

**SUID-AFRIKAANSE
WETENSKAPLIKE EN NYWERHEID-
NAVORSINGSRAAD**

**SOUTH AFRICAN
COUNCIL FOR SCIENTIFIC
AND INDUSTRIAL RESEARCH**

**NEGENDE
JAARVERSLAG**

**NINTH
ANNUAL REPORT**

1953 — 1954

P R E T O R I A

UNIE VAN SUID-AFRIKA

UNION OF SOUTH AFRICA

Posbus 395, Pretoria

5 Oktober 1954.

Meneer,

Ek het die eer om aan u voor te lê die Negende Jaarverslag van die Wetenskaplike en Nywerheidsnavorsingsraad vir die jaar geëindig 4 Oktober 1954.

'n Balansstaat en 'n staat van inkomste en uitgawe vir die boekjaar eindigende 31 Maart 1954, soos nagegaan deur die Kontroleur en Ouditeur-Generaal, word ook voorgelê.

Dienswillig die uwe,

S. M. NAUDÉ

President: Wetenskaplike en Nywerheidsnavorsingsraad

Sy Edele E. H. Louw,

Minister van Ekonomiese Sake,

Paul Hof,

Minnaarstraat,

PRETORIA.

P.O. Box 395, Pretoria

5th October, 1954.

Sir,

I have the honour to present to you the Ninth Annual Report of the Council for Scientific and Industrial Research, for the year ended October 4th, 1954.

A balance sheet and statement of income and expenditure for the financial year ended 31st March, 1954, certified by the Controller and Auditor-General, is also presented.

I have the honour to be,

Sir,

Your obedient Servant,

S. M. NAUDÉ

President: Council for Scientific and Industrial Research.

The Hon. E. H. Louw,

Minister of Economic Affairs,

Paul Hof,

Minnaar Street,

PRETORIA.

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Samestelling en Vergaderinge van die Raad

Lede van die Raad gedurende die jaar was :

DR. S. M. NAUDÉ (*President*),
 DR. T. B. DAVIE.
 DR. F. J. DE VILLIERS.
 DR. F. J. DU TOIT.
 MNR. P. E. ROUSSEAU.
 DR. B. F. J. SCHONLAND.
 PROF. E. T. STEGMANN.
 MNR. T. P. STRATTEN.
 DR. E. TABERNER.
 DR. H. J. VAN ECK.
 DR. R. W. WILCOCKS.
 MNR. J. E. WORSDALE.

Die Goewerneur-Generaal het dr. F. J. de Villiers, mnr. T. P. Stratten en dr. E. Taberner heraaangestel as lede van die Raad vir drie jaar, van 5 Oktober, 1953.

Membership and Meetings of the Council

Membership of the Council during the year was :

DR. S. M. NAUDÉ (*President*),
 DR. T. B. DAVIE.
 DR. F. J. DE VILLIERS.
 DR. F. J. DU TOIT.
 MR. P. E. ROUSSEAU.
 DR. B. F. J. SCHONLAND
 PROF. E. T. STEGMANN.
 MR. T. P. STRATTEN.
 DR. E. TABERNER.
 DR. H. J. VAN ECK.
 DR. R. W. WILCOCKS.
 MR. J. E. WORSDALE.

Dr. F. J. de Villiers, Mr. T. P. Stratten and Dr. E. Taberner were re-appointed by the Governor-General as members of the Council for three years from 5th October, 1953.



THE COUNCIL — DIE RAAD.

Sitting/Sittende (L.—R.): Dr. P. J. du Toit, Dr. E. Taberner, Dr. F. J. de Villiers, Dr. S. M. Naudé (*President*), Mr./Mnr. J. E. Worsdale, Dr. B. F. J. Schonland.
 Standing/Staande: Mr./Mnr. E. W. Dohse (*Vice/Vise-President*), Prof. E. T. Stegmann, Mr./Mnr. J. R. Sorrie (*Secretary-Treasurer/Sekretaris-Tesourier*), Mr./Mnr. P. E. Rousseau, Prof. H. O. Mönnig.



Dr. H. J. van Eck.

Dr. H. J. van Eck en dr. F. J. du Toit het op 8 en 15 Maart 1954 onderskeidelik bedank as lede van die Raad na hul benoeming as lede van die Koördinerende en Adviserende Komitee, waarna verwys word in die verslag onder die hoof „Algemene Oorsig”.

Prof. H. O. Mönnig is benoem tot lid van die Raad vir drie jaar vanaf 1 Augustus, 1954.

Die Raad het twee keer in Pretoria en een keer in Durban vergader.

Lede en vergaderings van die Uitvoerende Komitee

Die Uitvoerende Komitee het vyf keer vergader. Die lede van die komitee was :

Dr. S. M. Naudé (Voorsitter).

Dr. F. J. de Villiers.

Dr. H. J. van Eck, met

Dr. F. J. du Toit of mnr. J. E. Worsdale as plaasvervangers vir dr. de Villiers of dr. van Eck. Na die bedanking van drs. van Eck en F. J. du Toit, is mnre. T. P. Stratten en J. E. Worsdale aangestel as plaasvervangers vir dr. de Villiers tot 4 Oktober 1954.

Navorsingsadvieskomitees.

Soos in vorige jare is die Raad dank verskuldig aan 'n groot aantal wetenskaplikes en nyweraars wat hul tyd opgeoffer het om op die nasionale advieskomitees te dien en leiding te gee aan die navorsingsaktiwiteite van sy laboratoriums en institute.

Dr. H. J. van Eck and Dr. F. J. du Toit resigned as members of the Council on 8th and 15th March, 1954, respectively, on being appointed to the Co-ordinating and Advisory Committee referred to under the heading “General Review” later in this report.

Prof. H. O. Mönnig was appointed as a member of the Council for three years from 1st August, 1954.

Membership and meetings of the Executive Committee.

The Executive Committee met five times. The members of the committee were :

Dr. S. M. Naudé (*Chairman*).

Dr. F. J. de Villiers.

Dr. H. J. van Eck, with

Dr. F. J. du Toit or Mr. J. E. Worsdale as alternates to Drs. de Villiers or van Eck.

On the resignation of Drs. van Eck and F. J. du Toit, Messrs. T. P. Stratten and J. E. Worsdale were appointed floating alternates to Dr. de Villiers until 4th October, 1954.



Dr. F. J. de Villiers

Research Advisory Committees.

As in past years the Council is indebted to the large number of scientists and industrialists who gave up their time to serve on the national advisory committees which guided the research activities of its laboratories and institutes.

Algemene Oorsig

Nasionale Laboratoriums

In die vorige *Jaarverslag* is aangekondig dat 'n spesiale eenheid binne die Nasionale Chemiese Navorsingslaboratorium gestig is om in die navorsingsbehoefte van die Departement van Voeding te voorsien. Die eenheid het nou 'n onafhanklike status gekry as die Nasionale Voedingnavorsingsinstituut, onder die direkteurskap van dr. A. W. Lategan, voorheen tegniese adviseur vir Federale Nywerhede Bpk.



Dr. A. W. Lategan

Gedurende die jaar is mnr. F. J. Hewitt, hoof van die Telekommunikasie-navorsingslaboratorium bevorder tot die rang van Direkteur en die laboratorium het die verhoogde status van 'n nasionale laboratorium gekry. Die aantal groter nasionale laboratoriums wat direk deur die Raad beheer word, is dus tot ses vermeerder. Uitvoerige uiteensettings van die werksaamhede van dié laboratoriums verskyn elders in die verslag.

Die Bouprogram

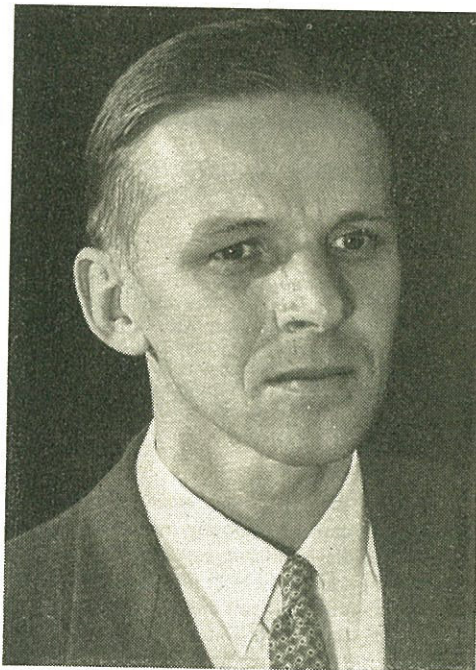
Gedurende die tydperk waaroor die verslag gaan, is die eerste van die Raad se groter institute, die Nasionale Bounavorsingsinstituut, op die nuwe perseel sewe myl oos van Pretoria voltooi. Die gebou is in April, 1954, in gebruik geneem en kort daarna het die Onderafdeling Akoestiek van die Nasionale Fisiese Laboratorium in hul

General Review

National Laboratories.

In the last *Annual Report* it was announced that a special unit had been set up within the framework of the National Chemical Research Laboratory to cater for the research needs of the Department of Nutrition. This has now been given an independent status as the National Nutrition Research Institute under the directorship of Dr. A. W. Lategan, formerly technical adviser to Federale Nywerhede Bpk.

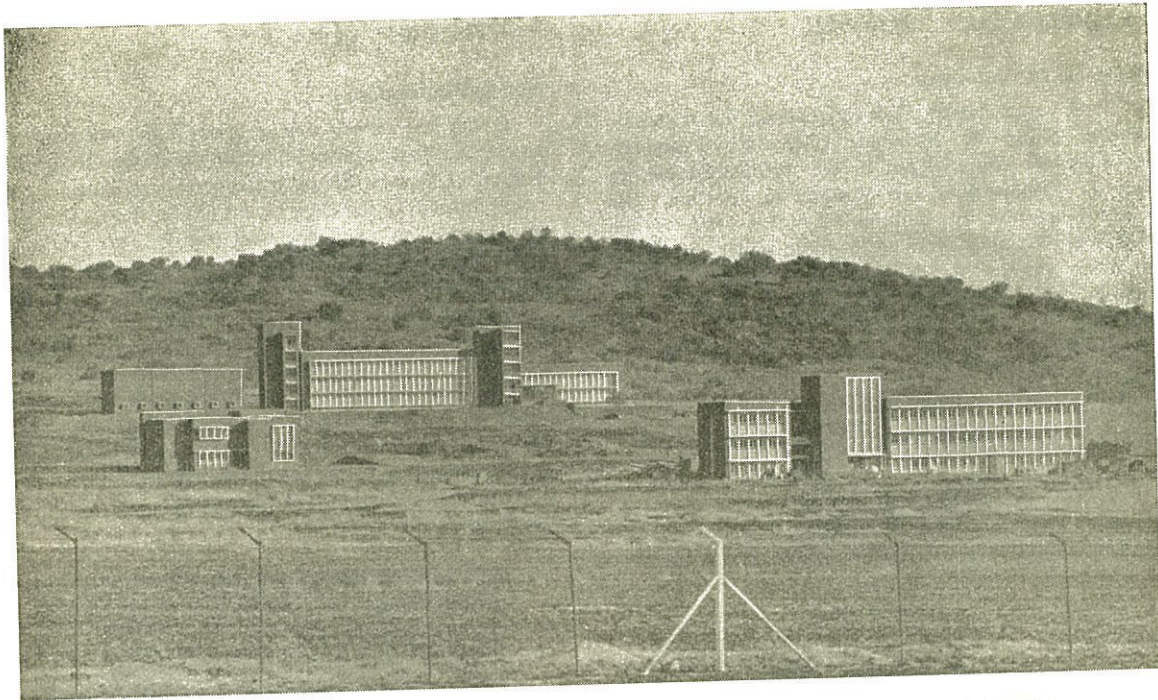
During the year, Mr. F. J. Hewitt, Officer-in-Charge of the Telecommunications Research Laboratory, was promoted to the rank of Director and the laboratory raised in status to that of a national laboratory. The number of major national laboratories controlled directly by the Council has thus been increased to six. Detailed accounts of the activities of these laboratories are given elsewhere in this report.



Mr./Mnr. F. J. Hewitt

The Building Programme.

During the period under review the first of the Council's major institutes, the National Building Research Institute, was completed at the new site seven miles east of Pretoria. This building was occupied during April, 1954, and soon afterwards the Acoustics Sub-division of the National Physical Laboratory moved into its new building. The Nuclear Physics Building and Cyclotron



*DIE EERSTE GEBOUE OP DIE NUWE
PERSEEL*

Hierdie is die eerste van die laboratoriums wat op die W.N.N.R. se nuwe navorsingsentrum naby Pretoria opgerig is. Op die voorgrond is die Kernfisika-gebou. In die kleiner gebou aan die linkerkant is die Onderafdeling Akoestiek van die Nasionale Fisiese Laboratorium gehuisves, terwyl die groot gebou op die agtergrond die Nasionale Bounavorsingsinstituut is.

*THE FIRST BUILDINGS AT THE
NEW SITE*

These are the first of the laboratories to be built at the C.S.I.R.'s new research centre near Pretoria. In the foreground is the Nuclear Physics Building. The smaller building to the left houses the Acoustics Sub-division of the National Physical Laboratory, while the large building in the background is the National Building Research Institute.

nuwe gebou ingetrek. Die Kernfisika-gebou en die Siklotronsaal nader voltooiing en daar is aansienlik gevorder met die installasie van die siklotron self. Die Biofisika-gebou langs die gebou vir Kernfisika word nou opgerig en teen die end van die jaar sal grond gereed gemaak word vir die Nasionale Fisiese Laboratorium. Tenders vir die oprigting van die Sentrale Werkplaas en vir die bou van paaie en vloedwatervore op die perseel, word in November 1954 ingewag. Daar sal na verwagting gedurende die eerste helfte van 1955 tenders gevra word vir die Biblioteek en Hoofkantore. Voorbereidings word getref om met die ontwerp van die groep geboue vir die Nasionale Chemiese Navorsingslaboratorium te begin.

In Johannesburg onderhandel die Raad met die Universiteit van die Witwatersrand vir 'n perseel vir 'n permanente gebou om die Telekommunikasie-navorsingslaboratorium te huisves en uitbreidings aan die Nasionale Instituut vir Personeelnavorsing word ook beplan.

Hall are nearing completion and considerable progress has been made with the installation of the cyclotron itself. Work on the Biophysics Building adjacent to Nuclear Physics is in progress while ground will be broken for the National Physical Laboratory itself towards the end of the year. Tenders for the erection of the Central Workshops and for the construction of roads and storm-water drainage on the site, are due in November, 1954. The Library and Headquarters buildings are expected to go to tender during the first quarter of 1955. Preparations are in hand to commence the design of the group of buildings to house the National Chemical Research Laboratory.

In Johannesburg, the Council is negotiating with the University of the Witwatersrand for a site for a permanent building to house the Telecommunications Research Laboratory, and extensions to the National Institute for Personnel Research are also planned.

Personnel

Die Raad het nou 'n personeel van oor die 700. Hiervan is 61 in besit van doktorsgrade, terwyl in die navorsingsgrade, waar die minimum kwalifikasies 'n M.Sc., B.Sc. (Hons.)- of B.Sc. (Ing.)-grad is, daar 'n totaal van 158 wetenskaplikes is. Onder die res van die Raad se personeel is daar 'n verdere 150 met M.A., B.A., B.Sc., of B.Com.-grade en 'n groot aantal het 'n mate van voorbereiding gemaak met hul buitenuurse grade. Die laasgenoemde word finansieel deur die Raad gesteen. word ook toegelaat om 'n beperkte aantal lesings gedurende kantoorure by te woon. Daar is nou 146 nie-blankes op die personeel van die Raad. Gedurende die jaar is die dienste van vyf erare wetenskaplikes oorse gewer, terwyl sesien lende van die Raad se eie personeel vir verdere opleiding na Europa en Noord-Amerika gestuur is.

Tekort aan Wetenskaplikes en Ingenieurs

Soos ander industriële lande, is die Unie van Suid-Afrika in 'n toenemende mate aan 'n kroniese tekort aan erare wetenskaplikes en ingenieurs. Die tekort is veral aknu op die bestuurspeil in tegniese Staatsdepartemente en nywerhede, waar 'n tekort aan geskikte applikante, daar soms persone in poste aangestel moes word waarvoor hul opleiding en ondervinding volgens die standaard wat gewoonlik in oorsese nywerheidslande vereis word, nie voldoende is nie. Gedurende die jaar het die President en senior beamptes van die Raad herhaalde-lik die dringendheid van die probleem beklemtoon. Dit het gevolglik omvattende publisiteit in die daaglikse en tegniese pers geniet. Binne sy gebied, n. die van navorsing, het die Raad voortgegaan om die universiteite en ander inrigtings deur middel van uitgebreide navorsingsworskemings en bourse te help om opgeleide ingenieurs te lewer, maar daar moet nog baie gedoen word om te voorkom dat potensieel wetenskaplikes en ingenieurs uit die hoër skole en onder die ongegradeerde studente aan universiteite verlore gaan.

Vir die kalenderjaar 1953-54 het die Raad nagrade bourse ter waarde van £10,859 aan sowat 60 mans en vroue toegeken om hul te help om hul navorsingsonder- vinding uit te brei. Vir dieselfde tydperk het dit £9,410 in senior bourse aan erare navorsers aan universiteite en ander wetenskaplike inrigtings toegeken. Twee nuwe oorse bourse vir navorsing onder leiding op bepaalde gebiede is gedurende die jaar toegeken en drie wat verlede jaar vir die eerste keer toegeken is, is hernu. Ook is drie verdere bourse toegeken vir navorsing onder leiding in die Raad se eie laboratoriums. 'n Lys van die navorsingsworskemings wat deur die Raad gedoen is, word in Aanhangsel II gegee.

Navorsing vir die Regering en Nywerhede

Dit is verblydend om te kan meld dat 'n toenemende deel van die Raad se lopende uitgawes nou gedeel word deur fondse wat nie inbreuk maak op die Parlement se jaarlikse begroting nie. Sulke fondse word verkry uit

Staff

The Council's staff now numbers over 700. Of these 61 hold doctor's degrees, while in the research grades, for which the minimum qualification is an M.Sc., B.Sc., (Hons.) or B.Sc. (Eng.) degree, there is a total of 158 scientists. Among the remainder of the Council's staff a further 150 have M.A., B.A., B.Sc. or B.Com. degrees, and a large number are at various stages of progress towards extramural degrees. The latter are assisted by the Council, both financially and by allowing them to attend a limited number of lectures during office hours. The Council's non-European staff now numbers 146. During the year five experienced scientists were recruited overseas, while sixteen members of the Council's own staff were sent to Europe and North America for further training.

Shortage of Scientists and Engineers

Like other industrial countries, the Union of South Africa is suffering to an increasing degree from a chronic shortage of experienced scientists and engineers. This shortage is particularly acute at the management level both in the Government technical departments and Industry, where for lack of suitable applicants, men have sometimes had to be appointed to posts for which their training and experience was inadequate by the standards usually demanded in industrialized countries overseas. During the year the President and senior officers of the Council have repeatedly emphasized the urgency of the problem which, as a result, has been extensively publicized both in the Daily and Technical Press. Within its own field, that of research, the Council, by means of extensive research grants and bursaries, continued to help universities and other institutions to provide trained research workers, but much must yet be done to prevent wastage of potential scientists and engineers, from the high schools and among the undergraduate students at the universities.

For the calendar year 1954, the Council awarded post-graduate bursaries amounting to £10,859 to some 60 men and women to enable them to extend their research experience. For the same period it awarded £9,410 in senior bursaries to sixteen experienced research workers in universities and other scientific institutions. Two new overseas bursaries for directed research in specific fields were awarded during the year, and three, awarded for the first time last year, were renewed. In addition three bursaries were awarded for directed research in the Council's own laboratories. These figures do not include substantial amounts awarded in the form of bursaries to personnel in C.S.I.R. Medical Research Units. A list of the research awards made by the Council is given in Appendix II.

Research for Government and Industry

It is gratifying to report that an increasing proportion of the Council's operating expenses are now being met from funds other than the annual appropriation by Parliament. These revenues are derived from contracts,

kontrakte, beurse en toelaes vir bepaalde ondersoekte, toetse en ander dienste verrig deur die Raad se laboratoriums. Dit toon dat daar 'n toenemende vertroue deur Staat en Nywerheid gestel word in die hulp wat navorsing kan verleen om probleme op te los. Gedurende die boekjaar 1 April 1953 tot 31 Maart 1954 het die Raad altesaam £77,133 ontvang vir werk gedoen in sy laboratoriums vir die Nywerheid, Staatsdepartemente, Provinsiale Administrasies en Munisipaliteite, terwyl 'n verdere som van £9,727 ontvang is uit verskillende bronne vir spesiale werk (bv. voorsiening van radio-isotope). Bo en behalwe dit alles het die Raad vir £45,000 kostelose dienste gelewer aan Staatsdepartemente.

Die Raad het baie aandag geskenk aan skakeling en kontak met die nywerheid, veral in die kusgebiede waar die Natalse en Middellandse Streeknavorsingskomitees van die W.N.N.R. voortgegaan het om onskatbare hulp en advies te verleen. 'n Nuwe streeknavorsingskomitee is in Kaapstad gestig om die Westelike Provinsie te dien. Drie van die Skakelafdeling se senior beamptes is individuele verantwoordelike opgelê vir elk van die streke. Hulle probeer om elke kwartaal vir sowat twee weke besoeke te bring aan ondernemings in hul gebiede en gedurende die afgelope jaar is hulle by verskeie geleenthede vergesel deur deskundiges uit die Raad se laboratoriums. Die streekskomitees was bedrywig om tegniese vergaderings en simposiums te belê om saam te val met die besoeke.

Die vrywillige samewerking tussen leiers van die nywerheid en die W.N.N.R., het van onskatbare waarde geblyk in die bevordering van goeie verhoudings tussen die navorsingslaboratoriums en die nywerheid, asook van die uitruiling van idees en inligting tussen nyweraars en navorsingswetenskaplikes.

In ooreenstemming met sy beleid om af en toe 'n vergadering weg van Pretoria te hou, het die Raad in Junie in Durban vergader. Dit het 'n geskikte geleentheid vir die President gebied om 'n gesamentlike byeenkoms van die Kamers van Nywerheid en van Handel toe te spreek en het ook die Raad in staat gestel om hulle lede te ontmoet.

Daar is ook 'n gesamentlike vergadering met die Natalse Streeknavorsingskomitee gehou.

