee vesels se amfoteriese eienskappe eenders is en dat die gehalte aan dikarboksielsuur en twee basiese sure miskien groot ooreenkoms toon. Die aanmerklike verskil in die gedrag van die twee vesels onder nywerheidsbewerking kan dus nie aan verskille in gedrag teenoor suur en alkali toegeskryf word nie.

Gedurende die jaar is werk i.v.m. wolwassery sowel in die laboratorium as in 'n proefinstallasie weer voortgesit, veral ten opsigte van die doeltreffendheid van verskeie wasmiddels met betrekking tot die koste daaraan verbode.

Daar is voortgegaan met die werk aan vloeistowwe vir die merk van skape, veral met die ontwikkeling van 'n vloeistof wat vinnig droog, wat nie loop as die skaap nat word nie, maar wat tog maklik uitwas.

'n Uitvoerige ondersoek van somer- en wintersybokhaarskeersels het geen verskille getoon wat groot genoeg is om die prysverskil in die twee skeersels te verklaar nie. Daar word algemeen erken dat die bekendmaking van hierdie bevindings 'n aanmerklike invloed op die prys van wintersybokhaar gehad het.

An investigation of the sorption of acid and alkali showed that mohair and wool react very similarly towards acid, but that wool suffers alkali damage more easily. The close similarity of the two titration curves suggests that the two fibres are alike in amphoteric properties and that their content of dicarboxylic and dibasic amino acids may be very close. The marked difference in behaviour of the two fibres in industrial processing can therefore not be attributed to differences in acid-alkali behaviour.

Further laboratory as well as pilot-scale work on scouring of wool was done during the year, particularly with regard to the efficiency of various scouring agents in relation to cost.

Work was continued on sheep branding fluids, particularly with regard to developing a fluid which will dry quickly, which will not run when the sheep become wet, but which will still scour out readily.

A detailed investigation of summer and winter mohair clips failed to reveal differences of sufficient magnitude to account for the differentiation in price between the two clips. It is generally acknowledged that the publication of these findings had a marked effect upon the price of winter mohair.