Nywerheidsnavorsingsinstitute

Die vyf nywerheidsnavorsingsinstitute wat deur die Raad gesubsidieer word, het weereens goeie vordering gemaak, soos sal blyk uit die opsommings van hul verslae hieronder. In elke instituut was daar 'n toename in finansiële bydraes teenoor die van vorige jare, wat die betrokke nywerhede se toenemende waardering van die dienste wat hulle lewer, toon. Die gelde wat jaarliks aan die vyf institute beskikbaar is bedra reeds meer as £90,000, waarvan meer as die helfte van die betrokke industriële ontvang word.

Die Leernywerheid-navorsingsinstituut en die Visnywerheid-navorsingsinstituut nader die einde van hul tweede vyfjaarlikse tydperke; en die Suid-Afrikaanse

fellowships and grants-in-aid for applied research, investigations, tests and services in the Council's laboratories and indicate the increased confidence both Government and Industry are placing in research as a means of solving their problems. During the financial year 1st April, 1953, to 31st March, 1954, the Council received a total of £77,133 in return for work undertaken in its laboratories for Industry, Government departments, the provincial administrations and municipalities, and a further sum of £9,727 was received from various sources for special services such as the supply of radio-isotopes. In addition to this, a considerable amount of work estimated at £45,000 was done free for Government departments.

The Council paid much attention to liaison and contact with Industry, particularly in the coastal areas, where the Natal and Midland Regional Research Committees of the C.S.I.R. have continued to provide invaluable help and advice. A new regional committee was established in Cape Town to serve the Western Province. Three of the Liaison Division's senior officers have been given individual responsibilities for each of these regions. They endeavour to spend about two weeks each quarter visiting firms in their areas, and on several occasions during the past year were accompanied by specialists from the Council's laboratories. The regional committees have been active in arranging technical meetings and symposia to coincide with these visits.

This voluntary association between leaders of Industry and the C.S.I.R. has proved of inestimable value in promoting good relations between the research laboratories and industry as well as the exchange of ideas and information between industrialists and research scientists.

In pursuance of its policy of holding an occasional meeting away from Pretoria, the Council met in Durban in June. This provided a suitable opportunity for the President to address a joint gathering of the Chambers of Industry and of Commerce and also enabled Council to meet members thereof.

A joint meeting was also held with the Natal Regional Research Committee.

Industrial Research Institutes

The five industrial research institutes subsidized by the Council have continued to make good progress, as will be seen from their summarized reports which appear below. In each institute there has been an increase in financial contributions over previous years, indicating an increased appreciation by the industries concerned of the services rendered. The funds annually available to the five institutes now total over £90,000, of which more than half is received from the industries concerned.

The Leather Industries Research Institute and the Fishing Industry Research Institute are approaching the end of their second five-year periods; and the last to be formed, the South African Wool Textile Research In-

Woltekstiel-navorsingsinstituut wat die laaste gestig is, sal vroeg in 1955 sy eerste vyf jaar van geslaagde werksaamhede voltooi.

Verskeie institute het 'n toenemende hoeveelheid toetswerk en adviserende werk vir hul lede onderneem. Dit het gelei tot 'n nouer voeling met die nywerheid, wat wedersyds tot voordeel was, sonder om inbreuk te maak op navorsingsprogramme. 'n Nuwe stelsel waarmee twee jaar gelede deur die Leernywerheid-navorsingsinstituut begin is, is die opbou van sterk „produktiwiteit-spanne” om skoelersvervaardigers te help om moderne produktiwiteitstechniek tesame met aansporingsloonskemas toe te pas. Daar word bereken dat die werk van die span gelei het tot 'n gemiddelde besparing van veertien pennies in die koste van 'n paar skoene. Die werk het ook gehelp om te verseker dat die Instituut se navorsingsbevindinge gou in die praktyk toegepas kan word.

stitute, will reach the end of its first five-year period of successful operation early in 1955.

Several of the institutes have undertaken an increased amount of testing and consulting work on behalf of their members. This has led to closer contact with industry which has been mutually beneficial without interfering with research programmes. A new feature initiated two years ago by the Leather Industries Research Institute has been the building up of strong productivity teams to assist footwear manufacturers to apply modern productivity techniques coupled with wage incentive schemes. It is estimated that the work of these teams has led to savings of an average of fourteen pence in the cost of a pair of shoes. This work has also helped to ensure the rapid translation of the Institute's research findings into practice.



Die Minister van Arbeid spreek vervaardigers toe by geleentheid van die invoering van die eerste voltooide loonaansporingskema deur die Leernywerheid-navorsingsinstituut in 'n Suid-Afrikaanse skoefabriek.

The Minister of Labour addressing manufacturers on the occasion of the inauguration of the first completed wage incentive application by the Leather Industries Research Institute in a South African footwear factory.

Mediese Navorsingseenhede

Twee nuwe mediese navorsingseenhede is gedurende die jaar gestig. Die Tandheelkundige Navorsingseenheid onder professor J. T. Irving is vroeg in Februarie 1954 in die lewe geroep. Die eenheid is gehuisves in die Mond- en Tandheelkundige Hospitaal van die Universiteit van die Witwatersrand en sal navorsingswerk doen i.v.m. studies van tand- en beenformasie, die samestelling van tandproteïene, murg en glasuurkiem, mondslymvlies en die speekselkliere.

Report—2

Medical Research Units

Two new medical research units were formed during the year. The Dental Research Unit under Professor J. T. Irving came into being early in February, 1954. This unit is housed in the Oral and Dental Hospital of the University of the Witwatersrand, and will do research into studies of tooth and bone formation, the composition of dental proteins, pulp and enamel organ, oral epithelia, and salivary glands.

Teen die end van die jaar is 'n nuwe Hartnavorsings-eenheid by die Mediese Skool van die Universiteit van Pretoria gestig, onder professor H. W. Snyman, met dr. A. J. Brink as Assistent-Direkteur. Die navorsingsprogram sal hoofsaaklik 'n uitbreiding wees van die werk wat voorheen met behulp van W.N.N.R.-toekennings geding is en sal veral toegespits wees op 'n ondersoek van hartspierinfarsie en koronêre vate. Verslae van die nege ander eenhede verskyn in die afdeling mediese navorsing.

Verdedigingsnavorsing

Die Raad het gedurende die jaar voortgegaan om navorsing vir die Unieverdedigingsmag te koördineer en deur verteenwoordigers op sekere oorsese komitees te hou, het hy die Departement van Verdediging op die hoogte gehou van die nuutste ontwikkelinge in militêre navorsing. Vir die doel is 'n beampste van die Raad by die Verdedigingshoofkwartier gestasioneer. Dr. S. M. Naudé, President van die Raad, is aangestel as bevelvoerder van die Suid-Afrikaanse Korps van Wetenskaplikes in opvolging van dr. B. F. J. Schonland wat die pos neergelê het na sy aanstelling as Adjunkdirekteur van die Atoomkragnavorsingsinrigting te Harwell, Groot-Brittanje.

Die Koördinerende en Adviserende Komitee

In Februarie 1954, het die Minister van Ekonomiese Sake, wat verantwoordelik is vir die W.N.N.R. en die Suid-Afrikaanse Buro vir Standaarde, 'n komitee ingestel om hom van raad te bedien in verband met die koördinerende van die werk wat onderneem word deur die liggame wat verantwoordelik is vir wetenskaplike navorsing aan die een kant en standarde en toetse aan die ander kant.

Dr. H. J. van Eck, voorsitter en besturende direkteur van die Industriële Ontwikkelingskorporasie is benoem tot voorsitter van die nuwe komitee met dr. F. J. du Toit, voorsitter van die Raad vir die Ontwikkeling van Natuurlike Hulpbronne as ondervoorsitter. Dr. F. Meyer, voorsitter van die S.A. Yster- en Staalkorporasie is aangestel as 'n addisionele lid, terwyl die President van die W.N.N.R. en die voorsitter van die Raad vir Standaarde *ex officio* lede is.

Erkennings

Die Raad erken met dank onvoorwaardelike skenkings van £1,000 elk van die Administrasie van Suidwes-Afrika en die Suid-Afrikaanse Uitsaaikorporasie, £105 van die Nasionale Federasie van Boubedryfwergewers en die som van £203 wat deur individue geskenk is ter erkenning van die werk van die Teringnavorsingseenheid.

Die Nasionale Raad vir Maatskaplike Navorsing het £3,771 aan die Raad geskenk om deur die Nasionale Bounavorsingsinstituut gebruik te word vir maatskaplike opnames van natuurlike behuising en 'n verdere £541 vir werk van die Nasionale Instituut vir Personeelnavorsing. Die som van £6,466 is van die Nasionale Behuising- en Beplanningskommissie ontvang ter steuning van werk op die gebied van behuising deur die Nasionale Bounavorsingsinstituut.

Towards the end of the year a new Heart Research Unit was established in the University of Pretoria Medical School, under Professor H. W. Snyman with Dr. A. J. Brink as Assistant Director. The research programme will, for the most part, be an extension of research previously done with the aid of C.S.I.R. grants and will be centred upon an investigation of myocardial infarction and coronary arteries. Reports of the other nine units are given under the section of medical research.

Defence Research

The Council continued during the year to co-ordinate research for the Union Defence Force, and by maintaining representatives on certain overseas committees, it has kept the Department of Defence informed of the latest developments in military research. For this purpose an officer of the Council has been stationed at Defence Headquarters. Dr. S. M. Naudé, President of the Council, was appointed Commander of the South African Corps of Scientists in succession to Dr. B. F. J. Schonland who relinquished the post on his appointment as Deputy Director of the Atomic Energy Research Establishment at Harwell in Great Britain.

The Co-ordinating and Advisory Committee

In February, 1954, the Minister of Economic Affairs, who is the Minister responsible for the C.S.I.R. and the South African Bureau of Standards, established a committee to advise him on the matter of co-ordinating the work undertaken by the bodies responsible for scientific research on the one hand and standards and testing on the other.

Dr. H. J. van Eck, Chairman and Managing Director of the Industrial Development Corporation, was appointed Chairman of the new committee with Dr. F. J. du Toit, Chairman of the Natural Resources Development Council, as Vice-Chairman. Dr. F. Meyer, Chairman of the S.A. Iron and Steel Corporation, was appointed as an additional member, whilst the Chairman of the S.A. Standards Council and the President of the C.S.I.R. are *ex officio* members.

Acknowledgements

The Council gratefully acknowledges unconditional grants of £1,000 each from the South West Africa Administration and the South African Broadcasting Corporation, £105 from the National Federation of Building Trade Employers, and the sum of £203 donated by individuals in recognition of the work of the Tuberculosis Research Unit.

The National Council for Social Research has donated £3,771 to the Council for use by the National Building Research Institute in carrying out social surveys of Native housing and a further £541 for work by the National Institute for Personnel Research. The sum of £4,766 was received from the National Housing and Planning Commission in support of work in the field of housing by the National Building Research Institute.

Skakelafdeling

Hoof van die Afdeling: MNR. D. G. KINGWILL

In Oktober 1953, het die Skakelafdeling na kantore in S.A.T.U.-huis, Visagiestraat, Pretoria, verhuis en in April 1954 het die Washingtonse kantoor saam met die res van die „British Commonwealth Scientific Offices (North America)” na 'n gebou in 1907 K-straat, N.W. Washington, D.C. verhuis.

Mnr. J. P. de Wit, wat sedert April 1950 aan die hoof van die Wetenskaplike Skakelkantoor in Londen was, het in April, 1954 na die Unie teruggekeer. Hy is opgevolg deur mnr. A. M. Schady, wat bygestaan word deur mnr. C. G. Hide.

NYWERHEIDSKAKEL

Streekswerksaamhede

Daar is baie aandag geskenk aan die kusgebiede, veral Natal, die Oostelike Provinsie en die Westelike Provinsie, waar streeknavorsingskomitees nog steeds onskatbare advies en hulp verleen. Dr. G. C. Scully het mnr. S. Stephenson as voorsitter van die Natalse Streeknavorsingskomitee opgevolg en professor P. H. Connell, van die Universiteit van Natal het ere-sekretaris van die komitee geword. In die Westelike Provinsie is 'n streekskomitee saamgestel onder voorsitterskap van professor W. J. Pretorius, bestuurder van die K.W.V. Aan die begin het dr. G. M. Dreosti, direkteur van die Visnywer-



Prof. W. J. Pretorius

Liaison Division

Head of Division: MR. D. G. KINGWILL

In October 1953 the Liaison Division moved to offices in S.A.T.U. House, Visagie Street, Pretoria and in April 1954 the Washington office moved with the rest of the British Commonwealth Scientific Offices (North America) to a building at 1907, K Street, N.W. Washington, D.C.

Mr. J. P. de Wit, who has been in charge of the London Scientific Liaison Office since April 1950, returned to the Union in April, 1954. He was succeeded by Mr. A. M. Schady who is assisted by Mr. C. G. Hide.

INDUSTRIAL LIAISON

Regional Activities

Much attention has been given to the coastal regions, particularly Natal, Eastern Province and the Western Province, where regional research committees continue to provide invaluable help and advice. Dr. G. C. Scully took over the chairmanship of the Natal Regional Research Committee from Mr. S. Stephenson and Professor P. H. Connell, of the University of Natal, has taken on the duties of honorary secretary to this committee. In the Western Province a regional committee was set up under the chairmanship of Professor W. J. Pretorius, manager of the K.W.V.; and initially Dr. G. M. Dreosti, director of the Fishing Industry Research Institute, undertook the task of honorary secretary and provided administrative services through his Institute. In July, Dr. J. R. Nunn, head of the C.S.I.R. Seaweed Research Unit at the University of Cape Town took over the secretaryship of the committee.

Research intelligence

This aspect of the work is carried out mainly by liaison officers attached to the research laboratories, by the overseas liaison officers and by one officer with special qualifications in the fields of economics and statistics. Contact with Industry through the Regional Research Committees and liaison visits, and through industrial and other inquiries for scientific and technical information and advice, is contributing, through systematic analysis, to a better knowledge of the need for research into problems which are of particular interest to geographical regions or to segments of industry.

The officers attached to the laboratories deal with enquiries from industry with the assistance of the Library and Information Division, specialists in the laboratories, and the overseas liaison offices. As the overseas offices become better known, they are beginning to receive an increasing number of inquiries directly from other South African organizations. In this way, for instance the liaison officer attached to the National Chemical Research Laboratory dealt with 300 major inquiries,

heidnavorsingsinstituut die taak van ere-sekretaris op hom geneem en deur middel van sy Instituut die administratiewe werk verrig, maar in Julie het dr. J. R. Nunn, hoof van die W.N.N.R. se seewiernavorsingseenheid by die Universiteit van Kaapstad, die sekretarisskap van die komitee oorgeneem.

Navorsingsinligting

Die deel van die werk word hoofsaaklik behartig deur skakelbeamptes verbonde aan die navorsingslaboratoriums, deur die oorsese skakelbeamptes en deur een beampte met spesiale kwalifikasies op die gebied van ekonomie en statistieke. Die kontak met die nywerhede deur middel van die Streeknavorsingskomitees, deur besoeke van skakelbeamptes en deur industriële en ander navrae vir wetenskaplike en tegniese inligting en raad, dra deur sistematiese ontleding by, tot 'n beter kennis van die behoefte aan navorsing in vraagstukke wat van besondere belang is vir geografiese streke of vir afdelings van die nywerheid.

Die skakelbeamptes verbonde aan die laboratoriums hanteer navrae van die nywerheid met behulp van die Biblioteek- en Inligtingsdiens, van spesialiste in die laboratoriums en van die oorsese skakelkantore. Namate die oorsese kantore beter bekend raak, ontvang hulle 'n toenemende aantal versoeke direk van ander Suid-Afrikaanse organisasies. Op die manier bv. het die skakelbeampte verbonde aan die Nasionale Chemiese Navorsingslaboratorium 300 belangrike navrae gehanteer en die Washingtonse kantoor 200. Daar is begin met 'n stelselmatige ontleding van navrae wat deur die Raad se laboratoriums ontvang word, met die hoop dat dit gebruik kan word in die beplanning van skakelwerksaamhede, tesame met die toepassing van 'n ewewigsontleding op die basis van Leontief se goederevloei-tegniek, op die Unie se ekonomie. Die inligting kan ook waardevol wees om vas te stel watter navorsingsprojekte voorkeur moet geniet.

Die oorsese skakelbeamptes probeer op die hoogste bly van nuwe ontwikkelinge wat van besondere belang is vir wetenskaplike en nywerheidsorganisasies in Suid-Afrika. Die Washingtonse kantoor het byvoorbeeld spesiale aandag gewy aan onderwerpe soos waterbehandeling, kenaf (stokroos), benutting van munisipale afval en voedselnavorsing.

In 'n proefneming om die wetenskaplike en navorsingsontwikkelinge in Noord-Amerika beter te kan dek as wat deur 'n kantoor met een man gedoen kan word, het die Raad reëlings getref dat professor F. L. Warren, Hoof van die Chemiese Fakulteit van die Universiteit van Natal, van Februarie tot Junie 1954 in die V.S.A. kon deurbring.

Die Londense Kantoor het 'n omvattende opname gemaak van ontwikkelinge op die gebied van operasionele navorsing en produktiwiteitsstudies. Suid-Afrika word deur die Wetenskaplike Skakelbeampte in Londen verteenwoordig op die sub-komitee vir kooperatiewe navor-



Dr. G. C. Scully

and the Washington office with 200. A start has been made with the systematic analysis of inquiries received by the Council's laboratories; it is hoped to use this in planning liaison activities in conjunction with the empirical application to the Union's economy of an equilibrium analysis on the basis of Leontief's Input/Output technique. This information may also prove of value in assessing the priorities of research projects.

The liaison officers overseas endeavour to keep in touch with new lines of development which are of particular interest to scientific and industrial organizations in South Africa. The Washington office, for instance, has given special attention to subjects such as water treatment, kenaf (stokroos), utilization of municipal wastes and food research.

As an experiment in extending the coverage of scientific and research development in North America beyond what can be achieved by a one-man office, the Council arranged for Professor F. L. Warren, Head of the Department of Chemistry of the University of Natal, to spend five months in the U.S.A. from February to June 1954.

The London Office has made a comprehensive survey of developments in the fields of operational research and productivity studies. South Africa is represented on the Sub-Committee for Co-operative Research of the Organization for European Economic Co-operation by

sing van die „Organisation for European Economic Co-operation”. Deur hom word die W.N.N.R. en belangstellende Staatsdepartemente op die hoogte gehou van die werksaamhede van die O.E.E.C. en die „European Productivity Agency”.

Ander sake waaraan spesiaal aandag geskenk word in Brittanje en Europa, is: patentering van uitvindings, nuwe ontwerpe vir laboratoriums, voedseltegnologie, bak- en meeltegnologie, toerusting vir ’n graanlaboratorium, die maak van kompos van munisipale afval, opleidingsfasiliteite vir mikrobioloë en produksie-ingenieurs.

In Suid-Afrika is ’n omvattende opname van industriële mikrobiologie en Suid-Afrikaanse swawelbronne en die benutting daarvan voltooi en daar is begin met ’n opname van die gebruik en verkoop van melasse. Die doel van die opnames is om ’n tegniese en ekonomiese agtergrond te verskaf vir die waardering van navorsingsprojekte op die gebiede.

Vrystelling van Inkomstebelasting op Navorsingsuitgawes

Aansoeke om die sertifisering van navorsingsuitgawes word nog soos voorheen gehanteer. Die reaksie wat gevolg het op ’n verklaring in die Raad se driemaandelikse publikasie „Navorsingsoorsig” oor inkomstebelastingsaftrekkings wat vir navorsingsuitgawes toegelaat word, suggereer dat baie vervaardigers nie bewus is van die konsessie nie. Afskrifte van ’n herdruk van die verklaring is deur bemiddeling van die Kamers van Nywerheid en die Nywerheidsnavorsingsverenigings versprei.

PATENTE

Daar is antwoorde opgestel vir die talle vrae wat van oorsese patente-onderzoekers ontvang is gedurende die nagaan van patentaansoeke wat die Raad vir sowat vier uitvindings ingedien het. Aan die end van Julie 1954 was reeds vier van die aansoeke in Suid-Afrika, een in Suid-Rhodesië een in Frankryk en een in België, toegestaan. Ander was nog hangende in Engeland (4), Australië (3), Verenigde State (2), Duitsland (1) en Holland (1).

Van tien voorlopige patentaansoeke om ander uitvindings te dek, is daar besluit om slegs met een voort te gaan en in die geval is daar slegs vir ’n Unie-patent aansoek gedoen. Die patent is toegestaan.

Een nuwe voorlopige aansoek is gedurende die jaar ingedien en ’n ander voorlopige aansoek is later gedateer sodat dit nog verder oorweeg kon word.

Daar word gedurig getrag om verskeie van die gepatenteerde uitvindings van die Raad onder vergunning te ontgin. Vir een van die uitvindings is reeds drie vergunnings verleen.

the Scientific Liaison Officer, through whom the C.S.I.R. and interested Government Departments are kept in touch with the activities of the O.E.E.C. and the European Productivity Agency.

Other matters to which special attention has been given in Britain and Europe are: patenting of inventions, new laboratory design, food technology, baking and flour technology, equipment for a cereals laboratory, composting of municipal wastes and training facilities for microbiologists and production engineers.

In South Africa, a comprehensive survey of industrial microbiology has been completed, South African sulphur resources and utilization have been surveyed and a start has been made with a survey of the use and disposal of molasses. The object of these surveys is to provide a technical and economic background for the appraisal of research projects in these fields.

Remission of income tax on research expenditure.

Applications for the certification for research expenditure have continued to be dealt with as before. The response to a statement in the Council's quarterly publication *Research Review* about income tax deductions allowed for research expenditure suggests that many manufacturers are not aware of these concessions. Copies of this statement have been distributed through the Chambers of Industry and Industrial Research Associations.

PATENTS

Replies have been prepared to the numerous questions which have been raised by patent examiners overseas during the scrutiny of the patent applications which the Council has previously filed to cover some four inventions. Of these applications, at the end of July 1954, four had been granted in South Africa, one in Southern Rhodesia, one in France, and one in Belgium; others were pending in Britain (4), Australia (3), United States (2), Germany (1) and Holland (1).

Of ten provisional patent applications covering other inventions, it was decided to proceed with one only, and in this case application was made for a Union patent alone. This patent was subsequently granted.

One new provisional application has been filed during this year, and another provisional application was post-dated to enable it to be considered further.

Efforts to exploit and license several of the Council's patented inventions have been continued. In the case of one invention three licences have been granted.

INTERNASIONALE SKAKELING

Oorsese Kantore

Die wetenskaplike skakelkantore in Londen en Washington behandel navrae vir bepaalde inligting en maak opnames en doen verslag op gebiede van besondere belang vir die wetenskap en nywerheid in Suid-Afrika. Daarbenewens voorsien hulle die Biblioteek- en Inligtingsafdeling met publikasies en help Suid-Afrikaanse wetenskaplikes en nyweraars met reëlings vir besoeke aan wetenskaplike inrigtings in die Verenigde Koninkryk, Europa en Noord-Amerika.

Die volgende syfers is 'n opsomming van die bystand verleen aan die Biblioteek- en Inligtingsafdeling in die verkryging van herdrukke van verhandelinge of enkele fotostatiese afdrucke van seldsame wetenskaplike of tegniese verhandelinge wat nie in Suid-Afrika verkrygbaar is nie, asook die gereelde sendings van verslae en ander wetenskaplike publikasies :

	Londen	Washington
(1) Versoeke vir dokumente, mikrofilms, ens. van		
(a) die Biblioteek- en Inligtingsafdeling van die W.N.N.R.	151	242
(b) ander Suid-Afrikaanse navraers	—	25
(c) oorsese navraers	30	36
(2) Gereelde oorsending van dokumente		
Aantal dokumente	500	1,958

'n Nuwe stelsel om die W.N.N.R. se navorsingslaboratoriums in te lig i.v.m. wetenskaplike konferensies in Noord-Amerika en Europa het gelei tot 'n toename in die aantal versoeke vir herdrukke van verhandelinge en verwante dokumente. Die Washingtonse kantoor het 263 sulke versoeke ontvang en die Londense kantoor sowat 30.

Die Washingtonse Kantoor het sowat 80 B.C.S.O. (N.A.) verslae aangestuur, wat gedurende die jaar opgestel is deur individuele beamptes van die vyf wetenskaplike sendings wat gesamenlik die „British Commonwealth Scientific Office” in Washington uitmaak. Dit is gespesialiseerde verslae wat opgestel is na ondersoeke op bepaalde gebiede van die wetenskap en tegnologie in Amerika en op verskeie maniere versprei word na Suid-Afrika en ander lande van die Britse Gemenebes. Die *Washington Newsletter* wat elke twee maande deur al die sendings saam opgestel word, word betreklik wyd versprei, onder meer na Suid-Afrikaanse Universiteite. Die Suid-Afrikaanse skakelbeampte het ook verskeie bydraes tot die publikasie gelewer. Die *Annual Review of Science and Technology in the U.S.* is ook 'n gesamentlike produk van die B.C.S.O. (N.A.) en word beide in Amerika en in die Gemenebeslande versprei.

Weens die ingewikkeldheid van die moderne wetenskap en tegnologie is baie internasionale komitees in die lewe geroep vir die uitruil van inligting van gemeenskaplike belang. Die Wetenskaplike Skakelbeampte in

INTERNATIONAL LIAISON

Overseas offices

In addition to dealing with inquiries for specific information and surveying and reporting on fields of particular interest to science and industry in South Africa, the Council's scientific liaison offices in London and Washington transmit publications to the C.S.I.R. Library and Information Division and provide a useful service in assisting South African scientists and industrialists in arrangements for visits to scientific institutions in the United Kingdom and Europe, and in North America.

Assistance to the Library and Information Division in obtaining reprints of papers, or single photographic copies of rare scientific or technical papers which are not available in South Africa, in addition to the routine transmission of reports and other scientific publications, is summarized in the following figures:

	Londen	Washington
(1) Requests for documents, microfilms, etc.		
(a) From C.S.I.R. Library and Information Div.	151	242
(b) Other South African sources	Nil	25
(c) Overseas sources	30	36
(2) Routine transmission of documents	500	1,958

A new system of informing the C.S.I.R. research laboratories of scientific conferences in North America and Europe has led to an increase in the number of requests for reprints of papers and related documents; the Washington Office reports 263 such requests and the London Office approximately 30.

The Washington Office has forwarded some 80 B.C.S.O. (N.A.) Reports prepared by individual officers of the five constituent missions of the British Commonwealth Scientific Offices in Washington during the year. These are specialist reports prepared as a result of investigations in specific fields of science and technology in America, and made available under various categories of distribution to South Africa and other parts of the Commonwealth. The *Washington Newsletter*, the preparation of which every two months is a co-operative effort by all missions, is given a fairly wide distribution, including Universities, in South Africa; several items were contributed by the South African Scientific Liaison Officer. The B.C.S.O. (N.A.) *Annual Review of Science and Technology in the U.S.* is also a co-operative effort. This publication is distributed both in America and in the Commonwealth.

The complexity of modern science and technology has given rise to many international committees, designed to effect the exchange of information of common interest. The Scientific Liaison Officer in London continues to represent South Africa on many of these committees

Londen verteenwoordig nog steeds Suid-Afrika op baie van die komitees en vul die publikasies van die verrigtinge aan met persoonlike en informele opmerkings.

Een van die dienste wat die oorsese kantore verrig is die bystand wat hulle verleen aan wetenskaplike besoekers aan wetenskaplike inrigtings. Suid-Afrikaanse wetenskaplikes en ingenieurs wat nie verbonde is aan die W.N.N.R. nie, maak al meer van die dienste gebruik.

Die Londense Kantoor staan die Raad by in die adverteer van betrekings, voer onderhoude met applikante en help met die reëlings vir hul reise na die Unie. Organisasies buite die W.N.N.R. maak ook van die diens gebruik. Daar is vyf-en-twintig onderhoude gevoer met applikante vir betrekings in die W.N.N.R., 15 beamptes van die W.N.N.R. en sewe ander is gehelp met hul passaat na die Unie.

Internasionale Wetenskaplike Unies

Wetenskaplikes in Suid-Afrika is op die hoogte gehou van reëlings vir die algemene samekomste en ander werksaamhede van die internasionale wetenskaplike unies van Wetenskaplike Radio, Geodesie en Geofisika, Suiwer en Toegepaste Fisika, Kristallografie en Suiwer en Toegepaste Chemie.

and supplements the published proceedings with personal and informal comments.

One of the services provided by the overseas offices is in the assistance they are able to give scientific visitors from South Africa in arranging their visits to scientific institutions. Increasing use is being made of this service by South African scientists and engineers who are not associated with the C.S.I.R.

The London Office assists the Council with advertising vacancies, interviewing applicants and assisting with the arrangement of their passages to the Union; organizations outside the C.S.I.R. also make some use of this service. Twenty-five applicants were interviewed for vacancies advertised on behalf of C.S.I.R.; 15 C.S.I.R. officers and seven others were assisted with passages to the Union.

International Scientific Unions

Scientists in South Africa have been kept informed about arrangements for the general assemblies and other activities of the International Unions of Scientific Radio, Geodesy and Geophysics, Pure and Applied Physics, Crystallography, and Pure and Applied Chemistry.



Mnr. D. G. Kingwill (regs), hoof van die Skakelaafdeling van die W.N.N.R., en mnr. Martin Schady, die W.N.N.R. se hoofskakerbeampte in Londen, by 'n simposium oor die organisasie van toegepaste navorsing, saamgeroep deur die Organisasie vir Europese Ekonomiese Samewerking (O.E.E.C.) Nancy, Frankryk.

Mr. D. G. Kingwill (right), Head of the C.S.I.R. Liaison Division, and Mr. Martin Schady, the C.S.I.R.'s Chief Liaison Officer in London, attending a symposium on the organization of applied research convened by the Organization of European Economic Co-operation (O.E.E.C.) at Nancy, France.

'n Nasionale komitee vir die Internasionale Geofisiese Jaar, 1957-58 is onder voorsitterskap van dr. T. E. W. Schumann gevorm en 'n program vir Suid-Afrika se deelname is opgestel en aan die Spesiale Komitee vir die Internasionale Geofisiese Jaar voorgelê.

Algemeen

Uitvoerige reëlins is getref vir dr. E. Marsden se besoek aan Suid-Afrika en vir die Rutherford Memorial-lesings wat hy gedurende Mei 1954 in Pretoria, Salisbury, Johannesburg, Grahamstad, Kaapstad en Stellenbosch gehou het.

Hulp word verleen aan die Departement van Buitelandse Sake met reëlins vir die agtste vergadering van die Wetenskaplike Raad vir Afrika Suid van die Sahara, wat van 20 tot 27 September in Pretoria gehou sal word.

OPENBARE SKAKELING

Die hoofdoel van openbare skakelwerk vir 'n liggaam soos die W.N.N.R. is om die wetenskaplike publiek in te lig oor die werksaamhede van die W.N.N.R., oor die vordering van navorsingsprojekte en die resultate wat verkry is, en om die inligting aan die nie-wetenskaplike publiek verstaanbaar te maak. Dit word hoofsaaklik gedoen deur die publikasie van die Raad se jaarverslag en 'n driemaandelikse *Navorsingsoorsig*. Om so veel van die publiek as moontlik te bereik, word verklarings van die meer interessante items aan die pers uitgereik en dit is aangenaam om melding te maak van die behulp samewerking van die pers en handels- en tegniese blaai. Deur noukeurige en betroubare verslae gebaseer op inligting wat aan hulle beskikbaar gestel word, neem die blaai 'n belangrike aandeel in die werk om nywerhede en die algemene publiek oor wetenskaplike werksaamhede en ontwikkelinge binne die W.N.N.R. in te lig.

Sedert daar in Junie 1953 begin is met die publikasie van 'n weeklikse *Keur van Wetenskaplike Nuus*, is sowat 500 opsommings van inligting wat deur die Londense en Washingtonse kantore ontvang is aan staatsdepartemente, wetenskaplike inrigtings, uitsaaidienste, en die pers uitgereik. Die aantal navrae om meer besonderhede dui daarop dat die verslae hul hoofdoel bereik om vroeë inligting te verskaf oor oorsese wetenskaplike en tegniese ontwikkelinge. Die publikasie van die opsommings in baie koerante en tydskrifte toon 'n toenemende openbare belangstelling in die wetenskap.

Om die skakelbeamptes te help om die doeleindes en beleid van die W.N.N.R. en die werksaamhede van sy verskeie laboratoriums en geassosieerde organisasies te verduidelik, word 'n stel geïllustreerde brosjures nou opgestel. Daar word nog steeds navrae vir die Adresboek van Navorsingsinrigtings in die Unie van Suid-Afrika ontvang en aangesien dit nou uit druk is, is 'n hersiene uitgawe opgestel. Die druk daarvan is vertraag, maar dit sal hopelik vroeë in 1955 verskyn.

A national committee for the International Geophysical Year, 1957-58, has been formed under chairmanship of Dr. T. E. W. Schumann and a programme for South Africa's participation has been drawn up and submitted to the Special Committee for the International Geophysical Year.

General

Detailed arrangements were made for a visit to South Africa by Dr. E. Marsden and for the Rutherford Memorial Lectures which he gave in Pretoria, Salisbury, Johannesburg, Grahamstown, Cape Town and Stellenbosch during May, 1954.

The Department of External Affairs was assisted with arrangements for the eighth meeting of the Scientific Council for Africa South of the Sahara, which was held in Pretoria from September 20th to 27th.

PUBLIC RELATIONS

The main object in public relations for a body such as the C.S.I.R. is to inform the scientific public of the C.S.I.R.'s activities, of the progress of research projects and the results which have been achieved, and to interpret this information to the non-scientific public. This is achieved in the main through the publication of the Council's *Annual Report* and a quarterly *Research Review*. In order to reach as wide a public as possible statements on the more interesting items are issued to the Press and it is a pleasure to record the helpful co-operation of the Press, and trade and technical journals. By accurate and reliable reports, based on information which is made available to them, these organs are playing an important role in informing industry and the public generally of scientific activities and developments within the C.S.I.R.

Since publication of a weekly *Science News Selections* was started in June 1953, some 500 summaries of information received through the London and Washington offices have been issued to Government departments, scientific institutions, broadcasting services, and the Press. The number of inquiries for more detailed information received indicates that the *Selections* are serving their main purpose of providing early information on scientific and technical developments overseas. Re-publication of many of these summaries in newspapers and journals shows an increasing awareness of public interest in science.

To assist liaison officers in explaining the objects and policy of the C.S.I.R. and the activities of its various laboratories and associated organizations, a set of illustrated brochures is being prepared. Inquiries continue to be received for the *Directory of Research Organizations in the Union of South Africa* and, as this is now out of print, a revised edition has been prepared. Printing has been delayed, but it is hoped to issue it early in 1955.

Biblioteek- en Inligtings-afdeling

Hoof van die Afdeling: MEJ. HAZEL MEWS.

Die belangrikste administratiewe ontwikkeling van die jaar was die nuwe reëling vir toesig oor die Johannesburgse takke van die biblioteek (die versamelings by die Nasionale Instituut vir Personeelnavorsing, die Telekommunikasie-navorsingslaboratorium en die Navorsingsafdeling vir Waterbehandeling). In September 1953 het die N.I.P.N. vir die eerste maal 'n gedeeltelik-opgeleide bibliotekaresse in diens geneem om toesig te hou oor hul biblioteek en later is 'n ten volle opgeleide bibliotekaresse aangestel. Gedurende die jaar het die Hoofinligtings-beampte, die Senior inligtingsbeampte en die beampte in bevel van die afdeling katalogisering en klassifisering elkeen die Johannesburgse takke besoek om advies te gee en om nouer samewerking te bewerkstellig. Die hoofde van die takbiblioteke van die N.I.P.N. en die T.N.L. het vir 'n ruk in die biblioteek van die W.N.N.R. in Pretoria gewerk. Afskrifte van toepaslike katalogus-kaarte wat in Pretoria gemaak is, word nou na Johannesburg gestuur om die N.I.P.N. en die T.N.L. in staat te stel om katalogusse van hul eie versamelings op te bou. 'n Proefneming is nou onderweg om die grootste tak (N.I.P.N.) 'n deel van sy eie klassifisering en katalogisering te laat doen en om die twee kleiner Johannesburgse takke te help waar moontlik.

'n Ander belangrike gebeurtenis was die verskuiwing van sekere administratiewe afdelings van die Biblioteek na Blok 2, as 'n tydelike maatreël om die oorvol toestand in die hoofbiblioteek te verbeter.

Daar was 'n klein afname in die aantal publikasies wat aan die personeel van die W.N.N.R. uitgeleen word, weens die verskuiwing van een hooflaboratorium en twee kleineres na die nuwe perseel. Die afname sal waarskynlik voortduur totdat al die laboratoriums en die biblioteek op die nuwe terrein is.

Aan die ander kant het die inligtings- en publikasiewerk uitgebrei met die verskaffing van meer omvattende lysste van die biblioteek se literatuurvoorrade en die plan is om leemtes in die wetenskaplike bibliografie in 'n groter mate te vul as wat tot dusver moontlik was. Aan die end van 1953 is die *Register van huidige Wetenskaplike Navorsing aan die Suid-Afrikaanse Universiteite*, 1953 uitgereik en daar is onmiddellik begin aan die boekdeel vir 1954. Gedurende die jaar is twee klaslyste (nr. 6 *Beligting*, nr. 7 *Voedseltegnologie*) uitgegee en in September 1953 is 'n lys van die biblioteek se eie publikasies uitgegee. Dit het geblyk dat die lys baie nuttig is en gelei het tot baie versoeke oor versamelings wat in die lys aangegee is. Onderwerpelyste wat in antwoord op bepaalde versoeke opgestel is, sluit die volgende in: meubels; boekbindery; Suid-Afrikaanse mediese tydskrifte; registrasiestelsels; kleur; aluminiumstearate;

Library and Information Division

Head of Division: MISS HAZEL MEWS

The most important administrative development of the year has been the new arrangement for the care of the Johannesburg branches of the Library (the collections at the National Institute for Personnel Research the Telecommunications Research Laboratory and the Water Treatment Research Division). In September, 1953, the N.I.P.R., for the first time engaged a partially trained librarian to look after its library, and subsequently a fully-trained librarian was appointed. During the year, the Principal Information Officer, the Senior Information Officer and the officer in charge of the cataloguing and classification section have each visited the Johannesburg branches to give advice and arrange closer co-ordination, and the officers in charge of the N.I.P.R. and the T.R.L. branch libraries have spent some time working in the main C.S.I.R. Library in Pretoria. Copies of the relevant catalogue cards made in Pretoria are now sent over to Johannesburg to enable the N.I.P.R. and T.R.L. branches to build up catalogues of their own collections, and the experiment is being tried of the largest branch (N.I.P.R.) doing some of its own classification and cataloguing and helping the two smaller Johannesburg branches where it can.

Another important event was the removal of certain administrative sections of the Library to Block 2 as a temporary measure to ease the great congestion in the main Library.

There has been a small decrease in the number of publications issued on loan to C.S.I.R. staff, due to the removal of one main laboratory and two smaller ones to the new site. This drop is likely to continue until all the laboratories and the Library are together on the new site.

On the other hand, the information and publication work has been expanding with the production of more comprehensive lists of the Library's holdings and plans are on hand to fill more gaps in scientific bibliography than was possible up to now. The *Register of current scientific research at South African universities*, 1953 was issued at the end of 1953, and work was immediately begun on the 1954 volume. During the year two class lists (no. 6 *Lighting*, no. 7 *Food Technology*) were brought out, and in September 1953 a list of the Library's own publications was issued. This has proved extremely useful and has resulted in many requests for compilations given on the list. Subject lists compiled in reply to specific enquiries included: furniture, bookbinding; South African medical journals; registry systems; colour; aluminium stearates; electric precipitators; coal tar pitch and its uses; geology, geophysics and petrology; concrete tanks (for the storage of mineral

elektriese neerslagmiddels ; koolteerpik en die gebruike daarvan ; geologie, geofisika en petrologie ; betontenks (vir die berging van mineraalolies) ; silwer- en chroomplatering en polering ; asbes (met spesiale verwysing na die voorkoms in S.A.) ; vrugtestrope en drankke ; verwerking van beton in seewater ; natuurgeskiedenis-museums in Afrika ; binnebrandenjins ; visnywerheid ; interferometrië ; waterdigmaking van seil ; herwinning van silwer (uit afval van fotografiese oplossings, ens.) ; geskiedenis van die wetenskap ; bitumen en bituminese produkte ; suurvaste en suurbestandige sement ; voedselsuurdeeg en die maak daarvan uit sulfietloogafval, ens.

Aan twee van die skakelbeamptes is 'n kort kursus gegee om hulle bekend te maak met die organisasie en rangskikking van die biblioteek en om hulle te wys hoe die materiaal wat uit Londen en Washington ontvang word, hier gehanteer word. Aan die beampte wat na Londen sou gaan is ook 'n algemene begrip van die organisasie van wetenskaplike inligtingsdienste in Engeland gegee. Die bibliotekaris van die „National Occupational Safety Association” het ook 'n ruk in ons biblioteek deurgebring om ons metodes te bestudeer.

By die Jaarlikse Konferensie van die Suid-Afrikaanse Biblioteekvereniging wat in September 1953 in Johannesburg gehou is, het die Hoof van die Inligtingsdiens 'n verhandeling oor *Die Koördinasie van Wetenskaplike Navorsing in Afrika suid van die Sahara, met spesiale verwysing na inligtingsdienste*, voorgedra. Aangesien die konferensie selde in of naby Pretoria gehou word, is die geleentheid te baat geneem toe dit in Johannesburg was om lede van die beroepspersoneel van die biblioteek daarheen te stuur om te luister na verhandelinge van besondere belang vir hul werk en om kollegas te ontmoet uit wie se biblioteke hulle so dikwels leen vir gebruik van die W.N.N.R.

oils); silver and chrome plating and polishing; asbestos (with particular reference to its occurrence in S.A.); fruit syrups and drinks; deterioration of concrete in sea water; Natural history museums in Africa; Internal combustion engines; fishing industry; interferometry; water-proofing of canvas; silver recovery (from waste photographic solutions, etc.); history of science; bitumen and bituminous products; acid-proof and acid-resistant cements; food yeasts and their production from waste sulphite liquors, etc.

A short course was given to two of the liaison officers to acquaint them with the organization and arrangement of the Library and to show them how the material received from London and Washington is treated here; a general idea of the organization of scientific information services in Britain was also given to the officer proceeding to London. The Librarian of the National Occupational Safety Association also spent some time in the Library learning our methods.

At the Annual Conference of the South African Library Association held in Johannesburg in September, 1953, the Principal Information Officer read a paper on *The Co-ordination of Scientific Research in Africa South of the Sahara, with special reference to information services*. As the conference is seldom held in or near Pretoria advantage was taken of its being in Johannesburg to send over members of the professional staff of the Library to hear papers of particular interest to their work, and to meet the colleagues from whose libraries they borrow so frequently for C.S.I.R.'s use.

Nasionale Chemiese Navorsingslaboratorium

Direkteur; DR. W. S. RAPSON.

Daar is nog steeds 'n vinnige toename in die aantal ondersoekte wat vir nywerhede en ander organisasies uitgevoer word en die huidige koers waarteen nuwe verpligtinge aangegaan word, is reeds sowat dubbel wat dit 'n jaar gelede was. Laboratoriumwerkzaamhede word dus al hoe meer toegespits op toegepaste ondersoekte in teenstelling met fundamentele navorsing.

Totdat die nuwe laboratoriumgeboue beskikbaar is, sal moeikhede van huisvesting die grootste beperking vir laboratoriumwerkzaamhede wees. Die beplanning van die geboue wat in April gemagtig is, duur voort. Dit word al hoe duideliker dat die Navorsingsafdeling vir Waterbehandeling aansienlik uitgebrei moet word om die huidige en toekomstige opdragte te kan uitvoer en daar is besluit om die afdeling in 'n aparte laboratorium te huisves sodat dit daar kan uitbrei en uiteindelik afsonderlik geadminestreer kan word. 'n Aparte gebou word beplan om die Afdeling Prosesontwikkeling te huisves. Die afdeling sal ook groter word want hul werkzaamhede brei uit op die verskillende gebiede van tegnologie. Hopelik sal die Voedingseenheid, wat in die afgelope jaar tydelik huisvesting verkry het en toegerus is, 'n vierde gebou inneem in die groep "chemiese" laboratoriums.

Hoewel personeelmoeikhede nie so groot was soos verwag is nie en hoewel die laboratorium in die afgelope ses maande byna teen volle sterkte kon werk, is die personeel van die laboratorium nog sleg gebalanseer. 'n Tekort aan hulppersoneel in vergelyking met die navorsingspersoneel is 'n ernstige hindernis in die meeste afdelings van die laboratorium, behalwe in die Afdeling Prosesontwikkeling waar die tydelike personeel wat spesiaal vir kontrakwerk aangestel is die permanente personeel van die Afdeling oortref. In dié Afdeling is daar veral 'n behoefte aan ervare navorsingsbeamptes aan wie die uiteenlopende verantwoordelikhede van werk i.v.m. prosesontwikkeling toevertrou kan word. Moeilikhede i.v.m. die aanwrf van chemiese ingenieurs word egter nie alleen in dié laboratorium maar dwarsdeur die Unie ondervind, omdat te min chemiese ingenieurs deur die Universiteite opgelei word.