RESEARCH BURSARIES and ASSISTANTSHIPS

awarded by the C.S.I.R. during 1959

NAVORSINGSBEURSE en ASSISTENTSKAPPE

wat deur die W.N.N.R. gedurende 1959 toegeken is

GENERAL RESEARCH—ALGEMENE NAVORSING

BURSARIES—BEURSE

SENIOR BURSARIES/SENIOR BEURSE

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|-------------------------------|---|
| BARNARD, K. H. M.A., D.Sc. Hon. Worker S.A. Museum £650 | South African Museum | Revision of S.A. Marine Mollusca. (Previous awards 1957-1958.) <i>Hersiening van S.A. Seeweekdiere. (Vorige toekennings 1957-1958.)</i> |
| BOTTO, Dr. G. D. L. D.Ph. Research Worker £480 | Transvaal Museum, Pretoria | Catalogue of Southern African Coleoptera. (Previous awards 1954-1958.) <i>Katalogus van die Coleoptera van Suidelike Afrika. (Vorige toekennings 1954-1958.)</i> |
| EWER, Dr. (Mrs.) R. F. B.Sc., Ph.D. Research Bursar £250 | Rhodes University | Study of fossil reptile genus <i>Euparkeria</i> . (Previous awards 1955-1957.) <i>Studie van die fossielreptielgenus Euparkeria. (Vorige toekennings 1955-1957.)</i> |
| JUBB, R. A. B.Sc. Scientific Assistant £300 | Rhodes University | The freshwater fishes of Southern Africa with particular attention to the study of the biology of the freshwater eels. (Previous awards 1957-1958.) <i>Die varswatervisse van Suidelike Afrika met spesiale aandag aan die studie van die biologie van die varswaterpalings. (Vorige toekennings 1957-1958.)</i> |
| OMER-COOPER, Dr. (Mrs.) J. B.A., Ph.D. Lecturer in Zoology £550 | Rhodes University | Dytiscidae of Southern Africa. (Previous award 1955-1958.) <i>Ditiscidae van Suidelike Afrika. (Vorige toekennings 1955-1958.)</i> |
| PILLANS, N. S. Research Worker, Bolus Herbarium £600 | University of Cape Town | A taxonomic revision of the genus <i>Hermannia</i> (Sterculiaceae). Taxonomic study of the remaining 230 species of the genus towards elucidating their identity and specific limits and to determine their distribution patterns in Southern Africa. (Previous award 1958.) <i>'n Taksonomiese hersiening van die genus Hermannia (Sterculiaceae). Taksonomiese studie van die orge 230 spesies van die genus ter toeligting van identiteit en spesifieke grense en om die verspreidingspatroon daarvan in Suidelike Afrika te bepaal. (Vorige toekennings 1958.)</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|---|--|
| SMITH, Prof. J. L. B. B.A., M.Sc., Ph.D., F.R.S.(S.A.) Research Professor £1,620 | Rhodes University | Fishes. (Previous award 1947-1958.) <i>Visse. (Vorige toekenning 1947-1958.)</i> |
| VAN DEN BOS, W. H. D. Maths. & Physics Astronomer £600 | Union Observatory, Johannesburg | Micrometer measures and orbits of double stars. <i>Mikrometermetings en bane van dubbelsterre.</i> |
| WINTERBOTTOM, Dr. J. M. B.Sc., Ph.D. Senior Bursar £600 | University of Cape Town | Geographical and Ecological distribution of birds in the Eastern Cape Province. (Previous awards 1957-1958.) <i>Geografiese en Ekologiese verspreiding van voëls in die Oos-Kaapprovinsie. (Vorige toekennings 1957-1958.)</i> |
| <i>SENIOR BURSARIES OVERSEAS/SENIOR BEURSE OORSEE</i> | | |
| BRAAE, R. N. M.Sc., B.Sc., (Toegep. Wisk.) Beurshouer £800 | University of Wisconsin | A critical study of the diacoptic method of analysis of complicated compound electromechanical systems. <i>'n Kritiese studie van die diakoptiese metode van analise van ingewikkelde samegestelde elektromeganiese sisteme.</i> |
| SIMON, H. A. B.Sc. (Eng.), D.C.Ae. Research Bursar £300 | Minnesota University | Heat transfer in fluid flow. <i>Warmte-oordrag in stromingsvloei.</i> |
| SMITH, J. G. M.Sc. Student-beurshouer £300 | Phytopathologisch Laboratorium, Baarn, Ned. | The antagonistic characteristics of some soil moulds and their influence on <i>Thielaviopsis basicola</i> . <i>Die antagonistiese eienskappe van sommige grondskimmels en hul invloed op Thielaviopsis basicola.</i> |
| VAN DER SPUY, E. B.Sc.(Ing.), Ph.D. Senior Lektor £600 | Max-Planck Institut für Physik, München, e.a. | The Theory of fundamental particles and their interactions, and thermonuclear work. (Previous award 1954-1955.) <i>Die Teorie van fundamentele partikels en hulle interaksies, en termokernwerk. (Vorige toekenning 1954-1955.)</i> |
| <i>STUDENT BURSARIES/STUDENTEBEURSE</i> | | |
| <i>Biology/Biologie</i> VAN EEDEN, D. M.Sc. £300 | University of Cape Town | A study of the Antigens of <i>Pseudomonas aeruginosa</i> . <i>'n Studie van die Antigene van Pseudomonas aeruginosa.</i> |
| <i>Botany/Plantkunde</i> BENADE, A. B.Sc. £220 | Universiteit van Stellenbosch | Anatomic investigation of the follicle glands in some selected specimens of the S.A. Rutaceae and Compositae. <i>Anatomiese ondersoek van die oliekliere by 'n paar gekose voorbeelde van die S.A. Rutaceae en Compositae.</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|---|---------------------------------|--|
| DYER, T. A. B.Sc. £250 | University of Natal | A Physiological Study of ferns. <i>'n Fisiologiese studie van varings.</i> |
| HOLLAND, P. E. B.Sc. £125 | University of the Witwatersrand | A Project in Biochemistry. <i>'n Projek in Biochemie.</i> |
| JOUBERT, A. F. B.Sc. £125 | Universiteit van Stellenbosch | An investigation of the profit-earning capacity of private afforestation with <i>P. patula</i> Schl. et Cham. in the Eastern Transvaal. <i>'n Ondersoek na die winsgewendheid van privaat bebossing met P. patula Schl. et Cham. in die Oos-Transvaal.</i> |
| MARTIN, P. M. D. B.Sc. (Hons.) £250 | Rhodes University | Study of selected genera of S.A. wood fungi with particular reference to their characteristics of culture. (Previous award 1958.) <i>Studie van uitgesoekte genera van S.A. houtswamme met besondere verwysing na hulle kultuureienskappe. (Vorige toekening 1958.)</i> |
| ROOS, N. B.Sc. £125 | University of the Witwatersrand | A Project in Biochemistry. <i>'n Projek in Biochemie.</i> |
| <i>Chemistry/Skeikunde</i> BROWN, M. E. B.Sc. £125 | University of the Witwatersrand | Use of cation-exchange resins as condensing agents in organic reactions. <i>Die gebruik van katoonuitruilingsharse as kondenseermiddels in organiese reaksies.</i> |
| BULL, J. R. B.Sc. £125 | University of Natal | Wood Chemistry. <i>Houtchemie.</i> |
| BURGER, B. V. B.Sc. £220 | Universiteit van Stellenbosch | Composition of ammonium phosphomolybdate precipitated from solutions with a slight excess of molybdate. <i>Samestelling van ammoniumfosfomolibdaat neergeslaan uit oplossings met geringe oormaat molibdaat.</i> |
| COETZEE, C. J. B.Sc. £220 | Universiteit van Stellenbosch | Solubility of ammonium phosphomolybdate precipitate in ammonium nitrate in the absence of excess molybdate. <i>Oplosbaarheid van ammoniumfosfomolibdaatneerslag in ammoniumnitraat in afwesigheid van oormaat molibdaat.</i> |
| CHRISTENSEN, W. P. B.Sc. £125 | University of the Witwatersrand | A topic in the field of polarography. <i>'n Onderwerp op die gebied van polarografie.</i> |
| CONRADIE, W. J. B.Sc. £125 | Universiteit van Stellenbosch | A project in Anorganic Chemistry. <i>'n Projek in anorganiese chemie.</i> |
| COTTON, T. H. B.Sc. £125 | University of the Witwatersrand | Synthesis in Organic Chemistry. <i>Sintese in organiese chemie.</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|---------------------------------|---|
| CROWTHER, P. B.Sc. (Hons.) £250 | University of Natal | Thermal diffusion in liquids. (Previous award 1958.) <i>Warmteverspreiding in vloeistowwe. (Vorige toekening 1958.)</i> |
| DEKKER, J. B.Sc. (Hons.) £250 | Universiteit van O.V.S. | The Study of the Mechanisms of the organic chemical reactions. (Previous award 1957.) <i>Die studie van die Meganismes van die organiese chemiese reaksies. (Vorige toekening 1957.)</i> |
| DU PLESSIS, L. A. B.Sc. £250 | University of Cape Town | Separation of Nitrogen Isotopes by gas chromatography. <i>Skeiding van Stikstofisotope deur middel van gaschromatografie.</i> |
| EDGE, R. A. M.Sc. £300 | University of Cape Town | The quantitative analysis of trace elements in rocks. <i>Die kwantitatiewe ontleding van spoorelemente in rotse.</i> |
| EGGERS, S. H. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| FARRER, H. N. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| FISHER, J. B. B.Sc. (Hons.) £250 | University of the Witwatersrand | A study of silica alumina-catalysts, with special reference to the correlation between the acidity and activity of the catalyst. <i>'n Studie van silika-aluminakatalisators met besondere verwysing na die korrelasie tussen die suurgehalte en die aktiwiteit van die katalisator.</i> |
| FROST, J. B. B.Sc. £125 | University of the Witwatersrand | Project in Organic Chemistry. <i>'n Projek in Organiese Chemie.</i> |
| GARBUTT, D. C. F. B.Sc. (Hons.) £250 | University of Natal | Constitutional studies in the alkaloids of the amaryllidaceae. (Previous award 1958.) <i>Konstitusionele ondersoek van die alkaloiëde van die amaryllidaceae. (Vorige toekening 1958.)</i> |
| GROSSERT, J. S. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| HARDING-BARLOW, I. B.Sc. £250 | University of Cape Town | Techniques in the detection of trace metals in Biological materials. <i>Tegnieke by die opsporing van spoormetale in Biologiese materiaal.</i> |
| HARWOOD, J. E. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| HAWKSWORTH, W. A. B.Sc. (Hons.) £250 | University of Natal | Studies on Non-isothermal cells. (Previous award 1958.) <i>Studie van nie-isotermiese selle. (Vorige toekening 1958.)</i> |
| HELPER, W. E. B.Sc. £250 | University of Natal | Physico-chemical properties of gas mixtures. (Previous award 1958.) <i>Fisiochemiese eienskappe van gasmengsels. (Vorige toekening 1958.)</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|---------------------------------|---|
| HERBERT, R. B. B.Sc. £125 | University of Cape Town | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| HERLEY, P. J. B.Sc. (Hons.) £250 | Rhodes University. | The thermal decomposition of Rubidium and Caesium Permanganates and the effects of pre-irradiation. (Previous award 1957.) <i>Die termiese ontbinding van rubidium- en sesiumpermanganaat en die uitwerking van voorbestraling. (Vorige toekening 1957.)</i> |
| HOEKSTRA, R. G. B.Sc. £250 | University of Pretoria | Study of effects of flow patterns on reaction rates at inlet to tubular reactors. <i>Studie van die uitwerking van vloeipatrone op reaksietempo by die inlaat van buisreaktors.</i> |
| JOHN, E. V. O. B.Sc. (Hons.) £250 | University of the Witwatersrand | Alkaloids with hypertensive properties. (Previous award 1956-1957.) <i>Alkalotiede met hipertensiewe eienskappe. (Vorige toekening 1956-1957.)</i> |
| KENWAY, C. H. B.Sc. £125 | University of Natal | Some experiments on smoke precipitation with a water spray. <i>Proefnemings i.v.m. rookneerslag met 'n waterspuit.</i> |
| LAING, M. J. B.Sc. £125 | University of Natal | Action of light on Silver Salts. <i>Inwerking van lig op silwersoute.</i> |
| LE ROUX, H. M.Sc. £250 | University of the Witwatersrand | Research in the field of kinetics of electron transfer reactions. <i>Navorsing op die gebied van die kinetika van elektrone-oorgangsreaksies.</i> |
| LOMBARD, J. H. B.Sc. £125 | Universiteit van Stellenbosch | A project in physical chemistry. <i>'n Projek in fisiese chemie.</i> |
| MCINTOSH, S. C. B.Sc. £250 | University of Cape Town | Behaviour of weak acid ion exchange resins in Basic Solvents. (Previous award 1958.) <i>Gedrag van swak suurioonruilingsharse in basiese oplosmiddels. (Vorige toekening 1958.)</i> |
| MARX, A. B.Sc. £125 | Universiteit van Stellenbosch | A project in organic chemistry. <i>'n Projek in organiese chemie.</i> |
| MOELWYN-HUGHES, J. T. B.Sc. (Hons.) £250 | University of Natal | Polarographic analysis. (Previous award 1957-1958.) <i>Polarografiese ontleding. (Vorige toekening 1957-1958.)</i> |
| NOURSE, H. H. E. B.Sc. £250 | University of Natal | High Temperature gas viscosities. (Previous award 1958.) <i>Gasviskositeit by hoë temperature. (Vorige toekening 1958.)</i> |
| OLIVIER, C. B.Sc. £220 | Universiteit van Stellenbosch | Exchange of phosphate ions between ammonium phosphomolybdate in solution. <i>Uitruiling van fosfaatione tussen ammoniumfosfomolibdaat in oplossing.</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|---------------------------------|--|
| PHILPOTTS, C. A. R. B.Sc. £83.6.8 | Rhodes University | Construction of a polarograph of increased sensitivity and selectivity and application to the determination of certain trace elements. <i>Konstruksie van 'n polarograaf van verhoogde gevoeligheid en selektiwiteit en die toepassing daarvan om sekere spoorelemente te bepaal.</i> |
| RADZIWILL, A. B.Sc. (Hons.) £250 | University of the Witwatersrand | Some experiments on the lengthening of the carbon chain of fatty acids. (Previous award 1958.) <i>Proefnemings i.v.m. die verlenging van die koolstofketting van vetsure. (Vorige toekenning 1958.)</i> |
| RUDOLF, I. H. B.Sc. (Hons.) £250 | University of the Witwatersrand | Determination of heats of adsorption of nitrogen on transition element nitrides and phosphides. (Previous award 1958.) <i>Bepaling van stikstofadsorpsiehitte by oorgangselementnitriede en -fosfiede. (Vorige toekenning 1958.)</i> |
| SAUNDERS, G. R. B.Sc. £105 | Universiteit van Stellenbosch | Studies on new methods for the manufacture of particle boards from wood and wood waste. (Previous award 1958.) <i>Studie van nuwe metodes vir die vervaardiging van korrelbord van hout en houtafval. (Vorige toekenning 1958.)</i> |
| SCHNEIDER, D. F. M.Sc. £300 | Universiteit van Stellenbosch | The epoxidation of conjugated double bond systems. (Previous award 1958.) <i>Die epoksidasie van gekonjugeerde dubbelbindingssteme. (Vorige toekenning 1958.)</i> |
| SIMPSON, C. E. B.Sc. £250 | University of Natal | Study of the alkaloids of the Amaryllidaceae. (Previous award 1958.) <i>Studie van die alkaloïede van die Amaryllidaceae. (Vorige toekenning 1958.)</i> |
| SPRUYT, J. E. L. B.Sc. £125 | Rhodes University | A study of the active principle of <i>Gonioma Kamassi</i> . <i>Studie van die aktiewe beginsel van Gonioma Kamassi.</i> |
| TORRANCE, J. D. B.Sc. (Hons.) £250 | University of the Witwatersrand | A chemical investigation of Cucurbitacin. (Previous award 1958.) <i>'n Chemiese ondersoek van kukurbitasien. (Vorige toekenning 1958.)</i> |
| VAN MAARSEVEEN, G. B.Sc. (Hons.) £250 | University of Natal | Absolute configurational studies of the Senecio alkaloids. (Previous award 1958.) <i>Studie van die absolute konfigurasie van die Senesienalkaloïede. (Vorige toekenning 1958.)</i> |
| WEIR, A. J. M. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| WELKE, H. J. F. H. D. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |
| YATES, K. C. B.Sc. £125 | University of Natal | A Project in Chemistry. <i>'n Projek in Chemie.</i> |

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|--|---------------------------------|--|
| <p><i>Chemical Engineering/ Chemiese Ingenieurswese</i></p> <p>BROADBRIDGE, G. W. B.Sc. £125</p> | University of Natal | <p>A Project in Chemical Engineering. <i>'n Projek in Chemiese Ingenieurswese.</i></p> |
| <p>CHANGFOOT, J. M.Sc. (Chem. Eng.) £250</p> | University of the Witwatersrand | <p>A study of the Catalytic decomposition of Ammonia on pentavalent compounds of the 1st series transition elements. <i>'n Studie van die katalitiese ontbinding van ammonia by vyfwaardige verbindings van oorgangselemente van die eerste reeks.</i></p> |
| <p>GLUCKMAN, H. L. B.Sc. (Chem. Eng.)</p> | University of the Witwatersrand | <p>The improvement of interfacial mass transfer by high-frequency pulsing in continuous counter-current liquid-liquid extraction. <i>Die verbetering van tussenvlakmassa-oordrag d.m.v. hoëfrekwensieskommeling by kontinue teenstroom-vloeistof-uit-vloeistofekstraksie.</i></p> |
| <p>GOLTZ, G. E. M.Sc. (Chem. Tech.) £300</p> | University of Natal | <p>Interface Phenomena in liquid-liquid extraction. (Previous award 1956.) <i>Tussenvlakverskynsels by vloeistof-uit-vloeistofekstraksie. (Vorige toekenning 1956.)</i></p> |
| <p>KING, R. P. B.Sc. (Chem. Eng.) £250</p> | University of the Witwatersrand | <p>Mass transfer of co-efficients in absorption columns for processes involving a chemical reaction. <i>Massa-oordrag van koëffisiënte in absorpsiekolomme vir prosesse waarby 'n chemiese reaksie plaasvind.</i></p> |
| <p>MCGILL, W. J. B.Sc. (Chem. Eng.) £250</p> | University of the Witwatersrand | <p>An investigation of transition element borides from Ti to Ni as catalysts for conversion of Co and H₂ to CH₃OH. <i>'n Onderzoek van oorgangselementboriede van Ti tot Ni as katalisators vir die omsetting van Co en H₂ in CH₃OH.</i></p> |
| <p>MULLER, P. J. B.Sc. (Chem. Eng.) £250</p> | University of the Witwatersrand | <p>The investigation of fluidised beds with reference to the system: calcium oxide and chlorine. <i>Onderzoek van vloeibaar gemaakte lae met betrekking tot die stelsel: kalsiumoksied en chloor.</i></p> |
| <p>PREEN, B. V. M.Sc. (Chem. Tech.) £300</p> | University of Natal | <p>Removal of Mercaptans from spent caustic by Neutralisation with flue gas. (Previous awards 1957-1958.) <i>Verwydering van merkaptane uit uitgeputte bytmiddels deur neutralisering met rookgas. (Vorige toekennings 1957-1958.)</i></p> |
| <p>SWANEPOEL, H. J. B.Sc. (Civil Eng.) £250</p> | University of the Witwatersrand | <p>The study of methods of extending Streamflow data. <i>Studie van metodes om gegewens oor stroomvloeit te brei.</i></p> |
| <p><i>Civil Engineering/ Siviele Ingenieurswese</i></p> <p>BURLAND, J. B. B.Sc. £250</p> | University of the Witwatersrand | <p>Analysis of stream flow in the summer rainfall area of South Africa. <i>Ontleding van stroomvloeit in die somerreënvalgebied van Suid-Afrika.</i></p> |

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|--|---------------------------------|--|
| PRINS, F. X. B.Sc. (Siviele Ing.) £220 | Universiteit van Stellenbosch | Relation between specific surface of clays and their engineering properties. <i>Verband tussen soortgelyke oppervlaktes (specific surface) van kleie en hul ingenieurseienskappe.</i> |
| <i>Electrical Engineering/ Elektriese Ingenieurswese</i> ASHPOLE, F. V. B.Sc. £250 | University of Cape Town | Development of Electronic Measurement devices for harmonic analysis. <i>Ontwikkeling van elektroniese meettoestelle vir die ontleding van botrillings.</i> |
| GUELKE, C. B. B.Sc. (Elec. Eng.) £250 | University of Cape Town | Investigation into methods of improving the starting torque of Induction Motors. <i>Ondersoek na metodes om die aansitdraaimoment van induksiemotore te verbeter.</i> |
| HEMP, R. B.Sc. (Electr. Eng.) £250 | University of the Witwatersrand | A Study of phase relationships in output stage distortion. <i>'n Studie van faseverhoudings by vervorming in die leweringstadium.</i> |
| LOUW, B. S. B.Sc. £250 | University of Cape Town | Investigation of Starting Torque characteristics of Induction motors. <i>Ondersoek van induksiemotore se aansitdraaimoment-eienskappe.</i> |
| RYDER, J. A. B.Sc. £250 | University of the Witwatersrand | A study of analogue computer techniques. <i>'n Studie van die tegnieke vir die gebruik van die analogierekenoutomaat.</i> |
| <i>Mechanical Engineering/ Meganiese Ingenieurswese</i> ATKINSON, M. W. B.Sc. Eng. £250 | University of the Witwatersrand | Lateral stability of planted poles. <i>Dwarsstabiliteit van geplante pale.</i> |
| DU BOURG, N. J. B.Sc. (Mech. Eng.) £250 | University of the Witwatersrand | Forced convection heat transfer from Matrices. <i>Geforseerde konveksiehitte-oordrag van matryse.</i> |
| BULL, J. M. R. B.Sc. (Mech. Eng.) £250 | University of Natal | The Collapsing pressures and mechanisms for thin vessels under externally applied forces. <i>Die swigtingsdrukke en meganismes vir dun vate onder uitwendig aangewende kragte.</i> |
| BYLAND, P. B.Sc. (Mech. Eng.) £250 | University of the Witwatersrand | Transportation of fine powders in a gas stream. <i>Vervoer van fyn poeier in 'n gasstroom.</i> |
| GREEN, G. S. B.Sc. (Mech. Eng.) £250 | University of the Witwatersrand | Investigation into performances of low temperature heat exchangers for hydrogen liquifier. <i>Ondersoek van die prestasie van warmte-uitruilers met lae temperatuur by waterstofvervloeie-apparate.</i> |
| GREENLAND, R. V. B.Sc. (Mech. Eng.) £250 | University of the Witwatersrand | Boiling heat transfer. <i>Kookhitteoordrag.</i> |

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|---|---------------------------------|--|
| HYMAN, S. B.Sc. (Mech. Eng.) £250 | University of the Witwatersrand | The use of membrane analogies for the solution of stress distribution problems. <i>Die gebruik van membraanalogie vir die oplossing van spanningsdistribusieprobleme.</i> |
| ISAACS, H. S. B.Sc. (Metall. Eng.) £250 | University of the Witwatersrand | The corrosion of metals and alloys in South African Tap Waters. <i>Die korrodering van metale en legerings in S.A. waterleidings.</i> |
| KELLY, R. D. B.Sc. (Mech. Eng.) £250 | University of Natal | Correlations of asymmetrical stress fatigue properties of steels. <i>Korrelasies van die vermoeidheidseienskappe van staal onder asimmetriese belasting.</i> |
| WADE, R. B. B.Sc. (Mech. Eng.) £250 | University of Natal | The fluid flow distribution in a divergent jet system. <i>Die vloeistromingsdistribusie in 'n divergerende straalstelsel.</i> |
| <i>Geology/Geologie</i> GENIS, J. H. B.Sc., M.Sc. £250 | University of Cape Town | The Occurrence and Origin of Amphibole asbestos in South Africa. <i>Die voorkoms en oorsprong van amfiboolasbes in Suid-Afrika.</i> |
| KEY, C. A. M.Sc. £300 | University of Cape Town | The Ondurakorume carbonatite complex, Kalkfeld, S.W.A. and further investigations into S.A. carbonatites. (Previous award 1958.) <i>Die Ondurakorume-karbonatietkompleks, by Kalkfeld, S.W.A. en verdere ondersoek na die S.A. karbonatiete. (Vorige toekening 1958.)</i> |
| KLEYWEGT, R. J. B.Sc. £125 | University of Natal | Studies of Tertiary sands in the lower Umfolozi Region. <i>Studie van tersiêre sand in die Benede-Umfolozigebied.</i> |
| MIDDLEMOST, E. A. K. B.Sc. £250 | University of Cape Town | Stratigraphy, physiography and Structure of the Matjiesfontein area. <i>Stratigrafie, fisiografie en struktuur van die Matjiesfontein gebied.</i> |
| TRUSWELL, J. F. M.Sc. £300 | University of Cape Town | The Older granites and related rocks from the Teginia area, Northern Nigeria. <i>Die ouer graniete en verwante rotse van die Teginagebied, Noord-Nigerië.</i> |
| <i>Mathematics/Matesis</i> BOTHA, M. H. B.Sc. £250 | Universiteit van Pretoria | Mathematical Statistics or Set Theory and Measure Theory. <i>Wiskundige Statistiek of Versamelingsleer en Maat-teorie.</i> |
| CHINNERY, D. N. W. B.Sc. £125 | Universiteit van Pretoria | (a) Function Theory (b) Differential Equations. <i>(a) Funksieteorie (b) Differensiaalvergelykings.</i> |
| LEMMER, H. H. B.Sc. £125 | Universiteit van Pretoria | (a) Function Theory (b) Theory of probabilities. <i>(a) Funksieteorie (b) Waarskynlikheidsrekening.</i> |

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|--|---|---|
| <i>Physics/Fisika</i> BURIC, G. B.Sc. (Hon.) £250 | University of the Witwatersrand | Investigation in a field of theoretical nuclear physics. <i>Ondersoek op 'n gebied van die teoretiese kernfisika.</i> |
| DE VILLIERS, J. A. M. B.Sc. £62.10 | Potchefstroomse Universiteit vir C.H.O. | The scattering of π -mesones measured in lead by means of a hodoscope set-up of counter tubes. (Previous award 1958.) <i>Die verstrooiing van π-mesone in lood gemeet met behulp van 'n hodokoop-opstelling van telbuise. (Vorige toekenning 1958.)</i> |
| DRIVER, A. S. B.Sc. (Hons.) £250 | Rhodes University | Fluorescence and absorption spectra of some organic compounds in the vacuum ultra-violet region. (Previous award 1958.) <i>Fluorensie- en absorpsiespektra van sekere organiese verbindings in die vakuum-ultravioletgebied. (Vorige toekenning 1958.)</i> |
| GROENEWALD, T. B.Sc. (Hons.) £250 | University of the Witwatersrand | The determination of activation energies for synthesis of ammonia using the stable compounds between Gp.v and the transition elements as catalysts. (Previous award 1958.) <i>Die bepaling van aktiveringsenergieë vir die sintese van ammonia, met die gebruikmaking van stabiele verbindings van Gp.v en die oorgangselemente as katalisators. (Vorige toekenning 1958.)</i> |
| LOVELOCK, D. B.Sc. £125 | University of Natal | A Project in Physics. <i>'n Projek in Fisika.</i> |
| MUIR, M. S. B.Sc. £125 | University of Natal. | A Project in Physics. <i>'n Projek in Fisika.</i> |
| NADASEN, A. B.Sc. £125 | University College of Fort Hare | A Project in Physics. <i>'n Projek in Fisika.</i> |
| NORDWALD, D. R. A. B.Sc. £125 | University of Natal | A Project in Physics. <i>'n Projek in Fisika.</i> |
| SHEPSTONE, B. J. M.Sc. £300 | Universiteit van die Oranje-Vrystaat | Further investigation of the magnetic behaviour of iron at high temperatures, and eddy current losses in particular. (Previous award 1957-1958.) <i>Verdere ondersoek van die magnetiese gedrag van yster by hoë temperatuur, veral wervelstroomverliese. (Vorige toekenning 1957-1958.)</i> |
| SPOELSTRA, B. B.Sc. £125 | Potchefstroomse Universiteit vir C.H.O. | Direct pairing of π -mesons, by means of a Wilson chamber investigation. <i>Direkte paarvorming deur π-mesone-ondersoek m.b.v. 'n Wilson-kamer.</i> |
| STEMMET, M. C. B.Sc. £220 | Universiteit van Stellenbosch | The development of a liquid scintillation counter and its application in the investigation of the assimilation of C.O ₂ by plant roots with the aid of C ¹⁴ . <i>Die ontwikkeling van 'n vloeistofsintillasiesteller en die gebruik daarvan om die opname van C.O₂ deur plantwortels met behulp van C¹⁴ te ondersoek.</i> |