MINERALE PRODUKTE

Kleisoorte

In die afgelope paar jaar was daar 'n steeds-toenemende vraag na klei vir keramiek en ander industriële doeleindes en daar is voortgegaan met studies van Suid-Afrikaanse neerslae sodat die volle eksplorasie daarvan bevorder kan word. Verder is 'n groot aantal proses- en ander probleme vir die nywerheid ondersoek.

National Chemical Research Laboratory

Director: DR. W. S. RAPSON

The rapid increase in the number of investigations being carried out for industries and for other organizations has continued and the current rate at which new obligations are undertaken is already approximately double what it was a year ago. The emphasis so far as laboratory activities are concerned is therefore turning more and more in the direction of applied as opposed to fundamental investigations.

Accommodation difficulties promise to be the most severe handicap to the operation of the laboratory until the new laboratory buildings become available. The planning of these buildings, which was authorized in April, is proceeding. It has become increasingly clear that the Water Treatment Research Division must be expanded considerably in order to meet present and future commitments, and it has been decided to accommodate it in a separate laboratory which will be capable of expansion and eventual separate administration. A separate building is being planned to house the Process Development Division, which may be expected to increase in size as its activities extend into different fields of technology. The Nutrition Unit, for which temporary accommodation has been planned and fitted during the past year, will, it is hoped, constitute a fourth building in the "chemical" group of laboratories.

Although staffing difficulties have not been as great as was anticipated, and although the laboratory has worked close to full strength during the past six months, the laboratory establishment is still badly balanced. A shortage of auxiliary in relation to research staff constitutes a severe handicap in most of the divisions of the laboratory, except the Process Development Division where the temporary staff appointed to meet the needs of contract work is now in excess of the permanent establishment of the Division. In this Division, the need is more for mature research staff capable of carrying the varied responsibilities of process development work. Difficulties in the recruitment of chemical engineers are not peculiar to this laboratory, however, but are being experienced throughout the Union, owing to the inadequate output of chemical engineering graduates from the Universities.

MINERAL PRODUCTS

Clays

There has been a continuous increase in the demand for clays for ceramic and other industrial purposes in recent years, and studies of South African deposits have been continued with a view to promoting their full exploitation. In addition an increased number of



'n Hoë-temperatuurroond met platinadraad in navorsingswerk oor Suid-Afrikaanse kleisoorte vir bepaling van gewigsverlies gebruik.

A platinum-wound high temperature furnace being used for weight loss determinations in research on South African clays.

Werk i.v.m. die Burghersdorpse neerslag, wat reeds vroeër as 'n soort „montmorilloniet” geïdentifiseer is, is voortgesit. Studies van ander plaaslike neerslae van kleisoorte van die montmorilloniet-tipe het getoon dat hulle deur aktivering met sure produkte kan lewer wat net so goed is soos kleisoorte wat spesiaal in die Unie ingevoer is vir gebruik as olie-ontkleuringsmiddels. Daar word tans 'n kommersiële aanleg vir die produksie van geaktiveerde klei gebou. Die ondersoek van nouverwante illitiese kleisoorte uit verskeie dele van die Unie het geleidelik gevorder.

In medewerking met die Afdeling Skeikundige Dienste van die Departement van Landbou, is daar voortgegaan met werk i.v.m. die kolloïed-houdende fraksies van die verskeie grondgroepe in die Unie.

Daar is bewys gelewer dat 'n roomkleurige kaolien-neerslag vatbaar is vir bleiking en daar word tans ondersoek ingestel om die ekonomiese moontlikhede van die proses en die aanwending van die produkte te bepaal.

Mangaan

Die grootste deel van die mangaanerts wat in Suid-Afrika ontgin word, word oorsee verkoop waar daar 'n

processing and other problems has been investigated for industry.

Work was resumed on the Burghersdorp deposit, which was earlier identified as a “montmorillonite” type of mineral. Studies of other local deposits of clays of the montmorillonite type have shown that they are capable of activation by acids to give products as good as earths specially imported into the Union for use as oil-decolorizing agents. A commercial plant for the production of these activated clays is at present under construction. The investigation of closely related illitic clays from various parts of the Union has progressed steadily.

Work on the colloid fractions from the various soil groups in the Union has continued in collaboration with the Division of Chemical Services of the Department of Agriculture.

A cream-coloured kaolin deposit has been proved susceptible to bleaching and work is under way to assess the economic possibilities of the process and the applications of the products.

Manganees

The major proportion of the manganese ore mined in South Africa is sold overseas where the demand is

vraag is na hoëgraadertse. Gevolglik is daar 'n neiging om minderwaardige ertse by die ontginning eenkant te gooi en hoewel daar van die kant van die uraannywerheid 'n toenemende vraag na sommige van die minderwaardige ertse kom, word dit as belangrik beskou om gedurig die moontlikheid van hul plaaslike verwerking onder die oog te hou. Om die rede is nuwe ontwikkelinge in ander lande opgevolg en word 'n beperkte hoeveelheid werk in die laboratorium uitgevoer. Dit is 'n uitbreiding van vorige studies oor die produksie van manganosulfaat uit mangaanaarde van Oos-Transvaal met 'n inhoud van sowat 30% mangaandioksied.

Chroom

Verdere fundamentele gegewens is ingesamel oor die elektrode-spannings van chroom en yster in suuroplossing in die teenwoordigheid van 'n kwikelektrode. Terselfdertyd is gepoog om die selektiewe skeiding van yster en chroom in 'n kwikamalgamsel, uit oplossings verkry deur die inwerking van swawelsuur op chromiet, te verbeter. Die aanduidings is dat dit onmoontlik is om 'n graad van skeiding te bereik wat goed genoeg is om die proses van kommersiële belang te maak. Ander benaderings tot die verwerking van die oplossings van chroomerts in swawelsuur word nou uitgetoets.

Sout

Weens die hoë sulfaatinhoud wat kenmerkend is van die pekel in die meeste Suid-Afrikaanse soutpanne, bevat beskikbare voorrade van ru-sout gewoonlik natriumsulfaat. Die verwydering hiervan is 'n probleem vir baie nywerhede. Om hulle met genoeg inligting te voorsien vir die oplossing van die probleem is daar 'n studie gemaak van die faseverhouding van die stelsel natriumchloried-natriumsulfaatwater en geskikte diagramme is opgestel om die soutvervaardigers in staat te stel om die toestande vir die suiwering van sout uit te werk.

Jodering van sout

Inheemse skildkliervergroting(krop) kom oor 'n wye gebied in die Unie voor en op versoek van die Departement van Voeding is 'n ondersoek uitgevoer oor die jodering van gemaalde en van growwe kristallyne pansoute met die gebruik van toerusting wat spesiaal oorsee ontwerp is vir die jodering van growwe kristal-sout. In 'n verslag wat aan die Departement voorgelê is, word die resultate van die proewe en van 'n opname van die jodiuminhoud van pansoute in die Unie, asook 'n oorsig van die probleme waarmee soutverwerkers te kampe sal hê in die vervaardiging en verspreiding van gejodeerde produkte in Suid-Afrika, uiteengesit.

Fosfate

'n Belangrike ondersoek wat onder kontrak onderneem is, was om 'n proses vir die produksie van fosfate geskik vir dierevoer uit beskikbare neerslae van aluminium- en ysterfosfate by Saldanhabaai en Middelburg, Transvaal te ontwikkel.

for high grade ores. As a result lower grade ores tend to be discarded during mining operations, and, although there is an increasing demand for some of these lower grade ores from the uranium industry, it is considered important to keep the possibilities of their local processing under constant review. For this reason current developments in other countries have been followed up and a limited programme of laboratory scale work carried out. This is an extension of earlier studies of the production of manganous sulphate from manganese "wad" of about 30 per cent. manganese dioxide content from the Eastern Transvaal.

Chromium

Further fundamental data were obtained on the electrode potentials of chromium and iron in acid solution in the presence of a mercury electrode. At the same time attempts were made to improve the selective separation of iron and chromium in a mercury amalgam cell from solutions obtained from the dissolution of chromite in sulphuric acid. Indications are that it is impossible to achieve a sufficiently good separation to render the process of commercial use. Other approaches to the working up of the solutions obtained by the solution of chrome ore in sulphuric acid are being explored.

Salt

The high sulphate content which characterizes the brines of most South African salt pans results in most available crude salt supplies being contaminated with sodium sulphate, the removal of which poses a problem for many industries. To provide these industries with an adequate background for solving this problem, a study of the phase relationships of the system sodium chloride-sodium sulphate-water was carried out, and suitable diagrams prepared to enable salt manufacturers to work out the conditions for salt purification.

Iodization of salt

Endemic goitre occurs widely in the Union, and at the request of the Department of Nutrition, an investigation was carried out of the iodization of milled and coarsely crystalline pan salts using equipment specially designed overseas for iodizing coarse crystalline salt. A report submitted to the Department embodied the results of these trials, the results of a survey of the iodine content of pan salts in the Union, and a review of the problems with which salt processors would have to contend in the production and distribution of iodized products in South Africa.

Phosphates

A major contract investigation has been that of a process for the production of phosphates for animal nutrition from available deposits of aluminium and iron phosphates at Saldanha Bay and at Middelburg, Transvaal.

Steenkool en produkte wat daaruit verkry word

Koolteer. 'n Ondersoek na die samestelling van die basisse van 'n koolteer van YSKOR is voltooi. Deur 'n verbinding van distillasie- en spektroskopiese metodes is die volgende geïdentifiseer en bepaal: piridien, α -pikolien, b -pikolien, γ -pikolien, 2:3-lutidien, 2:4-lutidien, 2:5-lutidien, 2:6-lutidien, chinolien, isochinolien, chinaldien.

Olie uit Steenkool. In oorleg met die Suid-Afrikaanse Steenkool- Olie- en Gaskorporasie (SASOL) en die Brandstofnavorsingsinstituut is verskeie ondersoeke i.v.m. verskillende aspekte van SASOL se werksaamhede begin. Volgens die program van samewerking is reaktors deur die Brandstofnavorsingsinstituut opgerig om katalitiese versnellers, wat nodig is vir die vorming van die brandstofkoolwaterstowwe en wasse in die Fischer-Tropsch-proses, behoorlik te waardeer. Die katalisators wat in die reaksiekamers gebruik word en die produkte wat met hulle verkry word, sal in die Nasionale Chemiese Navorsingslaboratorium ondersoek word. Ter voorbereiding is katalisators wat van oorsee verkry is bestudeer.

In 1951 het die Unie wasse van oor die £1,250,000 se waarde ingevoer en een van die voordele wat uit SASOL se werksaamhede voortspruit, sal die plaaslike vervaardiging van 'n aansienlike tonnemaat wasse wees, wat die tans ingevoerde sal vervang. Die wasse wat uit die Fischer-Tropsch-proses verkry word is nie in alle opsigte dieselfde as die petroleum- en plantaardige wasse wat tans beskikbaar is nie. Gedurende die jaar is laboratoriumfasiliteite aan drie lede van SASOL se personeel beskikbaar gestel vir werk i.v.m. die gebruik van wasse uit die Fischer-Tropsch-proses.

Daar is begin met 'n fundamentele studie van die meganisme van outoksidasie van vertakte kettingkoolwaterstowwe om basiese kennis i.v.m. die outoksidatiewe splitsing van Fischer-Tropsch-koolwaterstowwe te verkry. 5-Metielfnonaan is as 'n modelstof gekies en 'n groot hoeveelheid is in 'n suiwer vorm berei. Die toestande waaronder die koolwaterstof selfoksiede sonder 'n groot-skaalse afbreking, is vasgestel. Sommige van die moontlike reaksieprodukte is gesintetiseer om as standaarde te dien by die ontleding van die reaksieprodukte.

WATER

Ontsoouting van gemineraliseerde waters

Daar is aansienlike vordering gemaak met die projek, wat nou die belangrikste werksaamheid van die Afdeling vir Prosesontwikkeling vorm. Die tegniek van elektrodialise deur ioon-uitruilingsmembrane word ondersoek veral met betrekking tot die ontsoouting van brakwaters wat tot sowat 10,000 dele per miljoen opgeloste soute bevat. Die werksaamhede kan rofweg as volg ingedeel word: fundamentele werk i.v.m. die ontwikkeling van membrane, fisies-chemiese metings en waardebeplanning van membrane, tegnologie van membraanproduksie, en werk i.v.m. proefinstallasies. Aktiewe steun van 'n aantal

Coal and derived products

Coal tar. An investigation of the composition of the bases from an ISCOR coal tar has been completed. By a combination of distillation and spectroscopic methods, the following were identified and estimated: pyridine, α -picoline, β -picoline, γ -picoline, 2:3-lutidine, 2:4-lutidine, 2:5-lutidine, 2:6-lutidine, quinoline, isoquinoline, quinaldine.

Oil from coal. In consultation with the South African Coal, Oil and Gas Corporation (SASOL) and the Fuel Research Institute, several investigations relating to different aspects of SASOL's activities have been started. In a collaborate scheme of work, reactors for the practical evaluation of catalytic materials which are necessary to promote the formation of the fuel hydrocarbons and waxes in the Fischer-Tropsch process have been erected by the Fuel Research Institute. The catalysts used in these reactors and the products obtained using them will be examined in the National Chemical Research Laboratory. As a preliminary step, catalysts obtained from overseas have been studied.

The Union imported waxes to the value of over £1,250,000 in 1951, and one of the benefits resulting from SASOL's activities will be the production locally of a considerable tonnage of waxes, which will replace those at present imported. The waxes from the Fischer-Tropsch process are not equivalent in all respects to the petroleum and plant waxes at present available, and during the year laboratory facilities were accorded to three members of the SASOL staff for work on the use of waxes from the Fischer-Tropsch process.

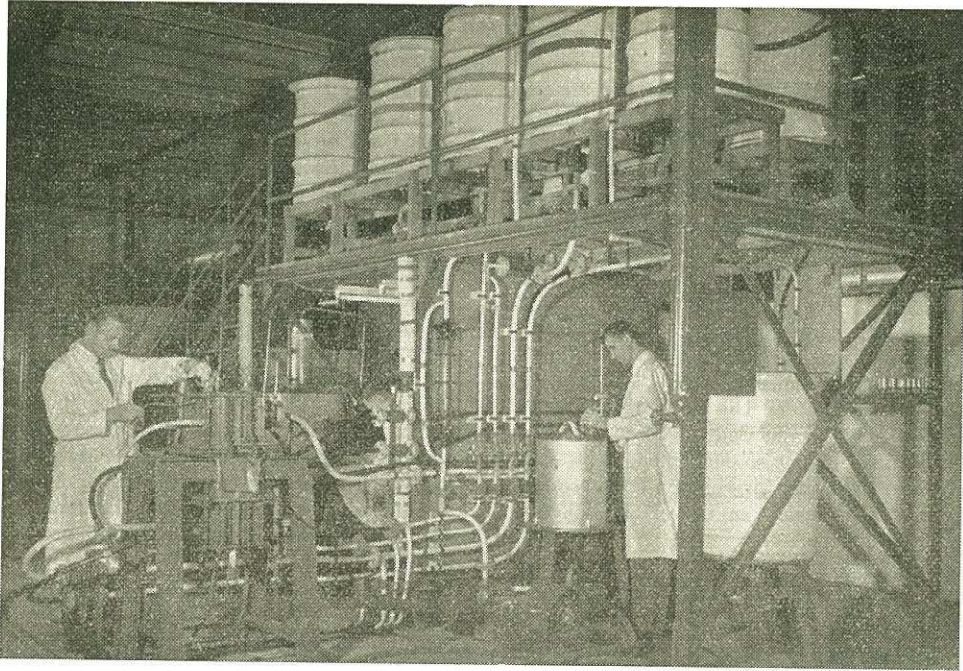
A fundamental study of the mechanism of autoxidation of branched chain hydrocarbons has been initiated to provide background knowledge in relation to the autoxidative fission of Fischer-Tropsch hydrocarbons. As a model substance 5-methylnonane was chosen and prepared in quantity in a pure state. Conditions under which this hydrocarbon autoxidizes without extensive gross degradation have been established. Some of the likely reaction products have been synthesized to serve as standards in the analysis of the reaction products.

WATER

Desalting of mineralized waters

Very considerable progress has been made with this project, which now forms the major activity of the Process Development Division. The technique of electro-dialysis through ion exchange membranes is being explored with particular reference to the desalting of brackish waters containing up to about 10,000 parts per million of dissolved salts.

Activities may be roughly classified as follows: fundamental work on the development of membranes, physico-chemical measurements and characterization of membranes, technology of membrane production, and pilot plant work. Active support from a number of gold



'n Proefinstallasie vir die ontsouting van brak water.

A pilot plant for the demineralization of saline waters.

goudmynmaatskappye en van die Administrasie van Suidwes-Afrika het 'n baie uitgebreide werksprogram moontlik gemaak.

'n Proefinstallasie waarby 'n enkele eenheid ingelyf is, met 'n beraamde kapasiteit van 250 gellings per uur as dit van 3,000 tot 1,000 dele per miljoen natriumchloried ontsout, is aangelê. Die installasie het vir 'n paar maande dag en nag gewerk om noodsaaklike ontwerpsegewens te verskaf vir die opbou van 'n grootskaalse apparaat wat gebruik kan word om die groot volumes brak water wat uit baie goudmyne in die Oranje-Vrystaat gepomp word, te ontsout.

Dit was moontlik om in die laboratorium membrane van dieselfde gehalte te vervaardig as die wat van oorsee kom. Die werk was 'n grondslag vir die tegnologiese ontwikkeling van die produksie van membrane.

Oorsese organisasies het aansienlike bystand verleen deur die verskaffing van voldoende hoeveelhede membrane sodat die werk van die proefinstallasie kon voortgaan onderwyl die laboratorium besig was om sy eie membrane te ontwikkel. Hier moet veral melding gemaak word van die bystand verleen deur die Nederlandse Organisasie vir Toegepaste Natuurwetenskaplike Onderzoek (T.N.O., Den Haag, Holland) in die voorsiening van membrane vir die werk van die proefinstallasie.

'n Goeie grondslag is gelê vir die fisies-chemiese metings en verskeie bydraes tot werk op die gebied is gelewer.

mining companies and the South West Africa Administration has made possible the prosecution of a much expanded programme of work.

A pilot plant incorporating a single unit having a designed capacity of some 250 gallons per hour when desalting from 3,000 to 1,000 parts per million of sodium chloride was constructed. This plant has been operated day and night for several months in order to obtain essential design data for the construction of a large scale apparatus, which might be used to desalt the large volumes of brackish water which are pumped from many gold mines in the Orange Free State.

It has been possible to produce, on the laboratory scale, membranes of the same quality as produced overseas. This work has provided a basis for the technological development of membranes production.

Considerable assistance has been obtained from overseas organizations which have supplied sufficient quantities of membranes to enable pilot plant work to proceed concurrently with the development of the laboratory's own membranes. Particular mention should be made of the assistance given by the Netherlands Council for Applied Scientific Research (T.N.O.) at The Hague, Holland, in supplying membranes for pilot plant work.

A sound basis has been established for the physico-chemical measurements and several contributions to work in this field have been made.

Hergebruik van Rioolwater

Die ondersoek van probleme i.v.m. die suiwing van riooluitvloeiels vir hergebruik het weer voorrang geniet. Die proefinstallasies by die rioolwerke in Pretoria en Johannesburg (Cydna) is voltooi en in werking gebring. Die resultate toon dat grasbeddings en vlei doeltreffende afskeiding van gesuspendeerde deeltjies bewerk, maar dat die verwydering van stikstofverbindinge en die produksie van opgeloste suurstof verswak word deur 'n oormatige groei van makroflora wat verhoed dat sonlig by die water kom. Welige groei van alge het gou ontwikkel in rioolafloopwater wat aan sonlig blootgestel is en dit het duidelik geword dat die alge 'n belangrike aandeel het in die suiweringsproses. Na dié waarnemings is vlak betondamme gebou om die suiweringswerking van die alge nader te bestudeer. Uit die proefnemings is afgelei dat 'n kombinasie van vleie, algebeddings, grasbeddings en opvangdamme baie doeltreffend sal wees in die suiwing van rioolwater vir onbeperkte hergebruik. Geeneen van die eenhede kan op sy eie volledige suiwing teweegbring nie.

Tegelyk met die genoemde proefnemings is metodes van chemiese behandeling ook ondersoek. Proefinstallasietoets met chemiese uitvlokkings, gevolg deur vinnige biologiese filtrasie het getoon dat 'n goedgesuiwerde afvloeielsel waarin ammoniak heeltemal geöksideer is, verkry kan word.

'n Struikelblok in die weg van meer uitgebreide hergebruik van riooluitvloeiels is die koste verbonde aan die finale ontsmetting. Dit is hoog omdat 'n hoë chloor-toediening nodig is. Om die doeltreffendheid van chloorontsmetting vas te stel is die noukeurigheid van verskeie metodes vir die bepaling van chlooroortblyfsels en van ontlastingsbakterieë krities ondersoek. Daar is gevind dat die amperometriese bepaling van chloor baie doeltreffend en noukeurig is. Die bakteriologiese studies met die gebruik van die MacConkey bry by 44° C. is slegs geskik vir ontlastingsbakterieë en is gevolglik 'n nuttige metode om die doeltreffendheid van ontsmetting vas te stel. Verdere bakteriologiese studies het getoon dat vir die heersende werkstoestande, vleie en grasbeddings 'n groter vermindering in die bakterieë van uitvloeiels teweegbring as stadige sandfiltrasie. Die vermindering van bakterieë in vlei-afvloeiels was direk verwant aan die aantal protosoë in die vlei, terwyl deursypeling deur sand selfs 'n toename van bakterieë kan veroorsaak.

Die voorlopige resultate dui daarop dat rioolafvloeiels wel beskikbaar gestel kan word as 'n waterbron.

Verwydering van Fluoried uit Watervoorrade

Onderhandelinge oor die kommersialisering van die proses vir die verwydering van fluoried wanneer dit in skadelike hoeveelhede in water voorkom, het geleidelik tot ondersoek om vas te stel of daar enige agteruitgang van die defluorideringsmiddel (superfosfaat van kalk geaktiveer deur behandeling met 'n bysoda-oplossing) ge-

Re-use of Sewage Effluents

Investigation of problems involved in the purification of sewage effluents for re-use has again received priority. Thus the pilot plant units at the Pretoria and at the Cydna (Johannesburg) Sewage Works have been completed and brought into operation. The results indicate that vleis and grasslands provide effective screening of suspended material from the water, but removal of nitrogenous compounds and production of dissolved oxygen were impaired when excessive growth of macroflora prevented access of sunlight to the water. Prolific growth of algae developed rapidly in sewage effluent exposed to sunlight, and it became apparent that these algae play an important part in the purification process. Following on this observation shallow concrete pools were constructed specifically for studying the purification afforded by algae. From these experiments it has been concluded that a combination of vleis, algal beds, grass beds and impounding reservoirs would be most effective in rendering sewage effluents fit for unrestricted re-use. Any one of these units on its own afforded incomplete purification.