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|--|---|---|
| USHER, P. D. B.Sc. (Hon.) £250 | Universiteit van die Oranje-Vrystaat | Advanced study of theoretical physics with special reference to nuclear physics and quantum electrodynamics. <i>Gevorderde studie van teoretiese fisika met spesiale verwysing na Kernfisika en kwantum-elektrodinamika.</i> |
| VAN DER WALT, A. J. B.Sc. £250 | Potchefstroomse Universiteit vir C.H.O. | A study of the scattering of π -mesons by atom nuclei of lead and other elements by means of a hodoscope set-up of counter tubes. (Previous award 1958.) <i>'n Studie van die verstrooiing van π-mesone deur lood en ander atoomkerne deur middel van 'n hodoskoop-opstelling van telbuise. (Vorige toekenning 1958.)</i> |
| VAN DER WALT, C. M. B.Sc. £250 | Universiteit van Pretoria | The crystallization process in the case of thin layers. (Previous award 1957-1958.) <i>Die kristallisasiestproses in die geval van dun lagies. (Vorige toekenning 1957-1958.)</i> |
| VAN RYNEVELD, W. P. B.Sc. £250 | Universiteit van die Oranje-Vrystaat | Time phenomena in Magnetism. <i>Tydverskynsels in Magnetisme.</i> |
| VAN WYK, J. A. B.Sc. £125 | Potchefstroomse Universiteit vir C.H.O. | Determination of Proton component in cosmic rays. <i>Bepaling van Protonekomponent in die kosmiese strale.</i> |
| VERSCHUUR, G. L. B.Sc. £250 | Rhodes University | The Polarization of Outbursts of solar noise. <i>Die polarisering van uitbarstings van songeraas.</i> |
| WALKER, A. D. M. B.Sc. £250 | Rhodes University | The effects of Solar Eclipses on the ionosphere. <i>Die uitwerking van sonsverduisterings op die ionosfeer.</i> |
| WINKLER, B. C. B.Sc. £220 | Universiteit van Stellenbosch | A study of preservatives in wood by means of radio isotopes. <i>'n Studie van preserveermiddele in hout m.b.v. radio-isotope.</i> |
| <i>Zoology Dierkunde</i> | | |
| BENYON, M. P. B.Sc. £250 | University of Natal | Some physiological problems in relation to Marine ecology. <i>Fisiologiese probleme in verband met die ekologie van die see.</i> |
| BINGHAM, M. G. B.Sc. £250 | University of Natal | Aspects of locust flight. <i>Aspekte van sprinkaanvlug.</i> |
| BOYES, D. G. B.Sc. £125 | Universiteit van Pretoria | Revision of the genus <i>Labeo</i> . <i>Hersiening van die genus Labeo.</i> |
| OOSTHUIZEN, J. H. B.Sc. £125 | Universiteit van Pretoria | A Morphological study of the skull of the S.A. Primates. <i>'n Morfolologiese studie van die skedel van die S.A. Primate.</i> |
| BRAYSHAW, B. M. B.Sc. £125 | University of Natal | A Project in Zoology. <i>'n Projek in Dierkunde.</i> |

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|--|---|--|
| BUSH, B. M. H. M.Sc. £300 | Rhodes University | Study on the Myoneural Physiology of the Fresh-water crabs, crayfishes and other Decapod Crustacea. <i>Studie van die mioneurale fisiologie van die varswaterkrappe, krewes en ander dekapoodskaaldiere.</i> |
| CLOETE, S. E. B.Sc. £220 | Universiteit van Stellenbosch | The Cranial Morphology of <i>Rhyacortriton olympicus</i> . (Previous award 1958.) <i>Die skedelmorfologie van Rhyacortriton olympicus. (Vorige toekenning 1958.)</i> |
| DANDY, J. W. T. M.Sc. £300 | Rhodes University | Studies on the permeability and respiratory function of the integument of Potamon and an interpretation of their biological significance in the ecology of the animal. <i>Studie van die deurdringbaarheid en asemhalingsfunksie van die huid van Potamon en 'n verklaring van die biologiese betekenis daarvan in die ekologie van die dier.</i> |
| DICKINSON, D. B. B.Sc. £250 | University of the Witwatersrand | Genetics of mice of the genus <i>Mastomys</i> . <i>Genetika van muise van die genus Mastomys.</i> |
| JOUBERT, P. J. B.Sc. £125 | Universiteit van Stellenbosch | The cranial Morphology of the plethodont salamander. <i>Die skedelmorfologie van die plethodontsalamander.</i> |
| STASSEN, J. R. B.Sc. £125 | Potchefstroomse Universiteit vir C.H.O. | The morphology and taxonomic position of the aphyllid fresh water snail forms of the genus <i>Bulinus</i> (Mollusca Basommatophora) in the Transvaal. <i>Die morfologie en taksonomiese posisie van die aphylliese varswaterslakvorme van die genus Bulinus (Mollusca Basommatophora) in Transvaal.</i> |
| SÜLTER, M. M. B.Sc. £125 | Universiteit van Stellenbosch | Skull morphology of the primitive adder (<i>Causus rhombeatus</i>). <i>Skedelmorfologie van die primitiewe adder (Causus rhombeatus).</i> |
| VAN DER WALT, J. J. A. B.Sc. £125 | Universiteit van Pretoria | Genetical studies in the Mouse. <i>Genetiese studie van die Muis.</i> |
| VISSER, J. G. J. B.Sc. £220 | Universiteit van Stellenbosch | Skull morphology of the snake genus <i>Thelotornis</i> . <i>Skedelmorfologie van die slanggenus Thelotornis.</i> |
| VISSER, M. H. C. B.Sc. £220 | Universiteit van Stellenbosch | The Cranial morphology of <i>Ichthyophis glutinosus</i> and of <i>I. Monochrous</i> . <i>Die skedelmorfologie van Ichthyophis glutinosus en van I. Monochrous.</i> |
| WEBER, R. E. B.Sc. £125 | University of Cape Town | A Project in Zoology. <i>'n Projek in Dierkunde.</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|---|---|---|
| <i>STUDENT BURSARIES (OVERSEAS) STUDENTEBEURSE (OORSEE)</i> | | |
| BOUWER, I. Z. M.Sc. £300 | University of Toronto | Studies in topological groups. <i>Studies in topologiese groepe.</i> |
| FORMAN, A. B.Sc., B.A. £250 | University of Cambridge | Physical Properties of Molecular Complexes. <i>Fisiese Eienskappe van Molekulêre Komplekse.</i> |
| HARRIS, A. P. B.Sc. £250 | Imperial College, London | A Study of the relation of Molecular Structure and configuration to the effect of high pressures on liquid phase reactions. (Previous award 1958.) <i>'n Studie van die verband tussen die molekulêre struktuur en reaktorreëling en die uitwerking van hoë druk op vloeistoffasereaksies. (Vorige toekenning 1958.)</i> |
| HENNING, J. J. H. M.Sc. £300 | Max Planck Institut für Physik | The decaying particles theory. <i>Teorie van onstabiele deeltjies.</i> |
| HEYMAN, G. M.Sc. £300 | University College, London | An investigation of high energy π -meson collision processes. (Previous award 1958.) <i>Ondersoek van die botsingsprosesse van π-mesone met groot energie. (Vorige toekenning 1958.)</i> |
| JOHANNES, C. B.Sc. (Chem. Eng.) M.Sc. (Chem. Eng.) £250 | Massachusetts Institute of Technology | Interphase mass transfer. (Previous awards 1957–1958.) <i>Tussenfasige massa-oordrag. (Vorige toekennings 1957–1958.)</i> |
| MACPHERSON, E. E. B.A. £250 | University of Liverpool | A Project in Applied Psychology. <i>'n Projek in Toegepaste Sielkunde.</i> |
| MORKEL, A. T. M.Sc. £300 | Massachusetts Institute of Technology | Molten Metal-salt Reaction Kinetics. (Previous awards 1956–1958.) <i>Reaksiekinetika van gesmelte metaalsoute. (Vorige toekennings 1956–1958.)</i> |
| MOUTON, W. L. M.Sc. £150 | Fisiese Laboratorium, Universiteit Utrecht | Investigation of light nuclei with (p, γ) reactions, and beta and gamma spectroscopy using radio-active isotopes. <i>Ondersoek van ligte kerne met (p,γ)-reaksies en beta- en gammaspektroskopie, d.m.v. radioaktiewe isotope.</i> |
| <i>DIRECTED RESEARCH BURSARIES (OVERSEAS) GERIGTE NAVORSINGSBEURSE (OORSEE)</i> | | |
| CRYER, C. W. M.Sc. £500 | University of Cambridge | Numerical analysis. (Previous award 1958.) <i>Numeriese Analise. (Vorige toekenning 1958.)</i> |
| FINKELSTEIN, N. P. M.Sc. £500 | University of Liverpool | Application of Mass Spectrometry to Radio-chemistry. <i>Toepassing van Massaspektrometrie op Radio-chemie.</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|--|--|
| GLASSER, L. B.Sc. £500 | Imperial College, London | Some Studies of Hydrogen bonds in crystals. <i>Studies in verband met Waterstofbindings in kristalle.</i> |
| KEDDY, R. J. M.Sc. £500 | University of London | The activation by high energy gamma rays and measurement of Nuclides. (Previous award 1958.) <i>Die aktivering deur gammastrale met groot energie en die meting van nuklides. (Vorige toekenning 1958.)</i> |
| NAUDE, C. F. B.Sc., M.S. £800 | California Institute of Technology | The Mechanism of Cavitation Damage. (Previous award 1957-1958.) <i>Die meganisme van beskadiging deur holtevorming. (Vorige toekenning 1957-1958.)</i> |
| PISTORIUS, C. W. F. T. M.Sc. £800 | University of California | Scattering processes in canal rays. (Previous award 1958.) <i>Verstrooiingsprosesse by kanaalstrale. (Vorige toekenning 1958.)</i> |
| ROPER, H. B.Sc. (Hons.) £800 | Research Laboratory of the Portland Cement Assc., Skokie, Illinois | Mechanics of dimensional change in aggregates. <i>Meganika van dimensieverandering by toeslae.</i> |
| SCHEPERS, J. M. M.A. £500 | Educational testing Service, University of Princeton | The differential transfer of abilities at different stages of learning. (Previous award 1958.) <i>Die differensiale oordrag van vermoëns in verskillende leerstadiums. (Vorige toekenning 1958.)</i> |
| SCHUTTE, C. J. H. B.Sc. (Hons.) | Laboratorium voor Algemene en anorganiese Chemie, Universiteit Amsterdam | 1. The dimerization of Nitric oxide under pressure. 2. A Spectroscopic study of the phase transitions at low temperatures of the Borohydrides. (Previous award 1958.) <i>1. Die dimerisering van stikstofoksied onder druk. 2. 'n Spektroskopiese studie van die fase-oorgange by lae temperature van die Boorhidride. (Vorige toekenning 1958.)</i> |
| DIRECTED RESEARCH BURSARIES (IN THE COUNCIL'S LABORATORIES) BEURSE VIR GERIGTE NAVORSING (IN DIE RAAD SE LABORATORIA) | | |
| BELL, H. B.Sc., B.Sc.(Hons.) £400 | N.P.R.L. | Research in Nuclear Physics. (Previous award 1958.) <i>Navorsing in Kernfisika. (Vorige toekenning 1958.)</i> |
| CRONJE, J. P. B.Sc. (Hons.) £400 | N.F.N.L. | Research in the field of theoretical Nuclear Physics. <i>Navorsing op die gebied van teoretiese Kernfisika.</i> |
| DU PLESSIS, N. M. B.Sc., M.Sc. £400 | N.F.N.L. | Research in theoretical nuclear physics. (Previous award 1957-1958.) <i>Navorsing in teoretiese kernfisika. (Vorige toekenning 1957-1958.)</i> |