In parallel to the above experiments, chemical treatment methods were also investigated. Pilot plant trials with chemical flocculation, followed by rapid biological filtration, showed that a well clarified effluent, in which ammonia had been oxidized completely, could be obtained.

The final sterilization of sewage effluents offers a serious restriction to their more extended re-use, since the high level of chlorine dosage required entails high costs. In order to evaluate the efficiency of chlorine sterilization, the accuracy of various methods for determination of chlorine residuals and faecal bacteria was critically investigated. It was found that amperometric determination of chlorine was most convenient and accurate. In the bacteriological studies the use of MacConkey broth at 44°C. indicated faecal bacteria only, and consequently offered a useful method for assessing efficiency of sterilization. Further bacteriological studies indicated that vleis and grasslands afforded a greater reduction in bacterial counts from effluents than did slow sand filtration under existing operating conditions. The reduction in bacterial count of vlei effluent was directly related to the number of protozoa present in the vlei, while sand filtration might even cause an increase in bacterial population.

The preliminary results of these investigations indicate that sewage effluents can be made available as a source of raw water.

Defluoridation of Water Supplies

Negotiations for commercialization of the process for removal of fluorides from water containing them in injurious concentrations have led to further investigations to determine whether any deterioration of the defluoridant (superphosphate of lime activated by treatment with caustic soda solution) occurs during use. A

vir 'n paar maande in 'n bekende streek met 'n tekort aan koper gewei het en daarna op Onderstepoort, waar hulle 'n dieet met voldoende koper gekry het. Nou word daar 'n uitvoerige vergelyking getref van die twee soorte wol wat op dieselfde skaap gegroei het.

Gedurende die jaar is 'n aantal skeikundige studies van merinowolwesels gemaak en verskeie proefnemings is gedoen op die bilaterale samestelling van wolwesels wat onlangs ontdek is. Daar is gevind dat dit duidelik gesien kan word as die geoksideerde wolvesel met metileenblou gekleur word, 'n feit wat 'n rukkie later bevestig is in 'n publikasie oor Australiese werk op dieselfde gebied. 'n Nuwe toets is toegepas vir die kwantitatiewe bepaling van sulfhidrilgroepe in wol en dit het die interessante resultaat gelever dat die verhouding aansienlik hoër is as wat voorheen vermoed is. Wol met 'n tekort aan koper bevat baie meer sulfhidrilgroepe as normale wol.

Wolwas

Die optiese konfigurasie van α -hidroksisure in wolwas en brein is vasgestel deur die sintese van 'n reeks Ls- α -hidroksisure uit Ls-appelsuur. Aangesien die α -hidroksisure kommersiële waarde mag hê, word daar gepoog om goedkoop metodes te vind om hulle van die ander meegaande sure te skei.

Verdere studies van wolwas het getoon dat dit 'n aansienlike hoeveelheid stowwe bevat wat uit die was ontstaan onder blootstelling aan wind en weer terwyl dit op die skaap is. Daar is 'n moontlike verband tussen dié stowwe en die agteruitgang van die groeiende wolvesel, en daarom word 'n uitvoerige studie van die outoksidase van wol en wolwas nou onderneem. Ander bestanddele van wolwas is verder bestudeer.

Daar word pogings aangewend om eenvoudige metodes vir die kommersiële ontleding van wolwas te vind. Die metode vir die bepaling van die steroïde en triterpene is verbeter en 'n chromatografiese metode is uitgewerk vir die bepaling van die hidroksisure. Die studie van ander metodes duur voort.

Ondersoeke op proefinstallasie-skaal oor die kalkversepingsproses vir wolwas is voltooi. Deur die reaksietoestande te wysig is 'n produk verkry wat meer vatbaar is vir behandeling in die afskeiding van die kalsiumsepe van die onverseepbare stowwe. Die proses word nog bestudeer, maar dit blyk dat moeilikhede wat voorheen ondervind is met die gebruik van vloeistof-ekstraksie-metodes in die skeiding van die onverseepbare stof van die sepe, nou moontlik oorbrug kan word.

Menslike Haarwas

Grootliks op grond van 'n persoonlike belangstelling is die ondersoek van menslike haarwas as 'n uitbreiding op die ondersoek van wolwas voortgesit. Die studie van die alifatiese alkohole in die onverseepbare stowwe van menslike haarwas is voltooi. Die volgende is teenwoordig: *n*-tetradekanol, *n*-heksadekanol, *n*-oktade-

succession for several months each in a known copper-deficient area and at Onderstepoort where they were fed on a diet containing adequate copper. A detailed comparison of the two types of wool grown on the same staple is being carried out.

During the year, a number of chemical studies of merino wool fibres have been made and several experiments have been carried out on the recently discovered bilateral structure of wool fibres. It was found that dyeing with methylene blue showed this up strongly in an oxidized fibre, a fact which was confirmed a little later in a publication of Australian work along similar lines. A new test for quantitative estimation of sulphhydryl groups in wool has been applied and found to yield interesting results. It appears that the proportion is considerably higher than previously suspected; a copper deficient wool was shown to possess much more sulphhydryl than normal wool.

Wool Wax

The optical configuration of wool wax and brain α -hydroxy-acids has been established by the synthesis of a series of Ls- α -hydroxy-acids from Ls-malic acid. As the α -hydroxy-acids may be of commercial value, efforts are being made to find cheap methods of separating them from the other acid constituents.

Further studies of the wax have shown it to contain considerable quantities of substances produced by weathering of the wax while it is exposed on the sheep; and as it is considered possible that these substances are connected with the deterioration of the growing wool fibre tip, a detailed study of the autoxidation of wool and wool wax is being undertaken. The study of other wool wax constituents has been continued.

Efforts are being made to devise simple methods for the commercial analysis of wool wax. The method of determining the steroids and triterpenes has been improved and a chromatographic method has been devised for the estimation of the hydro-acids. The study of other methods is in progress.

Pilot plant scale studies of the lime saponification process for wool wax have been completed. By modifying the reaction conditions a product has been obtained that is more amenable to subsequent treatment for the separation of the calcium soaps and the non-saponifiable matter. This separation is still being studied, but it now appears that it may be possible to overcome difficulties previously encountered when applying solvent extraction methods to the separation of the non-saponifiable matter from the soaps.

Human Hair Wax

Largely as a personal interest, and as an extension of the wool wax investigations, the investigation of human hair wax has continued. The study of the aliphatic alcohols in the non-saponifiables of human hair wax has been completed; the following are present: *n*-tetradecanol, *n*-hexadecanol, *n*-octadecanol, *n*-eicosa-

durende die gebruik is. 'n Defluorideringsinstallasie wat vir demonstrasiedoeleindes gebruik sal word, word nou in medewerking met die Departement van Openbare Werke opgerig.

Sondistillasie

Die werking van 'n eksperimentele sondistillasie-apparaat het getoon dat 'n betreklike klein apparaat met 'n verdampingsoppervlakte van 32 vierkante voet voldoende is om drinkwater aan 'n normale huishouding te verskaf waar daar slegs brakwater beskikbaar is. Dit kan selfs gebruik word om drinkwater te verkry uit voorrade wat te veel fluoried bevat.

Stroomopnames

In samewerking met die Departement van Besproeiing en plaaslike owerhede is voortgegaan met monsterneming en ontleding van sommige belangrike riviere.

Daar is reeds ver gevorder met die tabulering en ontleding van die resultate van die opname van die Berg-rivier in die Kaapprovinsie. Gedurende die opname is daar sowat 200,000 diere versamel en byna almal is volgens hul afsonderlike spesies ingedeel.

Die kwantitatiewe opname van riviere in die Witwatersrandgebied wat in die Vaal bokant die studam van die Randse Waterraad uitloop, is voltooi. 'n Baie belangrike waarneming gedurende die opname was dat die konsentrasie van mineraalsoute in die water wat in die Kliprivier vloei, toeneem met verhoogde reënval. Dit is die teenoorgestelde van wat gewoonlik gebeur en word vermoedelik veroorsaak deur vinnige oplossing van mineraalsoute wat gedurende die droë wintermaande in die opvanggebied ophoop. Daar is gevind dat die konsentrasie opgeloste stowwe in die Kliprivier van 410 dele per miljoen gedurende die droë seisoen van 1953 tot 1,500 sowat 'n week nadat die eerste reën geval het toegeneem het. As gevolg van die toename, tesame met die groter volume water in die rivier het die hoeveelheid mineraalsoute wat in 24 uur vervoer word van 13 ton tot 4,300 ton toegeneem. Dit was meer as twee keer die hoeveelheid wat gedurende dieselfde tyd deur die water uit die Vaaldam vervoer is.

In Natal is begin met 'n kwantitatiewe biologiese en chemiese opname van die Tugela-rivier. Die werk, wat gesteun word deur die kommissie vir Stads- en Streeksbeplanning van die Natalse Administrasie, volg tans dieselfde patroon as die wat vir die opname van die Berg-rivier gevolg is. In elke belangrike gebied waardeur die rivier loop, is stasies vir monsternemings opgerig. Vir die takriviere sal later gesorg word.

Vir SASOL word daar onder kontrak 'n kwantitatiewe opname van die Leeuspruit gemaak. Die hoofdoel hiervan is om die samestelling van oppervlakte- en grondwater vas te stel voordat die fabriek in werking tree.

Suiwelfabriekuitvloeiels

Die model-installasie wat by Bloemhof ontwerp is om tot 10,000 gellings suiwelafvalwater per dag te suiwer, is in Augustus 1953 in werking gebring. Na drie maande was die biologiese syfelbeddings goed ryp en 'n goeie

demonstration defluoridation plant is now being installed in collaboration with the Department of Public Works.

Solar Distillation

Operation of an experimental solar distillation unit has shown that a relatively small unit of 32 square feet pan area is sufficient to supply drinking water for a normal household in places where only saline water is available. It may even be used in order to obtain drinking water from supplies contaminated with fluorides.

Stream Surveys

With the co-operation of the Department of Irrigation and local authorities, sampling and analysis of some important rivers have been continued.

The tabulation and analysis of the results of the survey of the Berg River in the Cape are well advanced. In the course of the survey about 200,000 animals were collected, and almost all were sorted out into their respective species.

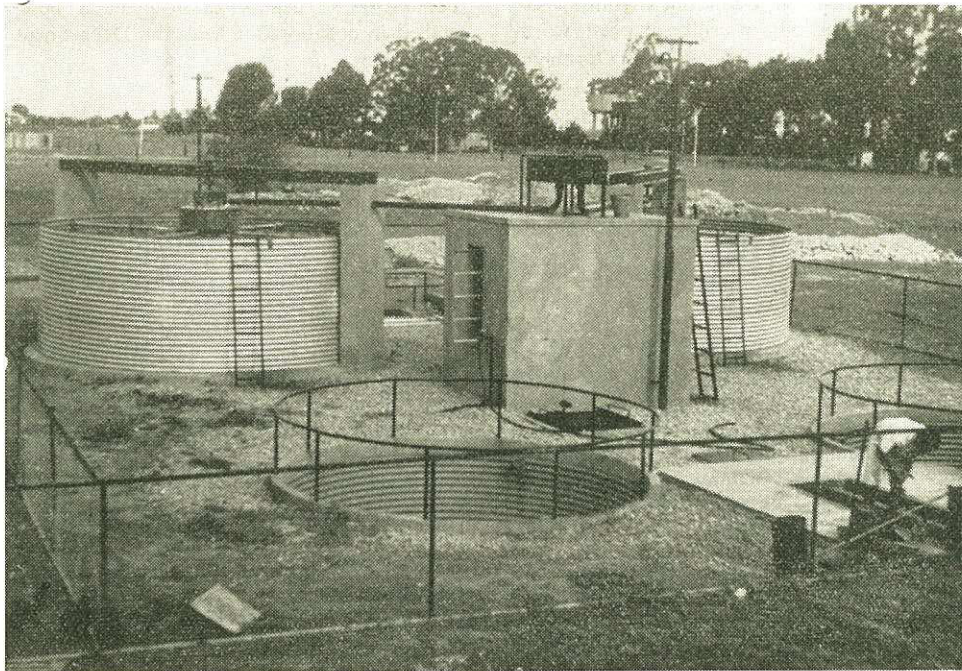
In the Witwatersrand Area the quantitative survey of rivers draining into the Vaal above the Rand Water Board barrage was completed. A most important result of the survey was the observation that the mineral salts concentration in water flowing in the Klip River increases with increased rainfall. This is the reverse of what normally takes place and is thought to be caused by rapid dissolution of mineral salts which accumulate in the catchment area during the dry winter months. It was thus found that the dissolved solids concentration in the Klip River increased from 410 parts per million during the dry season of 1953, to 1,500 p.p.m. about a week after the first rain fell. As a result of this increase, coupled with the larger volume of water flowing in the river, the mineral load carried increased from 13 tons to 4,300 tons per 24 hours, which was more than twice the mineral load carried by the flow from the Vaal Dam during the same period.

In Natal a quantitative biological and chemical survey of the Tugela River was commenced. This work, which is sponsored by the Town and Regional Planning Commission of the Natal Administration, is at the present stage following lines similar to those adopted for the Berg River Survey. Sampling stations have been selected to cover every important reach or zone of the river, while tributaries will be taken care of at a later stage.

A quantitative survey of the Leeuspruit is being conducted under contract for SASOL. The main objective of this survey is to establish surface and ground water composition before manufacturing operations commence.

Dairy Effluents

The demonstration plant designed to treat up to 10,000 gallons per day of creamery waste at Bloemhof was brought into operation during August, 1953. The biological filters were well matured after about three



'n Proefinstallasie vir die verwydering van tot 10,000 gellings suiwelafvloeisels.

An experimental dairy effluent disposal plant designed to treat up to 10,000 gallons per day of creamery waste.

uitvloeisel is gelever. Teen die tyd het die fabrieksproduksie egter so vermeerder dat die sytelbeddings oorlaai was. Ten spyte hiervan was die uitvloeisel nog sonder 'n onaangename reuk en heeltemal geskik vir verspreiding oor die grond.

'n Proefneming met beheerde besproeiing by 'n Springfonteinse botterfabriek was 'n groot sukses en dié metode van afvloeiselverwydering asook die van biologiese filtrering word ten sterkste aanbeveel vir die suiwering van suiwelafloopwater.

'n Verslag wat al die resultate en aanbevelings van die werk insluit is aan die suiwelnywerheid beskikbaar gestel. Hierdie verslag tesame met advies aan elke afsonderlike fabriek, behoort genoegsame inligting te verskaf om die doeltreffende suiwering van suiwelafvloeisels te verseker.

Verskillende Afvloeiselprobleme

Die studies van die suiwering van wynstokeryafval deur aneroobiese vertering is voortgesit en laboratorium-eksperimente is uitgevoer oor die akklimatisasie van die verteringsproses in die teenwoordigheid van giftige stowwe soos koper en swaweldioksied. Vroeg in 1954 is daar weer begin met proefinstallasie-ondersoeke. Die volle waardering van die akklimatiseringsproses is vertraag deur moeilikhede veroorsaak deur die nadelige werking van die bedorwe wynafval. Die moontlikheid om die wynafloopwater direk in 'n rioolslykverteertenk

months' operation and a good effluent was being produced. At this time, however, factory production shot up to such an extent as to impose a severe overload on the filters. In spite of this, the effluent was still free from unpleasant odour and quite suitable for discharge on to land.

A controlled irrigation experiment at a creamery in Springfontein was an unqualified success and this method of effluent disposal, as well as that of biological filtration, is strongly recommended for dairy waste purification.

A report embodying all the results and recommendations of this work has been made available to the dairy industry and this, together with advice given to each individual factory, should provide the information required for effective treatment of dairy effluents.

Sundry Effluent Problems

In the studies of the purification of wine distillery residues by anaerobic digestion, laboratory experiments on the acclimatization of the digestion process to toxic substances such as copper and sulphur dioxide continued, and the pilot plant studies were resumed early in 1954. Difficulties arising from an adverse effect of deteriorated wine residues have delayed the full evaluation of the acclimatization procedures. The possibilities of feeding wine slop directly to a sewage sludge digester, using a re-inoculation procedure are now being explored.

te voer met 'n prosedure van herinenting word nou ondersoek.

Op 'n vraag van 'n leerlooier oor die wegdoen van fabrieksaftloeiings is 'n opname gemaak van die aftloeiings uit verskillende dele van die fabriek. 'n Uitvoerige verslag wat verdere aanbevelings oor toekomstige ondersoek bevat is voorgelê.

Die Afdeling Waterbehandeling is geraadpleeg i.v.m. probleme i.s. die verwydering van uitvloeiings en watervoorsiening by Walvisbaai, S.W.A. 'n Uitvoerige opname is uitgevoer en aanbevelings gemaak i.v.m. die hersirkulering van water en die ontsmetting van boorgatwater.

Op versoek van die munisipaliteit van Bellville is sekere vraagstukke i.v.m. die verwydering van 'n uitvloeiing van 'n glukosestyselafabriek ondersoek. Aanbevelings is gemaak hoe om die toestande te verbeter en die moontlike suiwering van die uitvloeiing te ondersoek.

Die uitvloeiingsprobleme van 'n Durbanse fabriek wat teen die end van die jaar sal begin om geaktiveerde klei te produseer, is bestudeer. Aanbevelings is gemaak i.v.m. die hersirkulering van water en die suiwering van uitvloeiings om te voldoen aan die plaaslike spesifikasies vir uitvloeiings.

'n Inmaakfabriek in die Westelike Provinsie het inligting gevra i.v.m. die voorbehandeling van afvalwater vir verspreiding oor die grond. 'n Opname van die verskillende bronne hiervan en van waterverbruik in die fabriek is uitgevoer en 'n voorstel is aan die hand gedoen vir die voorbehandeling van die uitvloeiing.

Die raadgewende dienste aan die Komitee van Goudprodusente van die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese en aan SASOL, het voortgeduur.

Rioolsluk en Vuilgoedverwydering

Op versoek van die Raad vir Grondbewaring is daar begin met 'n ondersoek van die produksie van kompos uit munisipale afval en rioolsluk. Die Tesourie het 'n spesiale toekenning vir die doel gemaak, wat aangevul is met fondse wat deur belangstellende munisipaliteite beskikbaar gestel is.

Die hoofdoel is om prosesse wat geskik lyk vir plaaslike toestande te kies en uit te toets, sodat die laboratorium munisipaliteite en ander organisasies later op dié gebied van raad kan bedien. Nadat die betrokke beampte 'n studie van plaaslike toestande en grondstowwe voltooi het, sal hy oorsese installasies besoek om prosesse uit te kies wat in die Unie deur proefinstallasies getoets kan word.

DIEREPRODUKTE

Ruim steun van die Suid-Afrikaanse Wolraad en die „Marine Oil Refiners of Africa Ltd.” word nog steeds geniet en deur middel van navorsingsbeurse kon die werk i.v.m. wol en visolies vinnig voortgaan.

Wolwesels

In die studie van „staalagtige” wol veroorsaak deur 'n tekort aan koper, is spinwesels verkry van skape wat

In response to an enquiry by a tannery regarding the disposal of factory effluent, a survey of effluents from various stages in the plant was carried out. A detailed report embodying recommendations re future investigation was submitted.

The Water Treatment Division was consulted with regard to effluent disposal and water supply problems in Walvis Bay, S.W.A. A detailed survey was carried out and recommendations with regard to the recycling of water and sterilization of borehole water have been made.

At the request of the Municipality of Bellville, problems arising from the disposal of an effluent from a glucose-starch factory were investigated. Recommendations with regard to alleviating the problem and suggestions for investigating the purification of the effluent were made.

The effluent problem of a Durban factory which will start producing activated clay towards the latter part of this year was investigated. Recommendations were made with regard to recycling of water and treatment of effluent to comply with the local specifications for effluents.

Information was requested by a Western Province cannery with regard to the pretreatment of effluent for land disposal. A survey of the various sources of effluent and of water use within the factory was carried out, and a pretreatment method proposed.

The advisory services to the Gold Producers' Committee of the Transvaal and Orange Free State Chamber of Mines and to SASOL have continued.

Sewage Sludge and Refuse Disposal

At the request of the Soil Conservation Board, an investigation of the production of compost from municipal refuse and from sewage sludge has been started. A special grant for this purpose was made by Treasury, and this has since been supplemented by funds made available by interested municipalities.

The main objective is to select and try out processes suited to local conditions, so that the laboratory can subsequently offer an advisory service to municipalities and other organizations in this field. After completing a study of local conditions and raw materials, the officer concerned will visit overseas installations in order to select processes for trial on a pilot plant scale in the Union.

ANIMAL PRODUCTS

Generous support from the South African Wool Board and Messrs. Marine Oil Refiners of Africa, Ltd., has continued and research fellowships have enabled work on wool and on marine oils to continue vigorously.

Wool Fibres

In the study of “steely” or copper deficient wools, wool staples have been obtained from sheep grazed in

kanol, *n*-eikosanol, *n*-dokosanol, *n*-tetrakosanol, 18-metielnanodekanol, 20-metielheneikosanol, 22-metieltrikosanol, *n*-eikos-10-enol, *n*-dokos-12-enol, *n*-tetrakos-14-enol. Daar is getoon dat die onverseepbare stowwe ook 'n aantal veelkernige aromatiese koolwaterstowwe bevat wat volgens struktuur verwant is aan die karsinogene koolwaterstowwe. Dit lyk egter moontlik dat die koolwaterstowwe wat gevind is nie metabolismeprodukte is nie, maar voortkom uit die besmetting van die haarwas met atmosferiese roet. Aangesien die saak van besondere biochemiese belang is, sal dit verder bestudeer word sodra die tyd dit toelaat.

Breinlipiede

'n Tweede uitbreiding van die werk op was wat uit persoonlike belangstelling gedoen word met hulp van studente, staan in verband met die skeiding en bestudering van die hidroksisure in vet of lipieduittreksels van breinweefsels. Metodes uitgewerk vir die skeiding van wolwas-hidroksisure is toegepas en die karakterisering van brein-hidroksisure duur voort.