ASSISTANTSHIPS/ASSISTENTSKAPPE (£450-£650)

(a) GRANTS FOR THE EMPLOYMENT OF SKILLED RESEARCH ASSISTANTS /
TOEKENNINGS VIR DIE INDIENSNEMING VAN GESKOOLDE NAVORSINGSASSISTENTE

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|---------------------------------|---|
| BALINSKY, B. I. D.Biol. Sc. F.I.I. Embryol. Prof. of Zoology | University of the Witwatersrand | The submicroscopic structures of cells involved in processes of embryonic differentiation. (Previous awards 1957-1958.) <i>Die submikroskopiese strukture van selle wat by die prosesse van embrioniese differensiasie betrokke is. (Vorige toekennings 1957-1958.)</i> |
| BOZZOLI, G. R. B.Sc., D.Sc. Prof. of Electrical Engineering | University of the Witwatersrand | Study of long sparks in air and under oil. (Previous awards 1957-1958.) <i>Studie van lang vonke in die lug en onder olie. (Vorige toekenning 1957-1958.)</i> |
| DART, R. A. M.Sc., M.D., Ch.B., Hon. D.Sc. Prof. of Anatomy | University of the Witwatersrand | Recovery of breccia and fossils from Makapansgat Limeworks. (Previous awards 1957-1958.) <i>Opgraving van breccia en fossiele by die kalkgroewe te Makapansgat. (Vorige toekennings 1957-1958.)</i> |
| GOULD, A. J. Ph.D., D.Sc., M.I.Mech.E., M.I.C.E., M.I.N.A. Prof. of Electrical Engineering | University of Natal | 1. Fatigue, Corrosion-fatigue of a light alloy. 2. Engine wear by a range of lubricants. 3. Correlation of asymmetrical stress fatigue properties of steel. (Previous award 1954-1958.) 1. <i>Vermoeidheid, korrosievermoeidheid van 'n ligte legering.</i> 2. <i>Enjinslytasie deur 'n reeks smeermiddels.</i> 3. <i>Korrelasie van vermoeidheidseienskappe van staal onder asimmetriese spanning. (Vorige toekenning 1954-1958.)</i> |
| HALES, A. L. M.A., M.Sc., Ph.D. Director Bernard Price Institute of Geophysical Research | University of the Witwatersrand | Crustal structure and Paleomagnetic investigations in Southern Africa. (Previous awards 1952-1958.) <i>Korsstruktuur en paleomagnetiese ondersoeke in Suidelike Afrika. (Vorige toekennings 1952-1958.)</i> |
| HOLLIMAN, F. G. B.A., M.A., Ph.D., F.R.S.(S.A.) Prof. of Organic Chemistry | University of Cape Town | The Pigment of <i>Pseudomonas aeruginosa</i> . (Previous awards 1951-1958.) <i>Die pigmente van Pseudomonas aeruginosa. (Vorige toekennings 1951-1958.)</i> |
| ISRAELSTAM, S. S. M.Sc., Ph.D. Senior Lecturer | University of the Witwatersrand | 1. Reactions of tertiary alkyl Hypohalites. 2. The von Pechmann reaction and the synthesis of coumarines and related compounds. (Previous awards 1957-1958.) 1. <i>Reaksie van tersiere alkiel-hipohaliete.</i> 2. <i>Die von Pechmann-reaksie en die sintese van kumarinen en verwante verbindings. (Vorige toekennings 1957-1958.)</i> |
| KING, J. W. B.Sc., B.Sc. (Hons.), M.Sc., Ph.D. Lecturer in Physics | Rhodes University | Operation of ionosphere recorder. Production of Bulletins of ionosphere. Characteristics and relevant research. (Previous awards 1957-1958.) <i>Werking van ionosfeerregistreerder.</i> <i>Opstel van ionosfeerbuletins.</i> <i>Eienskappe en toepaslike navorsing. (Vorige toekennings 1957-1958.)</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|---|---|--|
| KOCH, C. Ph.D. Scientific Professional Officer | Transvaal Museum | Monograph of the Tenebrionidae of Southern Africa. (Previous awards 1955 and 1958.) <i>Monograaf van die Tenebrionidae van Suidelike Afrika.</i> (Vorige toekennings 1955 en 1958.) |
| LIEBENBERG, A. C. B.Sc., A.M.I.C.E., A.M.I. Struct.E., A.M.A.Sc. Consulting Engineer | University of Cape Town | The effect of extensional restraints on the mode of failure of concrete slabs subject to lateral loads. <i>Die uitwerking van rekstremming op die swigtingswyse van betonplate onder dwarsbelasting.</i> |
| PHILLIPS, W. E. D.Sc., M.I.E.E., S.M.I.R.E. Prof. of Electrical Engineering | University of Natal | 1. I.G.Y. projects (a) Backscatter observations. (b) Satellite tracking. 2. Micro-wave propagation phenomena over a land path. (Previous awards 1957-1958.) 1. <i>I.G.J.-projekte (a) Terugstrooiingswaarnemings.</i> (b) <i>Volg van satelliete.</i> 2. <i>Mikrogolfvoortplantingsverskynsels oor 'n landweg.</i> (Vorige toekennings 1957-1958.) |
| PRETORIUS, V. M.Sc. D.Phil Senior Lektor | Universiteit van Pretoria | Construction of mass spectrometer and its use for analytical work. (Previous award 1958.) <i>Opbou van massaspektrometer en gebruik daarvan vir analitiese werk.</i> (Vorige toekenning 1958.) |
| S.A. Association for Marine Biological Research | S.A. Coastal Waters | 1. Shark movements and behaviour. 2. Sardine movements and behaviour. 3. Inshore water currents. 1. <i>Bewegings en gedrag van haaië.</i> 2. <i>Bewegings en gedrag van sardientjies.</i> 3. <i>Inlandige waterstrome.</i> |
| SIMPSON, E. S. W. M.Sc., Ph.D. Prof. of Geology | University of Cape Town | 1. Petrology and structure of the Angola gabbroanorthosite massif. 2. Studies of carbonate rock metamorphism in S.A. 1. <i>Steenkunde en die struktuur van die gabbro-anortositmassief van Angola.</i> 2. <i>Studie van karbonaatrotsmetamorfose in S.A.</i> |
| SMITH, J. L. B. B.A., M.Sc., Ph.D., F.R.S.(S.A.) Research Professor | Rhodes University | Fishes. (Previous awards 1954-1958.) <i>Visse.</i> (Vorige toekennings 1954-1958.) |
| STACK-FORSYTH, E. F. B.Sc., B.Sc.(Hons.), Ph.D., A.M.I.E.E. Senior Lecturer | Rhodes University | An Investigation of the dynamic spectra of solar radio noise outbursts. (Previous awards 1957-1958.) <i>'n Ondersoek na die dinamiese spektra van sonradio-geraasuitbarstings.</i> (Vorige toekennings 1957-1958.) |
| STEYN, H. S. D.Sc. Prof. in Wiskunde | Universiteit van Suid-Afrika | Characteristics of the functions of multivariable probabilities. <i>Eienskappe van meerveranderlike kansfunksies.</i> |
| STOKER, P. H. M.Sc., D.Sc. Prof. in Fisika | Potchefstroomse Universiteit vir C.H.O. | Projects in cosmic rays. (Previous award 1956-1958.) <i>Projekte op kosmiese strale.</i> (Vorige toekenning 1956-1958.) |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|---|---|---|
| VANZINDEREN-BAKKER, E. M. B.Sc., M.Sc., Phil. Nat.D. Senior Lektor in Plantkunde | Universiteit van die Oranje-Vrystaat | Palynology. Previous awards 1957-1958.) <i>Palinologie. (Vorige toekennings 1957-1958.)</i> |
| WARREN, F. L. B.Sc., Ph.D., D.Sc., A.R.C.S. Prof. of Chemistry and Chemical Technology | University of Natal | S.A. Plants of toxic and medicinal interest with special reference to Alkaloids of Hypertensive sig- nificance. (Previous awards 1951-1958.) <i>S.A. Plante van toksikologiese en geneeskundige be- lang met spesiale verwysing na alkaloiëde wat 'n rol speel by verhoogde bloeddruk. (Vorige toekennings 1951-1958.)</i> |
| (b) GRANTS FOR THE EMPLOYMENT OF UNSKILLED RESEARCH ASSISTANTS TOEKENNING VIR DIE INDIENSNEMING VAN ONGESKOOLDE NAVORSINGSASSISTENTE | | |
| AHRENS, L. H. B.Sc., M.A., D.Sc., F.R.I.C., F.G.S. Prof. of Inorganic & Physical Chemistry | University of Cape Town | Geochemical and cosmochemical investigations on rare metals. <i>Geochemiese en kosmochemiese navorsing i.v.m. seldsame metale.</i> |
| ROBINSON, J. T. D.Sc. Prof. Officer | Transvaal Museum | The Australopithecines of South Africa and the period in which they lived. (Previous award 1958.) <i>Die Australopithecines van Suid-Afrika en die tydperk waarin hulle geleef het. (Vorige toekenning 1958.)</i> |
| SCHAFFER, W. M.Sc., Ph.D. Prof. of Physics | University of Cape Town | 1. Crystal Structure of Crotonylidene Piperidinium Chlorostannate. 2. Electric Structure factor computer. (Previous awards 1957-1958.) <i>1. Die kristalstruktuur van Krotonilideen-piperidin- iumchlorstannaat. 2. Elektriese struktuurfaktor-rekenoutomaat. (Vorige toekennings 1957-1958.)</i> |
| (c) PERMANENT ASSISTANTSHIPS ON C.S.I.R. STAFF PERMANENTE ASSISTENTSKAPPE OP W.N.N.R.-PERSONEEL | | |
| BADENHUIZEN, N. P. D.Sc. (cum laude) Professor of Botany | University of the Witwatersrand | Starch metabolism. <i>Styselmetabolisme.</i> |
| DAY, J. H. Ph.D., F.R.S.S.A. Professor of Zoology | University of Cape Town | Oceanography. <i>Oseanografie.</i> |
| ISAAC, W. E. B.Sc., Ph.D. Harry Bolus Professor (Botany) | University of Cape Town | The ecology and flora of the Marine Algae of the coasts of Southern Africa. <i>Die ekologie en flora van die see-alge van Suidelike Afrika.</i> |
| KRIJGSMAN, B. J. Ph.D. Associate Professor of Zoology | University of Cape Town | (a) Sensory mechanisms in aquatic animals. (b) Physiology of invertebrate hearts. (c) Osmoregulation in aquatic animals. <i>(a) Gevoelsmeganismes van waterdiere. (b) Hartfisiologie van ongewerwelde diere. (c) Osmoregulering by waterdiere.</i> |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|--|-------------------------------|--|
| MES, M. G. B.Sc. (met lof), Ph.D. (met lof) Professor in Plantkunde | Universiteit van Pretoria | (a) The influence of climate on plant growth. (b) The influence of temperature on the survival of rhizobia in soils. (c) Studies on seed germination including the influence of light and temperature and biochemical studies. (d) Causes of annual and possibly diurnal variations in the growth rate and activity of oat coleoptyls. (e) The metabolism of ripening fruit. (a) <i>Die invloed van klimaat op die groei van plante.</i> (b) <i>Die invloed van temperatuur op die oorlewing van rhizobia in gronde.</i> (c) <i>Studies oor saadkieming insluitende die invloed van lig en temperatuur en biochemiese studies.</i> (d) <i>Oorsake van jaarlikse en moontlik daelike variasies in die groeisnelheid en aktiwiteit van hawerkoleoptiele.</i> (e) <i>Die metabolisme van rypwordende vrugte.</i> |
| SMITH, J. L. B. B.A., M.Sc., Ph.D., F.R.S.S.A. Research Professor | Rhodes University | Fishes. <i>Visse.</i> |
| WARREN, F. L. A.R.C.S., B.Sc., Ph.D., D.Sc. Professor of Chemistry and Chemical Technology | University of Natal | South African plants of toxic and medicinal interest with special reference to alkaloids of hypertensive significance. <i>Suid-Afrikaanse plante van toksikologiese en geneeskundige belang met spesiale verwysing na alkalotiede van betekenis by hoë bloeddruk.</i> |
| MEDICAL, DENTAL AND NUTRITIONAL RESEARCH MEDIËSE, TANDHEELKUNDIGE EN VOEDINGSNAVORSING SENIOR BURSARIES SENIOR BEURSE | | |
| MUSPRATT, J. B.A. Senior Bursar £800 | S.A.I.M.R., Johannes- burg | Arthropod-borne virus research. (Previous award 1951-1958.) <i>Navorsing i.v.m. virussiektes deur artropode oorgedra. (Vorige toekenning 1951-1958.)</i> |
| <i>Grants for the Employment of Skilled Research Assistants Toekennings vir die Indiensneming van Geskoolde Navorsingsassistentente</i> | | |
| COETZEE, J. W. M.B., Ch.B., M.D. Professor, Dept. van Mikrobiologie | Universiteit van Pretoria | The genetics of the genus <i>Proteus</i> . (Previous award 1957-1958.) <i>Die genetiese van die genus proteus. (Vorige toekenning 1957-1958.)</i> |
| DERCKSON, C. H. (en groep) M.Ch. Prof. Dept. Chirurgie | Universiteit van Pretoria | 1. Problems in connection with the maintenance of an artery bank. 2. Experiments in extra-corporeal circulation. 3. Efficacy of various transplantantes. (Previous awards 1957-1958.) 1. <i>Probleme verbonde aan die instandhouding van 'n slagaarbank.</i> 2. <i>Eksperimente in ekstrakorporeale sirkulasie.</i> 3. <i>Doeltreffendheid van verskillende transplantante.</i> (Vorige toekennings 1957-1958.) |

| Name and Qualifications Naam en Kwalifikasies | Where tenable Waar geldig | Subject of Research Onderwerp van Navorsing |
|---|-------------------------------|--|
| ENGELBRECHT, F. M. B.Sc., S.O.D., M.Sc., D.Sc. Senior Lektor | Universiteit van Stellenbosch | Ondersoek van bepaalde aspekte van die Pneumokonioseprobleem. (Vorige toekennings 1957-1958.) <i>Investigation of certain aspects of the Pneumoconiosis problem. (Previous awards 1957-1958.)</i> |
| MERSKEY, C. M.D., M.R.C.P. Asst. Department of Medicine | University of Cape Town | 1. Blood coagulation in disease states. 2. Blood fibrinolysis, its normal occurrence, its relationship to meals and to disease states. (Previous awards 1956-1958.) 1. <i>Bloedstolling in siektetoestande.</i> 2. <i>Bloedfibronolise, die normale voorkoms en verband daarvan met die dieet en siektetoestande.</i> (Vorige toekennings 1956-1958.) |
| OETTLER, A. G. B.Sc. (Hons.), M.B.B.Ch. Cancer Research Officer | S.A.I.M.R., Johannesburg | Studies of tumours in the Multimammate Mouse, <i>Rattus (Mastomys) Natalensis</i> . (Previous awards 1955-1958.) <i>Studie van gewasse by die vaalveldmuis of moedermuis, (Rattus (Mastomys) natalensis).</i> (Vorige toekennings 1955-1958.) |
| PEPLER, W. J. B.Sc., M.B., Ch.B., M.D. Senior Lektor en Asst. Patoloog | Universiteit van Pretoria | 1. Experimental vascular degenerations. 2. Histochemistry of the hypothalamic nuclei under experimental conditions, and other histochemical experiments. (Previous award 1958.) 1. <i>Eksperimentele vaskulêre degenerasies.</i> 2. <i>Histochemie van die hipotalmiese kerne onder eksperimentele toestande, en ander histochemiese eksperimente.</i> (Vorige toekenning 1958.) |
| SCHRIRE, V. M.Sc. (Hons.), Ph.D., M.B., Ch.B., M.R.C.P. Physician, Dept. of Medicine | University of Cape Town | 1. Pericarditis. 2. Haemodynamic studies in beri-beri. 3. Studies in coronary vascular disease. 4. Effects of long-term anticoagulants in coronary vascular disease. 5. Mitral Stenosis. 6. Studies in the Murmurs of congenital heart disease. (Previous awards 1957-1958.) 1. <i>Perikarditis.</i> 2. <i>Hemodinamiese studie i.v.m. beri-beri.</i> 3. <i>Studie van kroonaaraandoenings.</i> 4. <i>Uitwerking van langtermynstollingsteenmiddels by kroonaarsiektes.</i> 5. <i>Mitrale stenose.</i> 6. <i>Studie van die geruise by aangebore hartkwaal.</i> (Vorige toekennings 1957-1958.) |
| <i>Permanent Assistantships on C.S.I.R. Staff/Permanente Assistenteskappe op W.N.N.R.-personeel</i> | | |
| PIPPER, A. M.D., D.Sc. Emeritus Professor in Patologie | Universiteit van Pretoria | Flagella, mobility and structure of bacteria. <i>Flagella, beweeglikheid en struktuur van bakterieë.</i> |