Visolies

Daar is voortgegaan met ondersteunde studies van visolies met die doel om fundamentele inligting te verskaf wat die bewerking daarvan vir verskillende doeleindes sal moontlik maak of vergemaklik. 'n Konsentraat van hoogs onversadigde sure wat verkry is uit sardynoliesure is verder onderverdeel deur drie fase-molekulêre distillasie en deur ureum-kompleksfraksionering. Die subfraksies kan verder ontleed word deur teenstroom-verdelingschromatografie. Op die manier is 'n suiwere C_{16} -tetraeensuur geïsoleer wat die ongewone terminale dubbelband het; deur spektroskopiese en afbrekingsmetodes is daar getoon dat dit heksadeka-6:9:12:15-tetraeensuur is. 'n Tweede suur ('n C_{20} -pentaen) is op soortgelyke wyse verkry en die suiwerheid daarvan word nou krities ondersoek voordat daar begin word met studies oor die struktuur.

Die Kreef (*Jasus lalandii*)

'n Studie van die ekstraktstowwe van kreefspiere is voortgesit, met besondere aandag aan die stikstofhoudende nie-proteïenbestanddele en aan suikers, want die mening bestaan dat die „bruinwording” van ingemaakte kreefsterte te wyte is aan 'n reaksie tussen vrye suikers en stikstofhoudende verbindings (Maillard-reaksie). Kreefsterte is ondersoek vir vrye ribose, wat bruinwording in ander soorte ingemaakte vis veroorsaak het. Dit is egter in geen enkele geval gevind nie. Vrye glukose was die enigste bespeurbare suiker.

'n Aanvullende kwantitatiewe studie van die stikstofhoudende nie-proteïenbestanddele van die spiere is voltooi.

Die ondersoek van die spierproteïene is voortgesit. Hul gedrag gedurende ekstraksie verskil van die van haasspierproteïene en dit was tot dusver nie moontlik om met enige van die metodes wat vir die ekstraksie van haasspiere gebruik is, kreefmiosien vry van aktien te berei nie.

nol, *n*-docosanol, *n*-tetrakosanol, 18-methylnonadecanol, 20-methylheneikosanol, 22-methyltrikosanol, *n*-eicos-10-enol, *n*-docos-12-enol, *n*-tetrakos-14-enol. The non-saponifiables have also been shown to contain a number of polycyclic aromatic hydrocarbons structurally related to the carcinogenic hydrocarbons. It appears probable, however, that the hydrocarbons found are not metabolic products, but arise from contamination of the hair wax with atmospheric soot. As the matter is one of outstanding biochemical importance, it is intended to do further work when time permits.

Brain Lipids

A second extension of the work on wool wax, carried out on a personal interest basis and with student assistance, concerns the separation and study of the hydroxy-acids present in fatty or lipid extracts from brain tissues. Methods developed for the separation of wool wax hydroxy-acids have been applied and the characterization of the brain hydroxy-acids is proceeding.

Marine Oils

Studies of marine oils have continued under sponsorship, with a view to providing fundamental information which will extend or facilitate their processing for different uses. A concentrate of highly unsaturated acids obtained from total pilchard oil acids was further subdivided by three-stage molecular distillation and urea complex fractionation. The sub-fractions are further resolvable by reversed-phase partition chromatography. In this way a pure C_{16} tetraene acid having the unusual terminal double bond has been isolated; by spectroscopic and degradative methods it has been shown to be hexadeca-6:9:12:15-tetraenoic acid. A second acid (a C_{20} pentaene) has been similarly obtained and its purity is now under critical examination before structural studies are undertaken.

The Rock Lobster (*Jasus lalandii*)

A study of the extractives of rock lobster muscle has continued, particular attention being paid to non-protein nitrogenous constituents and to sugars, since it is thought that the “browning” of canned rock lobster tails may be due to a reaction between free sugars and nitrogenous compounds (Maillard reaction). Rock lobster tails were examined, for free ribose which has been shown to be the cause of browning in other types of canned fish. In no case, however, was this detected free glucose being the only detectable sugar.

A complementary quantitative study of the non-protein nitrogenous constituents of the muscle has been completed.

The investigation of the muscle proteins has been continued. These differ from rabbit muscle proteins in their behaviour during extraction and it has not been possible to date to prepare rock lobster myosin free from actin by any of the methods used for extraction of rabbit muscle.

Suiwelprodukte

Die suiwelnywerheid in Suidwes-Afrika het hulle ten doel gestel om 'n middel uit te vind waarmee melk bewaar kan word terwyl dit na die fabriek vervoer word. In medewerking met die Navorsingsbeurshouer wat die vraagstukke in Windhoek ondersoek, is 'n studie gemaak van die uitwerking van waterstofperoksied in bederfwerende konsentrasies op die proteïene in melk. Elektroforetiese en ultrasentrifugale metings het getoon dat β -laktoglobulien verander het, maar dat ander proteïene, insluitende kaseien, geen ernstige veranderinge ondergaan het nie.

Afgesien van die genoemde werk is uitvoerige hulp verleen aan 'n fabriek vir gekondenseerde melk wat baie moeilikheid ondervind het om 'n nuwe installasie in werking te bring.

Die „Vitamiën A-sparende” faktor Uitgesmelte Dierewette

Addisionele personeel is gedurende die jaar voorsien sodat die fasiliteite van die laboratorium sover moontlik, direk kan gebruik word om die mediese navorsingseenhede van die W.N.N.R. by Universiteite by te staan.

Die Voedingnavorsingseenheid is bygestaan in hul ondersoek van die „vitamiën A-sparende faktor” in uitgesmelte dierewette. Daar is baie belangstelling vir die werk, want daar kan moontlik 'n onbekende analoog van

Dairy Products

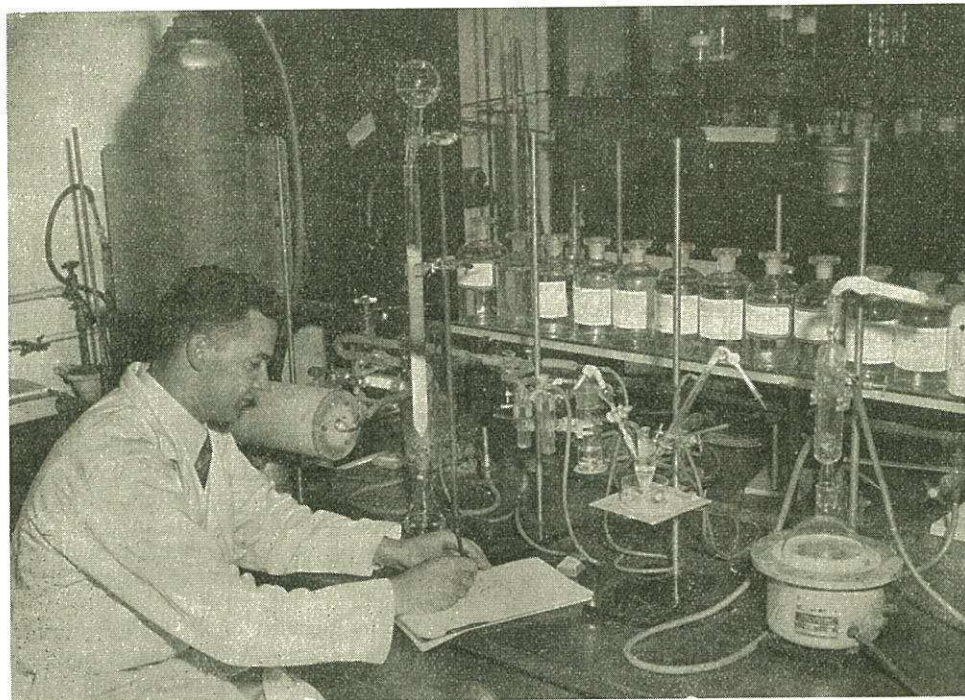
An objective of the dairy industry in South West Africa is to develop a means whereby milk can be preserved during transport to processing factories. In co-operation with the Research Fellow investigating this problem in Windhoek, a study was made of the effects of hydrogen peroxide in preservative concentrations on the proteins of milk. Electrophoretic and ultracentrifugal measurements showed that β -lactoglobulin was altered but that, on the whole, other proteins, including casein, underwent no profound changes.

Apart from the above, extensive assistance has been given to a condensed milk factory, which was experiencing grave difficulties in bringing a new plant into commission.

The “Vitamin A sparing” Factor in Rendered Animal Fats

Extra staff has been provided during the year to enable the resources of the laboratory to be used directly in assisting C.S.I.R. medical research units at Universities wherever feasible.

Assistance has been given to the Nutrition Research Unit in its investigation of the “vitamin A sparing” factor in rendered animal fats. This has attracted much interest because of the possibility that these fats might



Die sintese van radioaktiewe vitamien A vir gebruik in proefnemings met diervoeding.

The synthesis of radioactive vitamin A for use in animal feeding experiments.

vitamien A in die vette wees. Gewone uitgesmelte vet gee nie die gebruiklike kleurtoets vir vitamien A nie, hoewel dit vitamien A in die dieet van 'n rot kan vervang.

Om die faktor te konsentreer is 'n groot monster vet aan molekulêre distillasie onderwerp. Dit het geblyk dat die onverseepbare stowwe van die aktiewe fraksie 'n bestanddeel bevat wat dieselfde ultra-violetabsorpsie-kurwe het as vitamien A en die kenmerkende antimoon-trichloried-kleurtoets gee. Die positiewe uitkenning van die bestanddeel is aan die gang. Behalwe die bestanddeel is daar ander teenwoordig wat absorbeer in die ultra-violet en hulle word ondersoek. Die bepaling van die biologiese waarde van die fraksies is nou by die Universiteit van die Witwatersrand aan die gang en word vergelyk met die vitamien A (?) wat chemies herwin is.

'n Monster vet wat met 'n baie ligte impulsproses uit 'n dierekarkas herwin is, word ook nou ondersoek vir die aanwesigheid van faktore wat groei bevorder.

PLANTPRODUKTE

Suikerrietwas

'n Suikermeulefirma het in Natal 'n fabriek opgerig vir die produksie van suikerrietwas en ter voorbereiding van 'n studie van die verskillende produkte, is die ondersoek van suikerrietkutikulawas voortgesit. Dit het geblyk dat die hoofbestanddele langketting-alkohole is, waarvan sommige ongewone kenmerke het. Pogings word aangewend om al die bestanddele te skei.

Sisal

As gevolg van die groeiende produksie van sisal in die Unie en 'n toenemende belangstelling in die moontlikhede van die gebruik van ander bestanddele van die blare behalwe die vesel, is die kutikula- en waslae van die blare van 'n *Agave* spesies bestudeer. Die hidroksisuurmengsel wat uit hidrolise van *Agave americana* se kutien verkry is, is gedeeltelik geskei deur chromatografiese teenstroomverdeling, waarby 'n kolom met kasterolie as die stasionêre fase gebruik is.

Bitterstowwe van die Cucurbitaceae (komkommer-familie)

Nog twee verbindings wat die giftigheid van die plantfamilie veroorsaak, is geïsoleer. Hulle word cucurbitasien C en D genoem. Cucurbitasien A en B is in die vorige verslag beskryf.

In medewerking met die Afdeling Tuinbou is die toepassing van papierchromatografiese metodes op die biologiese probleme in verband met die ontstaan van bitterheid, bestudeer.

Die fisiologiese werking van die cucurbitasie word oorsee deur 'n welbekende farmaseutiese maatskappy bestudeer.

Kafferkoring

'n Groot deel van die jaarlikse kafferkoringproduksie in die Unie (1,712,000 sakke in 1951/52) word gebruik vir die brou van kafferbier en die maak van graanvoedsel. Ten spyte van die groot skaal waarop kafferbier nou

contain a hitherto unknown analogue of vitamin A. Ordinary rendered fat does not give the usual colour tests for vitamin A although it is capable of replacing vitamin A in the diet of the rat.

A large sample of fat was molecularly distilled to concentrate the factor. The non-saponifiables of the active fraction have been shown to contain a substance having the same ultra-violet absorption curve as vitamin A and giving the characteristic antimony trichloride colour test; the positive identification of this substance is under way. In addition to this substance there are others present which absorb in the ultra-violet and these are being examined. The biological evaluation of the fractions is in progress at the University of the Witwatersrand for comparison with the vitamin A chemically recovered.

A sample of fat recovered from an animal carcase by a very mild impulse-rendering process is also under examination for the presence of growth-promoting factors.

PLANT PRODUCTS

Cane Wax

A plant for the commercial production of cane wax has been built in Natal by a sugar milling firm, and as a preliminary to a study of the different products, the study of cane cuticle wax has been continued. The major constituents have been shown to be long chain alcohols, some of which appear to have unusual features. Attempts to separate the components completely are in hand.

Sisal

The growing production of sisal in the Union and an increasing interest everywhere in the possibilities of making use of other constituents of the leaves than the fibre has led to a study of the cuticular and wax coatings of the leaves of an *Agave* species. The hydroxy-acid mixture obtained on hydrolysis of *Agave americana* cutin has been partially resolved by reversed-phase partition chromatography using a castor oil stationary phase column.

Bitter Principles of the Cucurbitaceae (cucumber family)

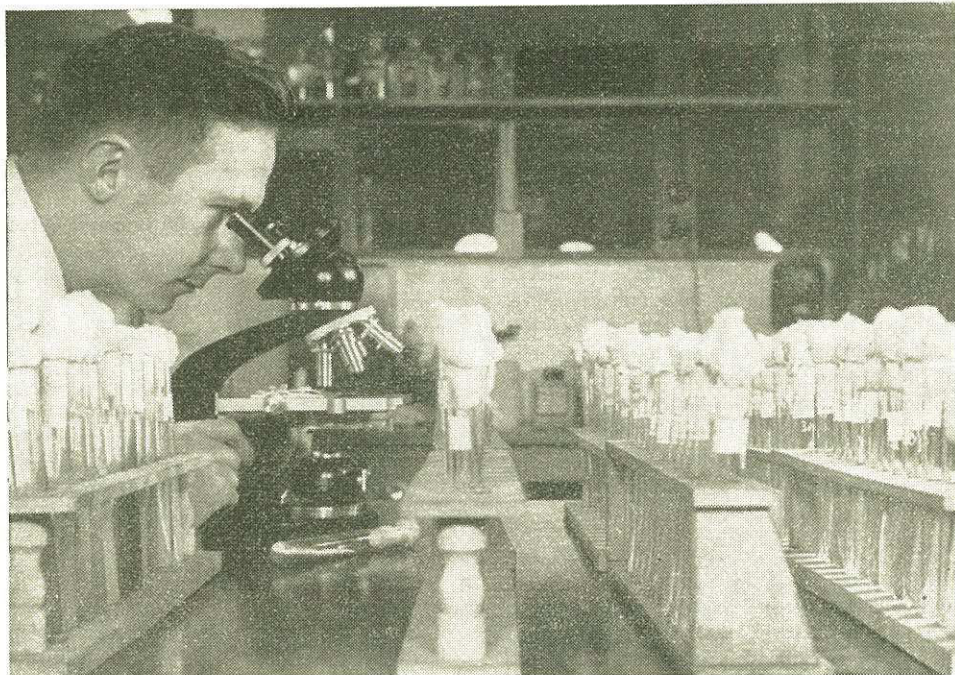
Two further compounds responsible for toxicity in this plant family have been isolated. They are referred to as cucurbitacins C and D; cucurbitacins A and B were described in the last report.

In a joint investigation with the Division of Horticulture the application of paper chromatographic techniques to the biological problems involved in the production of bitterness have been studied.

The physiological action of the cucurbitacins is being examined overseas by a well-known pharmaceutical company.

Kaffircorn

Of the annual production (1,712,000 bags in 1951/52) of kaffircorn in the Union, a large proportion is used in the brewing of kaffir beer and in the manufacture of cereal foods. Despite this large scale on which kaffir



Die ondersoek van kulture van organismes wat gedurende navorsingswerk oor brouery in kafferbier gevind is.

Study of cultures of organisms found in kaffir beer in the course of research on brewing.

gemaak word, is daar nie veel gedoen om vas te stel watter van die baie soorte kafferkoring die mees geskik is vir die moutproses nie, of om die beste toestande vir die verloop van die proses te bestudeer nie.

As 'n eerste stap in 'n ondersoek van die vraagstukke is metodes vir die ontleding van kafferkoringmoute ontwikkel en gebruik vir die bepaling van die kenmerke van kafferkoringmout wat tans as kommersiële produk vervaardig word. Daar word laboratoriumtoetse op mout uitgevoer om die invloed van verskeie faktore op die diastasewerking gedurende die maak van mout te bepaal. Dit sal 'n langtermynstudie wees, want die wisselwerking van 'n aantal faktore moet in aanmerking geneem word. Daar is egter reeds aanduidings dat ontledings vir brouers 'n goeie leidraad sal gee t.o.v. die broueienskappe van mout vir praktiese doeleindes.

Met die oog op die belangrikheid van die stikstofhoudende bestanddele van mout vir die brou van bier vir blankes, word die aminosure in kafferkoring en sy mout en hulle veranderinge gedurende die brouproses bestudeer.

Die mikrobiologiese ondersoeke van die brou van kafferbier is voortgesit. Gistowwe en melksuurbakterië wat in die pap en bier in die grootskaalse bereiding van kafferbier voorkom, is geïsoleer en geïdentifiseer. Die organismes wat verantwoordelik is vir die bederf van bier is ook bestudeer. Daar word nou eksperimentele brouproewe uitgevoer met suiwer kulture van melksuurbakterië en gisowwe om vas te stel watter stamme die beste bier gee.

beer is now made, however, there has been relatively little effort devoted to determining which of the many varieties of kaffircorn are best suited for malting or to studying the conditions most suited for the malting operation itself.

As the first step in an investigation of these problems, methods have been developed for the analysis of kaffircorn malts and applied to the characterization of malts as produced commercially at present. Laboratory malting tests are being carried out to determine the influence of various factors on the development of diastatic activity during the malting process. This will be a long-term study since it is necessary to consider the inter-action of a number of factors. There are already indications, however, that analysis may provide brewers with a good indication of the brewing qualities of malts under practical conditions.

In view of the importance of the nitrogenous constituents of malt in the brewing of European beer, a study is also being made of the amino acids in kaffircorn grain and malt, and their fate during brewing.

The microbiological investigations into the brewing of kaffir beer have been continued. Yeasts and lactic acid bacteria occurring in the mash and beer in large-scale practice have been isolated and identified. The organisms responsible for the spoilage of beer have also been studied. Experimental brewing trials are now being carried out with pure culture of lactic acid bacteria and yeasts to determine which strains give the best beer.

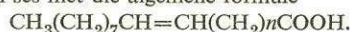
Seegrasse

Die seisoenstudies van bruin seegrass (wat alginien-suur bevat) is in die jaar voltooi. Fundamentele struktuurstudies van die agar van *Gracilaria confervoides* wat kommersieel in die Unie geproduseer word, word nou uitgevoer. Die tegniek wat vir die studie van die polisakkaried gebruik word, is die afbreking daarvan tot oligosakkaried met lae molekulêre gewigte deur middel van suurhidrolise. Die oligosakkaried word dan chromatografies geskei. Die strukture en eienskappe van die suikers met lae molekulêre gewig, wat betreklik maklik is om te hanteer in vergelyking met die agarmolekuul, word deur bekende metodes bepaal. Op die manier kan 'n prentjie van die oorspronklike agarmolekuul opgebou word.

'n Ander deel van die werk oor *G. confervoides* en *Gelidium pristoides* was 'n ondersoek van die koolwaterstowwe met 'n lae molekulêre gewig. 'n Glikosied van galaktose en gliserol is geïsoleer en die struktuur daarvan vasgestel.

Plantaardige Olies

Die ondersoek van die saadolie van verskeie *Ximenia* spp. (suurpruim) is gedurende die jaar voltooi. Een van die olies (die van *Ximenia caffra*) is uitvoerig ondersoek en dit het geblyk dat dit 'n monohidroksi-eniensuur bevat. Gewone bestanddele van die olie is 'n aantal ongewone mono-onversadigde sure, insluitende 'n groep van ses met die algemene formule



Verder is die olie van die saad van die narra (*Acanthosicyos horrida* Hook) en van die stokroos (*Hibiscus cannabinus*) ondersoek — laasgenoemde op versoek van die Departement van Handel en Nywerheid.

Gepolimeriseerde Olies

Die meganisme van die polimeriseringsreaksies wat sekere natuurlike vette geskik maak vir gebruik in verwe en ander oppervlaktelae, is verder bestudeer. Besondere aandag is geskenk aan die polimeriseringsreaksies wat onder die invloed van hitte (termiese polimerisasie) as gevolg van die reaksie met suurstof (outoksidasie) plaasvind. Die bestudering van die reaksie is ook van besondere belang om vollediger kennis te verkry van die reaksies wat in eetbare vette plaasvind as hulle galsterig word nadat hulle lank gebêre is.

Termiese polimerisering; Die struktuur van metiel-linoleaat-dimeer is ondersoek deur middel van 'n dehidreerings-oksidasieproses wat vroeër beskryf is. Preniteensuur is geproduseer met 'n opbrings van sowat 3% uit dimere wat geïsoleer is van (a) swak-gepolimeriseerde en (b) sterk-gepolimeriseerde linoleaat. Die Diels-Alderse polimerisering vind dus tot minstens sowat 20-30% plaas. Weens 'n tekort aan personeel mees die werk op die gebied gestaak word, maar dit sal hopelik gou weer 'n aanvang neem. 'n Nagraadse student van die Universiteit van Pretoria wat in die laboratorium werk, het voortgegaan met die studie van die fisies-chemiese aspekte van die polimerisering van olie wat snel droog word.

Seaweeds

The seasonal studies on brown (alginic acid-containing) seaweeds were completed during the year. Fundamental structural studies on the agar from *Gracilaria confervoides*, which is produced commercially in the Union, are under way. The technique being used for the study of this polysaccharide is its degradation to low molecular weight oligosaccharides by means of acid hydrolysis.

These oligosaccharides are then separated by chromatographic means. The structures and characteristics of these low molecular weight sugars, which are relatively easy to handle as compared with the agar molecule, are determined by conventional means. In this way a picture of the original agar molecule can be built up.

Another aspect of the work on *G. confervoides* and *Gelidium pristoides* has been an examination of the low molecular weight carbohydrates. A glycoside of galactose and glycerol was isolated, and its structure established.

Vegetable Oils

The investigation of the kernel oils from various *Ximenia* spp. (Suurpruim) has been completed during the year. One of the oils (that of *Ximenia caffra*) was extensively investigated and shown to contain a monohydroxy-ene-yne acid. Common constituents of these oils are a number of unusual mono-unsaturated acids including a group of six having the general formula $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_n\text{COOH}$.