KAPITAALFONDS

STAAT VAN TRANSAKSIES VIR DIE JAAR GEËINDIG 31 MAART 1959

| Besonderhede | | Uitgawe | | | Ontvangste | | | Totale op | |
|--|--|----------------------|------------------------|-------------------------|-------------------------|----------------------|------------------------|-----------------|-------------------------|
| | | Aansvaarde Begroting | Totale op 1 April 1958 | 1958-59 (Netto uitgawe) | Totale op 31 Maart 1959 | Aansvaarde Begroting | Totale op 1 April 1958 | 1958-59 | Totale op 31 Maart 1959 |
| | | £ | £ | £ | £ | £ | £ | £ | |
| (A) Geboue- en Reservekapitaalrekening | | | | | | | | | |
| Grond en Geboue . . . | | 283,000 | 1,183,107 7 7 | 356,318 5 3 | 1,539,425 12 10 | 245,000 | 1,362,600 0 0 | 1,607,600 0 0 | |
| Onbestede saldo . . . | | | 351,852 9 7 | (-)-22,535 15 6 | 329,316 14 1 | | 21,738 13 7 | 31,328 13 7 | |
| TOTALE | | £283,000 | £1,534,959 17 2 | £333,782 9 9 | £1,868,742 6 11 | £283,000 | £1,534,959 17 2 | £1,868,742 6 11 | |
| (B) Toerustingkapitaalrekening | | | | | | | | | |
| Meeubs, toebehore en Lantoerusting . . | | 12,500 | 172,749 13 8 | 14,526 11 7 | 187,276 5 3 | 176,240 | 1,796,908 0 0 | 1,973,148 0 0 | |
| Laboratorium- en Verkwiktoerusting | | 224,985 | 1,425,967 6 6 | 253,825 5 1 | 1,679,792 11 7 | | 28,628 0 1 | 29,155 1 9 | |
| Voortuie voorhande | | 4,800 | 117,738 5 7 | 3,878 3 5 | 121,636 9 0 | 18,689 | 1,607 19 9 | 1,607 19 9 | |
| Voortuie en fiense . . | | 7,194 | 64,824 8 11 | 13,792 7 11 | 78,616 16 10 | 70,100 | 19,949 19 2 | 46,334 7 0 | |
| Gesubsidieerde motorvoertuie (teen Kosprijs van terugbetaalings) . . | | 15,550 | 4,770 17 7 | (-)-194 9 10 | 4,576 7 9 | | 323,614 18 11 | 382,546 10 10 | |
| Boeke en tydskrifte . . | | | 101,418 11 8 | 12,624 17 5 | 114,043 9 1 | | | | |
| Voortuie vervaardigde Bouwerk | | | 127 13 11 | 1,069 4 0 | 1,196 17 11 | | | | |
| Geboue (verpaa) | | | 11,168 8 1 | (-)-11,168 8 1 | -- -- -- | | | | |
| Koste van bnie | | 265,029 | 1,898,785 5 11 | 288,353 11 6 | 2,187,138 17 5 | | | | |
| Onbestede Saldo | | | 271,923 12 0 | (-)-26,270 10 1 | 245,653 1 11 | | | | |
| TOTALE | | £265,029 | £2,170,708 17 11 | £262,083 1 5 | £2,432,791 19 4 | £265,029 | £2,170,708 17 11 | £2,432,791 19 4 | |
| TOTALE VAN (A) EN (B) | | £548,029 | £3,705,668 15 1 | £595,865 11 2 | £4,301,534 6 3 | £548,029 | £3,705,668 15 1 | £4,301,534 6 3 | |

OPMERKING—£1,539,425.12.10 vir grond en geboue sluit nie die waarde in van die terrein deur die Universiteit Pretoria aan die Raad geskenk nie, en vir oordragdoeltes teen £20,900 gewaardeer.

TOEWYSING VAN ONBESTEDE SALDO

| | £ | s. d. |
|--|----------|-------|
| (i) Vaste verpligings teen Toerustingkapitaalfonds (geskatte) | 112,505 | 14 0 |
| (ii) Gehou deur Universiteit vir die aankoop van kapitaaltoerusting | 14,133 | 5 11 |
| (iii) Nê op 31.3.1959 verbind nie, maar toeges in afwagting op ontvangs van prysopgawes of verdere ondersoek in verband met geskiktheid van toerusting | 119,014 | 2 0 |
| | £245,653 | 1 11 |

CAPITAL FUND
STATEMENT OF TRANSACTIONS FOR THE YEAR ENDED 31st MARCH, 1959

| Details | Expenditure | | | Receipts | | | Totals as at 31st March 1959 | | |
|---|--------------------|-----------------------------|----------------------------|------------------------------|--------------------|-----------------------------|------------------------------|------------------------------|--|
| | Accepted Estimates | Totals as at 1st April 1958 | 1958-59 (Nett expenditure) | Totals as at 31st March 1959 | Accepted Estimates | Totals as at 1st April 1958 | 1958-59 | Totals as at 31st March 1959 | |
| | £ | £ s. d. | £ s. d. | £ s. d. | £ | £ s. d. | £ s. d. | £ s. d. | |
| (A) <i>Building and Reserve Capital Account</i> | | | | | | | | | |
| Land and Buildings | 283,000 | 1,183,107 7 7 | 356,318 5 3 | 1,539,425 12 10 | 245,000 | 1,362,600 0 0 | 245,000 0 0 | 1,607,600 0 0 | |
| Balance unexpended | | 351,852 9 7 | (-)-22,535 15 6 | 329,316 14 1 | | 21,758 13 7 | 9,570 0 0 | 31,328 13 7 | |
| | | | | | | 121,601 3 7 | 30,044 1 8 | 151,645 5 3 | |
| | | | | | | 29,000 0 0 | 49,168 8 1 | 78,168 8 1 | |
| TOTALS | £283,000 | £1,534,959 17 2 | £333,782 9 9 | £1,868,742 6 11 | £283,000 | £1,534,959 17 2 | £333,782 9 9 | £1,868,742 6 11 | |
| (B) <i>Equipment Capital Account</i> | | | | | | | | | |
| Furniture, Fittings and Office Equipment | 12,500 | 172,749 13 8 | 14,526 11 7 | 187,276 5 3 | 176,240 | 1,796,908 0 0 | 176,240 0 0 | 1,973,148 0 0 | |
| Laboratory and Workshop Equipment | 224,985 | 1,425,967 6 6 | 253,825 5 1 | 1,679,792 11 7 | | 28,628 0.1 | 527 1 8 | 29,155 1 9 | |
| Stores on Hand | 4,800 | 117,758 5 7 | 3,878 3 5 | 121,636 9 0 | 18,689 | 1,607 19 9 | 26,384 7 10 | 1,607 19 9 | |
| Vehicles and Cycles | 7,194 | 64,824 8 11 | 13,792 7 11 | 78,616 16 10 | 70,100 | | | 46,334 7 0 | |
| Subsidised Cars (at cost less repayments) | | 4,770 17 7 | (-)-194 9 10 | 4,576 7 9 | | | | | |
| Books and Journals | 15,550 | 101,418 11 8 | 12,624 17 5 | 114,043 9 1 | | | | | |
| Prefabricated Structures | | 127 13 11 | 1,069 4 0 | 1,196 17 11 | | | | | |
| Buildings (Leasehold) | | 11,168 8 1 | (-)-11,168 8 1 | - - - | | | | | |
| Cost of Assets | 265,029 | 1,898,785 5 11 | 288,353 11 6 | 2,187,138 17 5 | | | | | |
| Balance unexpended | | 271,923 12 0 | (-)-26,270 10 1 | 245,653 1 11 | | | | | |
| TOTALS | £265,029 | £2,170,708 17 11 | £262,083 1 5 | £2,432,791 19 4 | £265,029 | £2,170,708 17 11 | £262,083 1 5 | £2,432,791 19 4 | |
| TOTALS OF (A) AND (B) | £548,029 | £3,705,668 15 1 | £595,865 11 2 | £4,301,534 6 3 | £548,029 | £3,705,668 15 1 | £595,865 11 2 | £4,301,534 6 3 | |

NOTE—£1,539,425.12.10 for land and buildings does not include value of site donated by the Pretoria University which was valued at £20,900 for transfer purposes.

ALLOCATION OF UNEXPENDED FUNDS

| | £ | s. | d. |
|---|-----------------|----------|-----------|
| (i) Firm commitments against Equipment Capital Fund (estimated) | 112,505 | 14 | 0 |
| (ii) Held by Universities for purchase of capital equipment | 14,133 | 5 | 11 |
| (iii) Not committed at 31.3.1959 but earmarked pending receipt of quotations or further investigations regarding suitability of equipment | 119,014 | 2 | 0 |
| | £245,653 | 1 | 11 |

Pretoria, 25 August 1959

S. M. NAUDÉ
President

A. J. MILLER-SMIT
Secretary/Treasurer

REKENING VAN LOPENDE UITGAWES VIR DIE JAAR GEËINDIG 31 MAART 1959

| 1957-58 | 1958-59 | 1957-58 | 1958-59 | | 1957-58 | 1958-59 | 1957-58 | 1958-59 | Aanvaarde Begroting | Aanvaarde Begroting | 1958-59 | |
|------------|------------|------------|------------|----|---------|------------|---------|---------|---------------------|---------------------|---------|----|
| | | | £ | s. | | | | | | | | d. |
| 1,347,935 | 1,601,429 | 1,570,050 | 1,601,429 | 15 | 5 | 1,601,429 | 15 | 5 | 1,728,760 | 1,728,760 | 0 | 0 |
| 79,109 | 89,826 | 257,560 | 89,826 | 1 | 9 | 257,560 | 1 | 9 | 488,501 | 488,501 | 2 | 7 |
| 57,018 | 64,680 | 206,074 | 58,294 | 9 | 11 | 206,074 | 9 | 11 | 57,000 | 57,000 | 11 | 8 |
| 150,719 | 151,007 | 55,740 | 151,007 | 9 | 5 | 55,740 | 9 | 5 | 39,000 | 39,000 | 6 | 9 |
| 268,328 | 293,719 | 9,461 | 293,719 | 4 | 5 | 9,461 | 4 | 5 | 10,725 | 10,725 | 0 | 0 |
| 218,108 | 271,761 | 9,601 | 229,379 | 16 | 11 | 9,601 | 16 | 11 | 61,550 | 61,549 | 0 | 3 |
| 2,121,217 | 2,423,656 | 3,856 | 2,423,656 | 17 | 10 | 3,856 | 17 | 10 | 4,305 | 4,045 | 9 | 10 |
| 14,770 | 14,580 | 3,856 | 14,580 | 1 | 9 | 3,856 | 1 | 9 | 9,850 | 8,137 | 2 | 3 |
| 22,832 | 2,409,076 | 4,400 | 2,409,076 | 16 | 1 | 4,400 | 16 | 1 | 200 | 3,074 | 14 | 11 |
| 2,081,615 | 47,441 | 5,887 | 47,441 | 18 | 3 | 5,887 | 18 | 3 | 104,407 | 149,407 | 6 | 11 |
| 257,507 | 2,361,634 | 3,301 | 2,361,634 | 17 | 10 | 3,301 | 17 | 10 | £2,518,346 | £2,539,716 | 15 | 2 |
| £2,341,122 | 178,081 | 215,192 | 178,081 | 17 | 4 | 215,192 | 17 | 4 | | | | |
| | £2,518,346 | £2,341,122 | £2,539,716 | 15 | 2 | £2,341,122 | 15 | 2 | | | | |

OPMERKING — 1. Onderstaande is die Raad se vaste verpligtinge op 31 Maart 1959:

- (i) Onder Rekening van Lopende Uitgawes (geskat) £ 59,397 14 0
- (ii) Vir Navorsingstoekennings 39,000 1 0

£98,397 15 0

2. Die ondervermelde bedrae is uitgegee vir die laboratoriums, departemente en projekte hieronder vermeld:

| | £ | s. | d. |
|--|---------|----|------------|
| S. A. Buro vir Standaard | 571,966 | | |
| Nasionale Chemiese Navorsingslaboratorium | 150,615 | | |
| Nasionale Fisiese Navorsingslaboratorium | 174,022 | | |
| Nasionale Bounavorsingsinstituut | 123,710 | | |
| Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese | 128,907 | | |
| Nasionale Instituut vir Personeelnavorsing | 116,099 | | |
| Nasionale Voedingnavorsingsinstituut | 78,496 | | |
| Nasionale Instituut vir Waternavorsing | 74,117 | | |
| Nasionale Instituut vir Telekommunikasieavorsing | 55,004 | | |
| Nasionale Padnavorsingsinstituut | 24,882 | | |
| Pneumokoniosenavorsingsenheid | 107,302 | | |
| Mediese Navorsingsenheid en Toekennings | 124,266 | | |
| Algemene Wetenskaplike Navorsingstoekennings | 70,738 | | |
| Industriële Navorsingsinstitute | | | 95,831 |
| Hoofkantoor en Administrasie | | | 130,193 |
| Afdeling Tegnieke Dienste | | | 122,064 |
| Departement Inligting en Spesiale Dienste | | | 66,873 |
| Eiendomsafdeling | | | 56,460 |
| Algemene Dienste en Laboratoriums | | | 106,355 |
| Washingtonse Sending | | | 14,601 |
| Londense Sending | | | 10,009 |
| Keutlense Sending | | | 6,567 |
| TOTAAL | | | £2,409,077 |

S. M. NAUDE
President

A. J. MILLER-SMIT
Sekretaris/Treasourier

Pretoria, 25 Augustus 1959

RUNNING EXPENSES ACCOUNT FOR THE YEAR ENDED 31st MARCH, 1959

| 1957-58 | Accepted Estimates | | | 1958-59 | | | 1957-58 | | | Accepted Estimates | | | 1958-59 | | |
|------------|--------------------|------------|-------|------------|--|------------|------------|-------|---|--------------------|---|-------|------------|-------|--|
| | £ | £ | s. d. | £ | s. d. | £ | £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. | |
| 1,347,935 | 1,616,638 | 1,601,429 | 15 5 | 1,570,050 | Parliamentary Grant..... | 1,728,760 | 1,728,760 | 0 0 | | | | | 1,728,760 | 0 0 | |
| 79,109 | 84,459 | 89,826 | 1 9 | 257,560 | Investigations, Tests and Services | 502,549 | 488,501 | 2 7 | | | | | 488,501 | 2 7 | |
| 57,018 | 64,680 | 58,284 | 9 11 | 206,074 | Revenue from Fellowships and Grants | | | | | | | | | | |
| 150,719 | 195,978 | 151,007 | 9 5 | 55,740 | Standardization Mark Permit Fees | 57,000 | 67,712 | 11 8 | | | | | 67,712 | 11 8 | |
| 268,328 | 336,830 | 293,719 | 4 5 | 9,461 | Levies: Compulsory Standard specifications towards the cost of— | 39,000 | 13,954 | 6 9 | | | | | 13,954 | 6 9 | |
| 218,108 | 271,761 | 229,379 | 16 11 | | Preparing specifications | | | | | | | | | | |
| 2,121,217 | 2,570,346 | 2,423,656 | 17 10 | 9,601 | Research investigations | 10,725 | 14,575 | 0 0 | | | | | 14,575 | 0 0 | |
| 14,770 | | 14,580 | 1 9 | 3,856 | Royalties | 61,550 | 61,549 | 0 3 | | | | | 61,549 | 0 3 | |
| 22,832 | 52,000 | 2,409,076 | 16 1 | 4,400 | Publications | 4,305 | 4,045 | 9 10 | | | | | 4,045 | 9 10 | |
| 2,083,615 | 2,518,346 | 47,441 | 18 3 | 5,887 | Administrative services to Laboratories financed by sponsors | 9,850 | 8,137 | 2 3 | | | | | 8,137 | 2 3 | |
| 257,507 | | 2,361,634 | 17 10 | 3,301 | Sundry Revenue | 200 | 3,074 | 14 11 | | | | | 3,074 | 14 11 | |
| | | 178,081 | 17 4 | 215,192 | Allocated from Appropriation Account in terms of Section 14(4) of Act No. 33 of 1945.. | 104,407 | 149,407 | 6 11 | | | | | 149,407 | 6 11 | |
| £2,341,122 | £2,518,346 | £2,539,716 | 15 2 | £2,341,122 | | £2,518,346 | £2,539,716 | 15 2 | | | | | £2,539,716 | 15 2 | |

NOTE—1. The following are from commitments of the Council at 31st March 1959:

| | £ | s. | d. |
|--------------------------------------|----------------|-----------|----------|
| (i) For Running Expenses (estimated) | 59,397 | 14 | 0 |
| (ii) For Research Grants | 39,000 | 1 | 0 |
| | <u>£98,397</u> | <u>15</u> | <u>0</u> |

2. The following amounts were spent on the laboratories, departments and projects mentioned below:

| | £ |
|--|-------------------|
| S.A. Bureau of Standards | 571,966 |
| National Chemical Research Laboratory | 150,615 |
| National Physical Research Laboratory | 174,022 |
| National Building Research Institute | 123,710 |
| National Mechanical Engineering Research Institute | 128,307 |
| National Institute for Research in Rubber | 116,099 |
| National Nutrition Research Institute | 78,496 |
| National Institute for Water Research | 74,117 |
| National Institute for Telecommunications Research | 55,004 |
| Pneumonia Research Unit | 24,882 |
| National Institute for Research | 107,302 |
| Medical Research Units and Grants | 124,266 |
| General Sciences Research Awards | 70,738 |
| Industrial Research Institutes | 95,831 |
| Headquarters and Administration | 130,193 |
| Technical Services Department | 122,064 |
| Information and Special Services Department | 66,873 |
| Estate Section | 56,460 |
| General Services to Laboratories | 106,355 |
| Washington Office | 14,601 |
| London Office | 10,009 |
| Cologne Office | 6,567 |
| TOTAL | <u>£2,409,077</u> |

S. M. NAUDE
President

A. J. MILLER-SMIT
Secretary/Treasurer

Pretoria, 25 August 1959

APPROPRIASIEREKENING VIR DIE JAAR GEÏNDIG 31 MAART 1959

| 1957-58 | | 1958-59 | | 1957-58 | | 1958-59 | |
|----------|--|--------------|---------------|----------|---------|---------------|---------|
| £ | £ s. d. | £ s. d. | £ s. d. | £ | £ s. d. | £ | £ s. d. |
| 288,327 | | 68,044 1 8 | 287,551 8 7 | 265,192 | | 257,507 6 11 | |
| | Toewysing deur Raad aan— | 70,100 0 0 | | 23,135 | | 30,044 1 8 | |
| | (a) Geboue- en Reserwekapitaalfonds | 149,407 0 11 | | | | | |
| | (b) Toerustingkapitaalfonds | | | | | | |
| | (c) Rekening van Lopende Uitgawes | | | | | | |
| 288,327 | Saldo vir toewysing deur Raad ingevolge Artikel 14(4) van Wet No. 33 van 1945 aan Rekening van Lopende Uitgawes—soos hieronder voorgestel: | | 287,551 8 7 | 288,327 | | 287,551 8 7 | |
| 257,507 | (i) Voorsiening vir Vaste Verpligtings op 31 Maart 1959 | 98,397 15 0 | 178,081 17 4 | 257,507 | | 178,081 17 4 | |
| | (ii) Saldo oorgedra om uitgawes in 1959/60 te finansier, soos in begroting aangetoon | 45,000 0 0 | | | | | |
| | (iii) Onvoorsiene uitgawes | 34,684 2 4 | | | | | |
| £545,834 | | | £465,633 5 11 | £545,834 | | £465,633 5 11 | |
| | Saldo oorgedra vir toewysing ingevolge artikel 14(4) van Wet no. 33 van 1945 | | | | | | |
| | Rente op beleggings vir toewysing aan Geboue- en Reserwekapitaalfonds | | | | | | |
| | Bedrag van inkomste bo uitgawes oorgedra van die Rekening van Lopende Uitgawes | | | | | | |

A. J. MILLER-SMIT
Sekretaris/Treasurier

S. M. NAUDÉ
President

Pretoria, 25 Augustus 1959

STATEMENT No. 4

APPROPRIATION ACCOUNT FOR THE YEAR ENDED 31st MARCH, 1959

| 1957-58 | | 1958-59 | | 1957-58 | | 1958-59 | |
|----------|--|----------|-------|----------|-------|----------|-------|
| £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. |
| 288,327 | | 287,551 | 8 7 | 265,192 | | 257,507 | 6 11 |
| | | | | 23,135 | | 30,044 | 1 8 |
| 288,327 | | 287,551 | 8 7 | 288,327 | | 287,551 | 8 7 |
| 257,507 | | 178,081 | 17 4 | 257,507 | | 178,081 | 17 4 |
| £545,834 | | £465,633 | 5 11 | £545,834 | | £465,633 | 5 11 |
| | Allocation by Council to— | | | | | | |
| | (a) Building and Reserve Capital Fund | 68,044 | 1 8 | | | | |
| | (b) Equipment Capital Fund | 70,100 | 0 0 | | | | |
| | (c) Running Expenses Account | 149,407 | 6 11 | | | | |
| | Balance for allocation by Council in terms of Section 14(4) of Act No. 33 of 1945 to Running Expenses Account—as proposed below: | | | | | | |
| | (i) Provision for firm commitments at 31st March, 1959 | 98,397 | 15 0 | | | | |
| | (ii) Budgeted surplus to be carried forward to finance expenditure in 1959/60 | 45,000 | 0 0 | | | | |
| | (iii) Contingencies | 34,684 | 2 4 | | | | |
| | Balance brought forward for allocation in terms of Section 14(4) of Act No. 33 of 1945 | | | | | | |
| | Interest on investments for allocation to Building and Reserve Capital Fund | | | | | | |
| | Excess of Revenue over Expenditure transferred from Running Expenses Account | | | | | | |

A. J. MILLER-SMIT
Secretary/Treasurer

S. M. NAUDÉ
President

Pretoria, 25 August 1959