In addition the oils from the seeds of the narra (*Acanthosicyos horrida* Hook) and of kenaf (*Hibiscus cannabinus*) have been examined — the latter at the request of the Department of Commerce and Industries.

Polymerized Oils

The mechanisms of the polymerization reactions which make certain natural fats suited for use in paints and other surface coatings have been further studied. Particular attention has been paid to the polymerization reactions occurring under the influence of heat (thermal polymerization) and as a result of reaction with oxygen (autoxidation). Study of the latter reaction is also of outstanding importance to provide a fuller knowledge of the reactions undergone by edible fats when they become rancid on prolonged storage.

Thermal Polymerization. The structure of methyl linoleate dimer has been investigated using a dehydrogenation-oxidation procedure previously described. Prenitic acid was produced about 3% yield from dimers isolated from (a) lightly polymerized and (b) extensively polymerized linoleate. Diels-Alder type polymerization thus occurs to the extent of at least about 20-30%. Work on this subject has had to be discontinued owing to shortage of staff, but it is hoped to recommence the study soon. The physico-chemical studies of drying oil polymerization have been continued by a post-graduate student of Pretoria University working in the laboratory.

Outoksidasie: Die mengsel van *cis-trans* en *trans-trans* metielhidroksilinoëlate wat verkry is deur reduksie met natriumboorhidried van metiellinoleaathidroperoksiede is gedeeltelik geskei deur ureumkompleksfraksionering. Daar word nou geprobeer om uit te vind of die *trans*-dubbelbinding in die *cis-trans* molekule altyd teenoor die hidroksielgroep staan soos teoreties verwag word. 'n Verbetering in die tegniek was die suiwering van die hidroperoksiede self deur teenstroom-verdelingschromatografie. Die metode kan ook gebruik word vir die gedeeltelike skeiding van die geometriese isomere wat in die studie teëgekomp is.

Plantstowwe

Voortvloeiend uit 'n aanbeveling van 'n Adviserende Subkomitee is daar voortgegaan met die opbou van 'n kaartindeks oor die chemie van Suid-Afrikaanse plante. Afskrifte van die indekskaarte is aan Universiteite en ander Institute verskaf. Daar word ook 'n versameling van monsters wat van belang is vir werkers op die gebied, opgebou.

Lupine; Die vinnige toename in die kweek van lupine in die winterreënvalstreek van die Kaapprovinsie, het 'n aktiewe belangstelling gewek in die voedingswaarde van die sade vir mens en dier. As voorbereiding vir 'n meer uitvoerige studie is die proteïene van die saad van die blou lupine aan 'n fisies-chemiese studie onderwerp.

Sonneblomsaad; Die proteïene van die sonneblomsaad is op soortgelyke wyse ondersoek. In vorige ondersoeke wat elders uitgevoer is, was daar altyd moeilikheid met die skeiding van die proteïene van die geassosieerde chlorogeensuur. Daar is 'n metode uitgewerk om dit te verwyder sonder denaturering van die proteïene. Ultra-sentrifugale ondersoek het getoon dat die gesuiwerde proteïene twee hoofbestanddele bevat. Die stowwe is suksesvol geïsoleer en ondersoek deur middel van ultra-sentrifugale, elektroforetiese en diffusiemetings. Die weg is dus gebaan vir 'n meer uitvoerige studie van die stowwe.

VOEDING

Die ontwikkeling van 'n nasionale organisasie vir voedingsnavorsing is nog 'n stap verder gevoer en alles is gereedgemaak vir die omsetting van die Voedingnavorsingseenheid van die Laboratorium in 'n Nasionale Voedingnavorsingsinstituut teen die end van 1954. Ter voorbereiding hiervoor moes nuwe laboratoriums verkry, nuwe personeel aangewerf en opgelei, en navorsingsprojekte gekeur en aangevoer word.

Biologiese Waardebepaling van Proteïene

'n Proefdierhuis is in werking gestel en die biologiese waardebeoordeling van proteïene word nou as 'n roetine toegepas in 'n ondersoek van die voedingswaarde van verskeie verrykingsmiddels wat by brood en meliemeel gevoeg word.

Visfynmeel

Daar word tans baie aandag geskenk aan die produksie van visfynmeel wat in 'n geskikte vorm as verrykingsmiddel gebruik kan word, en ook aan die bepaling van die

Autoxidation. The mixture of *cis-trans* and *trans-trans* methyl hydroxy-linoleates obtained by sodium borohydride reduction of methyl linoleate hydroperoxides has been partially resolved by urea-complex fractionation. Present efforts are directed towards discovering whether the *trans*-double bond in the *cis-trans* molecules is always α - to the hydroxyl group as predicted on theoretical grounds. An advance in technique has been purification of the hydroperoxides themselves by reversed-phase partition chromatography; this method can also be used for the partial resolution of the geometrical isomers encountered in this study.

Plant Extractives

Following on a recommendation of an Advisory Sub-Committee, the building up of a card index to the chemistry of South African plants has been continued. Copies of the index cards have been made available to Universities and other Institutions. A collection of samples of interest to workers in this field is being accumulated.

Lupins. With the rapid increase in the cultivation of lupins in the winter rainfall area of the Cape has come an active interest in the nutritive characteristics of the seeds both for human and animal nutrition. As a preliminary to a more detailed study, the proteins of blue lupin seeds have been submitted to physico-chemical study.

Sunflower seeds. The proteins of sunflower seed have been similarly examined. Earlier investigations elsewhere have always been complicated by the difficulty of separating these proteins from associated chlorogenic acid. A procedure to remove this without denaturation of the protein was developed, and ultra-centrifugal examination showed that the purified protein contained two major constituents. These were successfully isolated, and examined by ultra-centrifugal, electrophoretic and diffusion measurements. A way has therefore been opened for their more detailed study.

NUTRITION

The development of a national organization for nutrition research has been carried a stage further, and the stage has been set for the transformation of the Nutrition Research Unit of the Laboratory into a National Nutrition Research Institute towards the end of 1954. Preparation for this has involved the fitting of new laboratories, the recruitment and training of staff, and the selection and initiation of research projects.

Biological Evaluation of Proteins

An animal house has been brought into operation, and the biological evaluation of proteins is now being applied on a routine basis in an investigation of the nutritional value of various enriching agents added to bread and to mealie meal.

Fish Flour

Greatest attention is at present being paid to the production of fish flour in a form suitable for use in such enrichment and to its nutritional evaluation. Thus fish

voedingswaarde daarvan. Vismeel wat op 'n proefbasis deur 'n handelonderneming geproduseer word, is onder verskeie produksietoestande gewaardeer en die produkte is vir die verryking van fynmeel gebruik. Met die meel is brood gebak waarvan die voedings- en ander eienskappe vergelyk word met die van brood wat op dieselfde wyse van onverrykte meel gebak is. Die Visnywerheidsnavorsingsinstituut ondersoek nou verskillende metodes vir die produksie van vismeel wat op soortgelyke wyse gewaardeer sal word.

Mikrobiologiese Bepaling van B-groep Vitamine

'n Beampte van die Eenheid is in die tweede helfte van die jaar tydelik oorgeplaas na die S.A. Buro vir Standaarde om opgelei te word in die tegniek van mikrobiologiese bepalinge. Die bystand van die Buro, asook hul dienste in die uitvoering van ontledings was besonder waardevol.

Ontleding van Voormengsels vir die Verryking van Meel

Vir die produksie van verrykte meel word die verrykingsmiddels (grondboontjemeel, melkpoeiers, ens.) tot 'n voermengsel vervaardig wat deur verskeie ondernemings vir die Departement van Voeding gemaak word. Metodes vir die ontleding van die mengsel is uitgewerk en monsters wat deur die Departement voorgelê is, is ondersoek.

Omhulde Vitamien A

Vitamien A word baie maklik vernietig deur blootstelling aan lug en lig en dit, sowel as die feit dat dit gewoonlik in oplossing in vette toegedien word, maak dit baie moeilik om in droë poeiers te meng, soos bv. gedroogde afgeroomde melk vir skoolvoeding of die voermengsel vir die verryking van meel. Metodes om vitamien A in 'n bestendige poeiervorm te lewer, is dus ondersoek en aansienlike vordering is gemaak.

Gehalte van Brood wat met Verrykte Meel Gebak is

Daar is reeds begin met die daarstelling van fasiliteite vir baktoetse. Daar sal veral gelet word op die uitwerking van verskeie verrykingsmiddels op die bakeienskappe as dit by meel van 90% ekstraksie gevoeg word.

Kafferkoring (Sorghum) en Produkte wat daaruit verkry word

Saam met die studies oor die maak van mout van kafferkoring en die brou van kafferbier, is ondersoek ingestel oor die belangrike voedingsbestanddele van sekere produkte. Die ondersoek het ingesluit die belangrikste soorte kafferkoring wat in die Unie verbou word, moute wat in verskillende omstandighede van hulle verkry word, verskeie kafferbere en graankosse wat van kafferkoring en kafferkoringmout gemaak is.

MIKROBIOLOGIESE SKEIKUNDE

Verwering van Betonriole

'n Aantal stowwe is getoets vir hul vermoë om verwering van betonriole wat veroorsaak word deur swawelzuurvormende bakterieë, te verhinder. Bakteriedodende middels wat die groei van *Thiobacilli* in 'n vloeibare medium baie doeltreffend gestuit het, is in betonstawe

flour produced on a pilot plant scale by a commercial concern has been evaluated under a variety of production conditions, and the products have been used in the enrichment of flour. This has in turn been used in the baking of bread, the nutritional and other qualities of which are being compared with those of bread made under comparable conditions from the unenriched flour. Alternative methods of fish flour production are being investigated by the Fishing Industry Research Institute, and products obtained using them will be evaluated in a similar manner.

Microbiological Assay of B-group Vitamins

An officer of the Unit has been seconded to the S.A. Bureau of Standards during the latter part of the year for training in the techniques of microbiological assay. This assistance from the Bureau, as well as its services in the carrying out of assays, has been of the greatest value.

Analysis of Premix for the Enrichment of Flour

For the production of enriched flour, the enriching agents (groundnut meal, milk powders, etc.) are incorporated into a premix by various firms for the Department of Nutrition. Methods for the analysis of this premix have been developed, and samples submitted by the Department have been examined and reported upon.

Encapsulated Vitamin A

Vitamin A is very easily destroyed by exposure to air and light, and this as well as the fact that it is normally applied in solution in fats, makes it difficult to incorporate in dry powders—such as, for example, dried skim milk for school feeding, or the premix for enrichment of flours. Methods for the production of vitamin A in a stabilized powder form have therefore been investigated and very considerable progress made.

Quality of Breads Baked with Enriched Flour

A start has been made in the setting up of facilities for baking tests. It is planned to concentrate attention on the effects on baking qualities of various enriching agents when added to 90% extraction flours.

Kaffircorn (Sorghum) and Products derived from it

In parallel with the studies of the malting of kaffircorn and of the brewing of kaffir beer, various products have been examined for their content of nutritionally important constituents. Amongst the products examined have been the main varieties of kaffircorn grown in the Union, malts derived from them under different conditions, kaffir beer samples, and cereal foods made from malted and unmalted kaffircorn.

MICROBIOLOGICAL CHEMISTRY

Corrosion of Concrete Sewers

A number of substances were tested for their ability to inhibit the corrosion of concrete by sulphuric acid-producing bacteria. Bactericides which had been shown to be highly effective in preventing the growth of *Thiobacilli* in liquid medium were incorporated in concrete

ingesluit. Die stawe is met *Thiobacillus thioparus* en *Thiobacillus thiooxidans* geënt en in 'n gaskamer geplaas waar hulle vir 2 tot 4 maande blootgestel is aan 'n stroom vogtige lug wat 10-20 d.p.m. swawelwaterstof bevat. Onder die teenmiddels wat ondersoek is, was koperkarbonaat (maksimumkonsentrasie 1% van die gewig van die beton), chroomoksied (1%), natriumsilikofluoried, (0.5%), pentachlorofenol (1,000 d.p.m.) selenium (100 d.p.m.) en 'n kwaternêre ammoniumsout (500 d.p.m.). Die toetsstawe het egter in geen geval groter weerstand teen vertering getoon as die gewone betonstawe nie. Dit blyk dus dat die gebruik van bakteriedodende sement nie 'n oplossing bied vir die vertering van betonriole in warm streke nie. Die oplossing lê eerder in die ontwerp van die rioolstelsel op so 'n wyse dat 'n groot konsentrasie swawelwaterstof nie in die riool-atmosfeer opgebou kan word nie.

Korrosie van Yster deur Sulfaatreduserende Bakterieë

Die studie van die bevordering van anaerobiese korrosie van yster deur sulfaat-reduserende bakterieë is herwat. Die algemene opvatting is dat die bakterieë korrosie bevorder deur katodiese depolarisering (d.i. deur die waterstof wat by die katode afkom te gebruik om die sulfaat te reduseer). Vorige werk in die laboratorium het egter daarop gedui dat dit nie die geval is nie, maar dat die korrosie eerder bevorder word deur die waterstofsulfied wat deur die bakterieë voortgebring word en dan as 'n anodiese stimulant werk. Daar word nog werk gedoen om die resultate te bevestig en uit te brei.

Wattelekstrak

'n Monster gistende wattlekstrak is op versoek van 'n bedryfsonderneming ondersoek. Die gissoorte wat die gisting veroorsaak het, is geïsoleer en geïdentifiseer en dit is gevind dat die gisting heeltemal gestuit kon word deur 0.1% natriumsilikofluoried by die wattlekstrak te voeg.

Uiesuurtjies

'n Algemene vorm van bederf van suuruitjies is die ontwikkeling van geel kolle gedurende die inmaakproses. Monsters van verkleurde uie is van drie verskillende fabriekse ontvang. Talryke soorte gis en twee stamme bakterieë wat melksuur veroorsaak, is uit die monsters geïsoleer. Werk is aan die gang om die organismes te identifiseer, om vas te stel watter aandeel hulle in die ontwikkeling van die geel kolle het, en om uit te vind hoe om hul groei te voorkom.

FISIËSE SKEIKUNDE

Amalgaamskeikunde

Die amalgame van chroom, mangaan, yster, kobalt en nikkel is bestudeer. Terwyl „amalgame” van chroom, yster en kobalt uit suspensies van die onderskeie metale bestaan, bevat die amalgame van mangaan en nikkel tussen-metaalse verbindings. Deur sentrifugering van die amalgame en daaropvolgende spektrochemiese en

bars. These were inoculated with *Thiobacillus thioparus* and *Thiobacillus thiooxidans* and placed in a gas chamber where they were exposed for 2 to 4 months to a stream of moist air containing 10-20 p.p.m. hydrogen sulphide. Amongst the inhibitors tested were copper carbonate (maximum concentration 1% of the weight of the concrete), chromium oxide (1%) sodium silicofluoride (0.5%), pentachlorophenol (1,000 p.p.m.), selenium (100 p.p.m.) and a quaternary ammonium salt (500 p.p.m.). In no case, however, did the test bars show greater resistance to corrosion than the plain concrete controls. The use of bactericidal cements does not, therefore, appear to offer a solution to the problem of preventing the corrosion of concrete sewers in warm climates. The solution lies rather in designing the sewer system so as to prevent the build-up of the concentration of hydrogen sulphide in the sewer atmosphere.

Corrosion of Iron by Sulphate-reducing Bacteria

The study of the stimulation of the anaerobic corrosion of iron by sulphate-reducing bacteria has been resumed. The generally accepted idea is that the bacteria stimulate corrosion by cathodic depolarization (by using the hydrogen produced at the cathode to reduce sulphate). However, previous work in this laboratory indicated that this was not the case, but that corrosion was stimulated rather by the hydrogen sulphide produced by the bacteria which acted as an anodic stimulant. Work is in progress to confirm and extend these results.

Wattle Extract

A sample of fermenting wattle extract was examined at the request of a commercial firm. The yeasts responsible for the fermentation were isolated and identified and it was shown that the fermentation could be completely inhibited by the addition of 0.1% sodium silicofluoride to the wattle extract.

Pickled Onions

A common form of spoilage of pickled onions is the development of yellow spots during the pickling process. Samples of discoloured onions have been obtained from three different factories and numerous yeasts and two strains of lactic acid-producing bacteria isolated from them. The identification of these organisms is being undertaken to study their role in the development of the yellow spots and to find out how to prevent their growth.

PHYSICAL CHEMISTRY

Amalgam Chemistry

The amalgams of chromium, manganese, iron, cobalt and nickel have been studied. While chromium, iron and cobalt „amalgams” consist of suspensions of the respective metals, the amalgams of manganese and nickel contain inter-metallic compounds. Upon centrifuging the amalgams and subsequent spectrochemical or colori-

kolorimetrie ontleedings van die vloeibare gedeelte, is gevind dat die oplosbaarheid van die metale in kwik baie laag is (10^{-6} tot 10^{-7} g. metaal per 100 g. kwik by 30°C .), behalwe in die geval van mangaan.

Studies van die Adsorpsie van Gasse

Die oppervlaktediffusie van geadsorbeerde molekule is verder ondersoek deur die meet van die mate van adsorpsie in poreuse media. Die adsorpsie van argon is bestudeer omdat die gas eenatomig is. Daar is gevind dat die oppervlaktediffusiekoëffisiënte vir verskillende gasse by ooreenstemmende temperature van dieselfde orde is. Ooreenstemmende temperature verwys na T/T_s , waar T die absolute temperatuur van die eksperiment is en T_s die absolute kookpunt van die adsorbaat. Diffusiekoëffisiënte is besonder afhanklik van oppervlaktebedekking. By 'n enkellaagkapasiteit bereik die diffusie-koëffisiënt sy maksimumwaarde maar verminder tot 'n veel kleiner orde met verminderde bedekking. Terselfdertyd neem die verhouding van aktivering tot adsorpsie-energie toe en neig tot gelykheid. Dit is duidelik dat die meganisme van diffusie in die omstandighede verander.

Tot dusver het die poreuse adsorpsiemiddels wat bestudeer is, heterogene oppervlaktes gehad met betrekking tot die hitte van adsorpsie. Daar is begin met 'n studie van oppervlaktediffusie oor 'n betreklike eenvormige adsorpsieoppervlakte.

Gebaseer op ondervinding wat opgedoen is in die studie van oppervlaktediffusie, is pogings aangewend om die verskille in die spoed van oppervlaktevloei te gebruik in die skeiding van isotope. Daar is getoon dat 'n doeltreffende skeiding verkry kan word wat aansienlik beter is as met die Knudsen-diffusiemetode, wat dikwels gebruik word vir die skeiding van isotope. Die proewe is uitgevoer met suurstof wat 2 per sent suurstof-18 bevat en met normale argon wat deur poreuse proppe van saamgeperste silika by die temperatuur van vloeibare stikstof beweeg.

Diffusie in Kristalle van Nie-metale

Diffusiestudies is van primêre belang vir 'n verdere begrip van die kinetiek van vaste toestand-reaksies. In verband met die meganisme van die termiese ontbinding van karbonate, is die uitruiling tussen gemerkte koolstofdioksied en kalsietkristalle vanaf kamertemperatuur tot 800°C . ondersoek. Uit verandering in isotopiese samestelling van die gas wat massaspektrometrie bepaal is, is die diffusiekoëffisiënte van dié van die koolstofdraende bestanddeel in die kristal bereken. Aan die begin is daar 'n vinnige diffusie in die oppervlaktelaag, wat gevolg word deur 'n stadiger diffusie na die binnekant van die kristal.

Radioskeikunde

In die afgelope jaar het die aantal probleme waarvoor radioisotope nodig is, aansienlik toegeneem.

Die navorsing oor die toediening van kunsmis vir tabakplante in samewerking met die Tabaknavorsingstasie

metrie van die vloeibare gedeelte, is gevind dat die oplosbaarheid van die metale in kwik baie laag is (10^{-6} tot 10^{-7} g. metaal per 100 g. kwik by 30°C .) behalwe in die geval van mangaan.

Studies of Gaseous Adsorption

Surface diffusion of adsorbed molecules has been further investigated by the measurement of adsorption rates in porous media. Adsorption of argon was studied since this gas is monatomic. It was found that at corresponding temperatures the surface diffusion coefficients for different gases are of the same order. Corresponding temperatures refer to T/T_s , where T is the absolute temperature of the experiment and T_s the absolute boiling point of the adsorbate. Diffusion coefficients are strongly dependent on surface coverage. At about the monolayer capacity the diffusion coefficient attains its maximum value and decreases by several orders of magnitude with decreasing coverage. At the same time the ratio of activation to adsorption energy increases and tends to unity. It is obvious that the mechanism of diffusion changes under these conditions.

Thus far, the porous adsorbents studied have possessed heterogeneous surfaces with respect to heats of adsorption. A beginning has been made on study of surface diffusion over a relatively uniform adsorbent surface.

On the basis of experience gained from the study of surface diffusion, attempts were made to utilize differences in rates of surface flow in order to separate isotopes. It was demonstrated that an effective separation could be achieved which appreciably exceeded that for Knudsen diffusion frequently used for isotope separation. The experiments were carried out with oxygen containing 2 per cent oxygen-18 and normal argon passing through porous plugs of compressed silica at liquid nitrogen temperature.

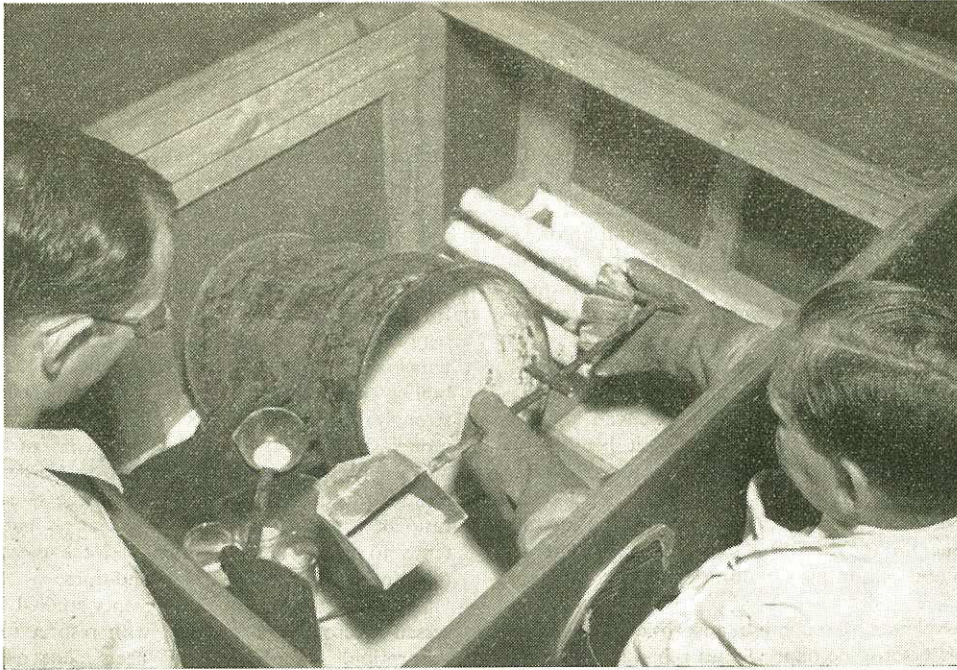
Diffusion in Non-metallic Crystals

Diffusion studies are of primary importance for a further understanding of the kinetics of solid state reactions. In connection with the mechanism of thermal decomposition of carbonates, exchange between labelled carbon dioxide and calcite crystals was investigated from room temperature to 800°C . From changes in isotopic composition of the gas as determined mass-spectrometrically, diffusion coefficients of the carbonaceous constituent within the crystal were calculated. An initial rapid diffusion within a surface layer is followed by a slower diffusion into the interior of the crystal.

Radiochemistry

The number of problems requiring use of radioisotopes has increased considerably in the past year.

In continuation of research on application of fertilizer to tobacco plants, in collaboration with the



Superfosfaat bevattende radioaktiewe fosfor word toegedien by studies van die inname van misstowwe deur gesaaides.

is voortgesit en die werk was veral toegespits op 'n stuk onbeboude nuwe grond met 'n bewese tekort aan fosfaat en op vier stukke grond met verskillende fosfaatinhoud wat volgens verwagting slegte resultate vir tabak sou gee. Die nuwe grond het merkbaar gereageer op die toediening van fosfaat en die plante het 'n groot deel van hul fosfaat uit die gemerkte kunsmisfosfaat opgeneem. Dit was in skerp teenstelling met die geringe invloed wat in vorige verslae vermeld is vir toedienings van fosfaat op ander gronde wat reeds bebou was en waarskynlik nog fosfaat bevat het uit kunsmis van vorige jare. Van die ander vier stukke grond het die met die meeste fosfaat slegte tabak gelewer en feitlik glad nie op die toediening van fosfaat gereageer nie. Die ander drie stukke grond het geen duidelike reaksie getoon nie.

Met die oog op die moontlike giftigheid van sistemiese insekdodende middels vir die mens is 'n belangrike reeks studies uitgevoer oor die inname van die sistemiese insekdoder o,o-diëtiel-o-etiëlmerkaptoëtieltiofosfaat. Die opname deur tabakblare en aartappels is gevolg met die gebruik van die verbinding, gemerk met P^{32} . Toedienings van die insekdodende middel op die blare en aan die grond is vergelyk. Om tussen die oorspronklike verbinding en sy finale ontbindingsprodukte te onderskei, is die totale aktiwiteit en ook die aktiwiteit wat uittrekbaar is met chloroform, gemeet.

'n Poging om die tiroksien in bloed met 'n radiometrie metode te bepaal, was nie besonder suksesvol nie.

Dispensing super-phosphate made with radioactive phosphorus for use in studies of the uptake of fertilizers by field crops.

Tobacco Research Station, attention was directed to a virgin soil known to be deficient in phosphate and to four soils of varying phosphate content which were expected to give poor results for tobacco. The virgin soil showed a marked response to application of phosphate, and the plants took up a high proportion of their phosphate as fertilizer (i.e. labelled) phosphate. This was in marked contrast to the indifference to additions of phosphate noted in earlier reports on soils which have already been cultivated and presumably carry phosphate from fertilizer added in previous years. Of the other four soils, that with the highest phosphate content gave poor tobacco and practically no response to added phosphate. The other three soils were less definite in response.

An important series of studies has been carried out on the uptake of the systemic insecticide, o,o'-diethyl o-ethylmercaptoethyl thiophosphate, from the point of view of its possible toxicity for human consumption. The uptake by tobacco leaves and by potato tubers has been followed using this compound labelled with P^{32} . Applications of the insecticide to the leaves and to the soil have been compared. In order to distinguish between the original compound and its final decomposition products, total activity and also the activity extractable with chloroform were both measured.

An attempt has been made to evaluate thyroxine in blood by a radiometric method, but has not met with complete success.

Om die omloop in slykverteertenks by rioolwerke te volg, is 'n metode om rou slyk met radio-aktiewe fosfor te merk, uitgewerk en toegepas.

Daar is voortgegaan met die meting van self-diffusie-koëffisiënte in organiese vloeistowwe en 'n verslag word nou opgestel.

Metaalverwering

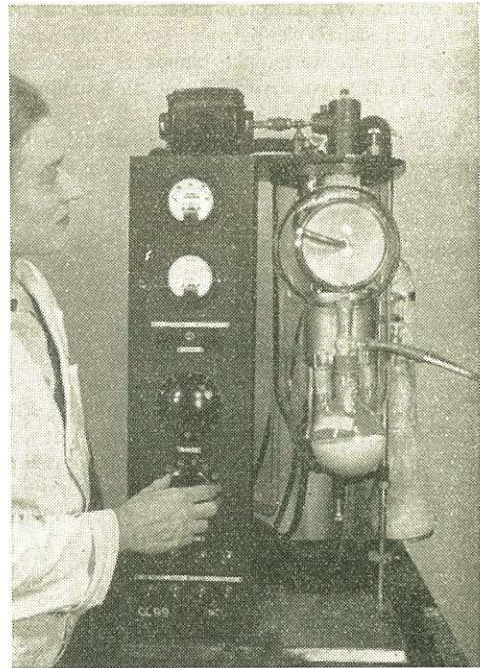
Die werk i.v.m. staalverwering in gewapende beton is voortgesit. Daar is begin met 'n program waarvolgens klein monsters bewapeningstaal wat in sementmortel gelê word aan toestande wat korrosie bevorder, onderwerp sal word. Terselfdertyd sal groot gewapende betonpilare op verskillende plekke aan korrosie by die see blootgestel word.

Katodiese beskerming van geweefde draadvervoerbande wat deur die visnywerheid gebruik word, is ondersoek. Ten spyte van die uiterste verweringstoestande, dui voorlopige werk daarop dat dit 'n baie suksesvolle metode kan wees. Verdere proefnemings oor die toepassing daarvan in 'n visfabriek word gedurende die seisoen uitgevoer.

Werk i.v.m. katodiese beskerming gekoppel met bitumineuse verf vir die beskerming van staalplaatwerk in hawens het voortgeduur en laboratoriumtoets het getoon dat katodiese beskerming doeltreffend toegepas kan word sonder dat die verflaag afskilfer.

Onder: Die swigting van gewapende beton in 'n brug as gevolg van verwering in 'n kusgebied.

Regs: 'n Molekulêre distilleertoestel in gebruik om dierevet te distilleer by die bepaling van die vitamien A-inhoud.



Above: A molecular still being used to distil animal fat for the estimation of vitamin A content.

Left: The failure of reinforced concrete on a bridge as result of corrosion in a marine environment.

In order to follow circulation in sludge digestion tanks at a sewage works, a method of labelling raw sludge with radioactive phosphorus was worked out and applied.

A programme of measurement of self-diffusion coefficients in organic liquids has been continued and a report is being drawn up.

Metallic Corrosion

Work has been continued on corrosion of reinforcing steel in concrete. A programme has been commenced in which small samples of reinforcing steel embedded in cement mortars will be subjected to corrosive conditions. At the same time, large reinforced concrete pillars will be subjected to marine corrosion at suitable sites.

Cathodic protection of woven wire conveyor belting used by the fishing industry has been investigated. Despite extremely corrosive conditions, preliminary work indicates that this promises to be highly successful, and further experiments on this application in a factory during the fishing season are in progress.

Work on cathodic protection combined with bituminous paints for protection of harbour steel sheet piling has been continued, and it has been shown in laboratory tests that cathodic protection can be made effective without blistering of the paint film.

Die gebruik van dampfase-afweerstawwe vir deurweking van bandeliers wat patrone bevat, is bestudeer en dit het beide patrone en patroonhouers merkwaardig bestand gemaak teen verwerking by blootstelling aan seelug.

Soos in vorige jare was daar 'n groot aantal versoeke van nywerhede en Staatsdepartemente vir hulp met allerlei verwerkingsprobleme.

ALGEMEEN

Suurbestande Tenkbekledings

Werk i.v.m. die formulering van samestellings bestaande uit bitumen, mineraal-aggregate en sintetiese polimere wat geskik is vir die werksvereistes van 'n nywerheidsonderneming, is voltooi. Samestellings met die gewenste eienskappe van gietbaarheid as dit warm is en stabiliteit as dit koud is, is uitgegiet op semi-skaalse betontoetsplate. As gevolg van die werk, wat toetse ingesluit het om die weerstand teen vloeibaarheid by hoë temperature en teen barste by lae temperature, te bepaal, tref die ondersteuner nou reëlings vir veldtoetse op die meer belowende samestellings.

Die Meng van Vaste Stowwe

'n Voorlopige studie van 'n eenvoudige mengstelsel, toegepas op gekleurde sand van 'n byna eenvormige korrelgrootte en vorm, maar van twee kenmerkende kleure, is voltooi. Met behulp van die Nasionale Instituut vir Personeelnavorsing is die resultate statisties ontleed en 'n poging aangewend om 'n bevredigende matematisiese verwantskap van die graad van vermenging daaruit af te lei. Die werk is oorsee gepubliseer en dit het die belangstelling van ander werkers op die gebied gewek.

Molekulêre D stillasie

'n Molekulêre distilleertoestel met 'n drie-stadium dalende film is ontwerp en opgebou. Dit het baie waardevol geblyk te wees vir die distillasie van labiele verbindinge soos hoogs onversadigde visoliesure.

Analitiese Laboratorium

Dit het voortgegaan om vir die hele W.N.N.R. van diens te wees en 'n groot verskeidenheid van werk is gedoen. In verband met die geochemiese ouderdomsbepalings wat deur die Afdeling Massaspektrometrie van die N.F.L. uitgevoer is, is verskeie soorte uraanerts ontleed en die lood is omgesit in loodjodied en die uraan in uraantetrabromied. Die studie van minerale produkte het die ontleding van kleisoorte, magnetiete, chromiete en fosfate ingesluit. Vir die Biochemiese Afdeling is ontledings van pynappelafval, kafferkoring en ander produkte gemaak. In die projek oor die jodering van sout moes 'n groot aantal ontledings gemaak word. Aan die Unie-Departement van Gesondheid is hulp verleen deur die loodinhoud van urines te bepaal i.v.m. studies oor loodgevare in nywerhede.

Die Mikro-analitiese Laboratorium het 'n groot aantal bepalinge van koolstof, waterstof, stikstof en groepe gehanteer. 'n Apparaat vir die direkte bepaling van suurstof in organiese verbindinge is opgestel.

The use of vapour phase inhibitors to impregnate bandoliers containing cartridges has been studied, and it has been shown that this results in a remarkable increase of resistance to corrosion on exposure to a marine atmosphere both for cartridges and cartridge chargers.

As in previous years, a large number of miscellaneous requests for assistance in corrosion problems has come from industry and from Government Departments.

GENERAL

Acid Resistant Tank Linings

Work was completed on the formulation of bitumen, mineral aggregate and synthetic polymer compositions suitable for the operating requirements of an industrial concern. Compositions having the desired characteristics of pourability when hot, and stability when cold, were poured on semi-scale concrete test slabs. As a result of this work, which included tests to determine resistance to flow at elevated temperatures and to cracking at low temperatures, arrangements are being made by the sponsor for field tests to be made from the more promising compositions.

Mixing of Solids

Work was completed on a preliminary study of a simple system using closely sized and shaped sand dyed in two distinctive colours. The results were analysed statistically with the assistance of the National Institute for Personnel Research, and an attempt made to derive a satisfactory mathematical relationship expressing degree of mixing. The work has been published overseas and has evoked the interest of other workers in this field.

Molecular Distillation

A three-stage falling film molecular still was designed and constructed. It has proved of value for the distillation of labile compounds such as highly unsaturated fish oil acids.

Analytical Laboratory

This has continued to operate as a service for the whole C.S.I.R. and a large variety of work has been dealt with. In connection with geochemical age determinations carried out by the Mass Spectrometry Section, N.P.L., various types of uranium ores were analysed and the lead converted to lead iodide and uranium to uranium tetrabromide. The study of mineral products involved analysis of clays, magnetites, chromites and phosphates. Analyses carried out for the Biochemistry Division included pineapple wastes, kaffircorn and other products. The project on the iodization of salt required a large number of analyses. Assistance was given to the Union Health Department by determining the lead content of urines submitted in connection with studies on lead hazards in industry.

The Microanalytical Laboratory has handled a large number of carbon, hydrogen, nitrogen and group determinations. An apparatus for the direct determination of oxygen in organic compounds has been set up.

Nasionale Fisiese Laboratorium

Direkteur: DR. A. J. A. ROUX.

'n Ontleding van die werksaamhede van die Nasionale Fisiese Laboratorium gedurende die afgelope jaar, toon 'n verdere toename in die mate waarin die nywerheid, staatsdepartemente en ander inrigtings van die dienste van die laboratorium gebruik maak.

Hierdie verblydende ontwikkeling het egter in sommige van die onderafdelings reeds die stadium bereik waar die aandag van die personeel voltyds in beslag geneem word deur korttermynondersoeke ten behoeve van buitelliggame. Ernstige oorweging sal gevolglik geskenk moet word aan uitbreiding van die personeel in hierdie spesifieke vakrigtings ten einde te verseker dat voldoende tyd aan basiese navorsing bestee word. Tensy die bron van fundamentele kennis, waaruit geput moet word in die oplossing van praktiese probleme, voortdurend op dié wyse aangevul word, sal dit nie alleen 'n uiters nadelige uitwerking op die personeel hê nie, maar ook op die gehalte van die diens wat gelewer word.

Die werwing van geskikte personeel gaan egter met al groter moeïlikhede gepaard. So byvoorbeeld het herhaalde pogings gedurende die afgelope jaar misluk om behoorlik opgeleide kern- en biofisici uit die buiteland te trek. Dit wil voorkom asof die ontwinging, wat deur die oorlog in Europa veroorsaak is, in so'n mate tot 'n normale toestand herstel het, dat wetenskaplikes van hierdie lande nie meer elders 'n heenkome hoef te soek nie. Suid-Afrika sal gevolglik voortaan al meer en meer in sy eie behoeftes moet voorsien. In hierdie verband, moet beklemtoon word hoe wys die besluit was om 'n sentrum vir kernfisiese opleiding in die Nasionale Fisiese Laboratorium op te rig wat hopelik in 1955 in werking sal tree.

KERNFISIKA

Sentrum vir Kernfisiese Navorsing

In Desember 1953 is die siklotronsaal voltooi, en kon 'n begin gemaak word met die oprigting van die siklotron. Die 84-ton magneet is geïnstalleer en die beleid wat by die afwerking van die juk gevolg is, naamlik om elke onderdeel noukeurig af te werk, en die afwerking met fyn fisiese meetmetodes te toets, het goeie vrugte afgewerp. Die gewenste graad van noukeurigheid van die magneetspleet is direk na montering bereik sonder enige verdere foeliëring of afwerking. Die spleetopening is op enige gegewe straal konstant binne 0.0006 duim.

Die deeketels wat van 2 ton elektrolitiese koper vervaardig is, is vir vakuum getoets terwyl goeie vordering met die opbou van die vakuumsisteem gemaak is. Al

National Physical Laboratory

Director: DR. A. J. A. ROUX.

An analysis of the activities of the National Physical Laboratory for the past year, showed a further increase in the extent to which industry, government departments and other bodies made use of the services of the Laboratory.

In some of the sub-divisions this encouraging development has, however, reached the stage where the time of the staff is fully occupied by short term research on behalf of outside bodies. Serious consideration must therefore be given to the extension of the staff in these specific fields so as to ensure that enough time be available for basic research. Unless the source of fundamental knowledge to which recourse can be had in the solution of practical problems be replenished in this way, it would have a detrimental effect not only on the staff, but also on the standard of the service rendered.

The recruitment of suitable staff is however fraught with increasing difficulty. Attempts to recruit nuclear physicists and biophysicists abroad resulted in complete failure. It would appear that after the dislocation brought about by the war, Europe has returned to normal to such an extent that scientists in these countries need not seek refuge elsewhere. South Africa will consequently have to meet its own needs in future. In this connection the wisdom of the decision to establish a nuclear physics training centre in the National Physical Laboratory is apparent. It is hoped that this centre will come into operation during 1955.

NUCLEAR PHYSICS

National Centre for Research in Nuclear Physics

After the completion of the cyclotron hall in December, 1953, it became possible to start erecting the cyclotron itself. The magnet, weighing 84 tons, was installed and the policy adopted during the machining of the yoke, i.e., to machine every component to close tolerances and to test the accuracy of the components by means of fine physical methods of measurement, proved to be very successful. The degree of accuracy required for the gap, was attained directly, without any shimming or further machining being necessary. The gap has a constant width to within 0.0006'' on any given radius.

The Dee-lines, made of 2 tons of electrolytic copper, were tested for vacuum and good progress was made in

groot komponent van die siklotron wat nog nie ontvang is nie, is die vakuumpkamer wat tans in Swede vervaardig word en teen Februarie 1955 afgelewer sal word. Goeie vordering is ook met die opbou van die beheer- en radio-frekwente sisteem gemaak. Verwag word dat die siklotron teen Desember 1955 voltooi sal wees.

Die navorsingswerk wat om die siklotron beplan word, val hoofsaaklik in die gebied van kernspektroskopie. Ongelukkig het gebrek aan ruimte in die bestaande geboue en aan voldoende opgeleide kernfisiese personeel dit onmoontlik gemaak om veel aandag aan fundamentele navorsing te bestee. Met die voltooiing van die Laboratorium vir Kernfisika in die komende jaar, behoort die toestand aanmerklik te verbeter.

Standaardisering van Radioaktiwiteit

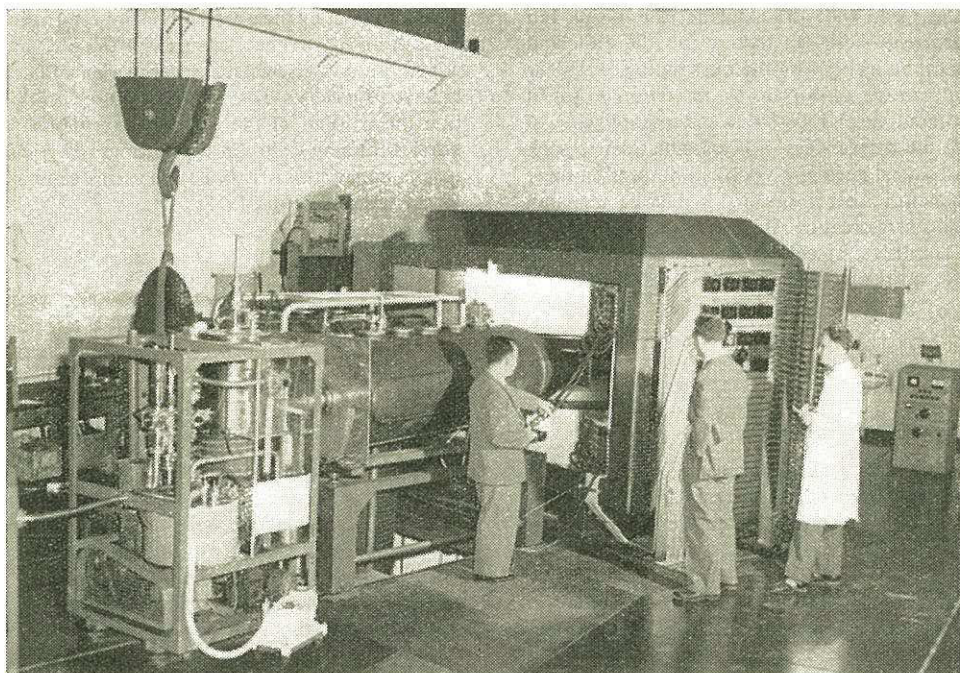
'n Aantal roetinestandaardiserings is uitgevoer, hoofsaaklik vir ander laboratoria. 'n Nuwe metaalvakuumsisteem en verdampingsapparaat is vir die 4π -teller opgebou. 'n Uitgebreide reeks metings is op Co^{60} uitgevoer om vas te stel watter metodes gevolg moet word om die hoogste graad van noukeurigheid met hierdie telbuis te bereik.

assembling the vacuum system. The only major component of the cyclotron which has not yet been received, is the vacuum chamber, which is at present being manufactured in Sweden and which will be delivered during February, 1955. Satisfactory progress can also be reported with the assembly of the control and radio-frequency systems. It is hoped that the erection of the cyclotron will be completed by December, 1955.

The research which is being planned around the cyclotron will be mainly concerned with nuclear spectroscopy. Lack of space in the present buildings and a lack of trained nuclear physicists has unfortunately made it impossible to do very much fundamental research. The position should improve appreciably in the coming year when the Nuclear Physics building, which is now nearing completion, becomes available.

Standardization of Radioactivity

A number of routine standardizations were performed, mainly on behalf of other laboratories. A new metal vacuum system and evaporation apparatus were constructed for the 4π counter. An extensive series of measurements was performed with Co^{60} to determine under what conditions the highest degree of accuracy is attained.



Die W.N.N.R.-siklotron in aanbou. In die afgelope jaar is daar aansienlike vordering gemaak en die siklotron sal waarskynlik teen die end van 1955 in werking wees.

The C.S.I.R. cyclotron under construction. Considerable progress has been made during the past year and it is expected that the cyclotron will be in operation by the end of 1955.

'n Reeks proewe het getoon dat dit moontlik is om 'n 4π -sintillasiesteller aan te wend vir die standaardisering van suiwer alfastralers soos polonium. Die standaardisering van sodanige isotope is uiters moeilik weens die besondere groot absorpsie van die alfadeeltjies in konvensionele vaste bronne. Deur die alfastraler met die fosfor van die sintillasiesteller te meng, word hierdie effek uitgeskakel en kan 'n noukeurigheid van $\pm 3\%$ verkry word.

'n 4π -eweredige teller is ook ontwerp en gebou, maar sal nie opgestel kan word voordat meer ruimte in die nuwe gebou beskikbaar is nie.

Toepassing van Kernfisiese Metodes

In die vorige jaarverslag is melding gemaak van die toetse wat ten behoeve van glasfabrikante op bauksiet-blokke uitgevoer is en die waarde daarvan in glasvervaardiging. In die afgelope jaar is meer as driemaal soveel blokke as in die vorige jaar getoets.

Hulp word op steeds groter skaal aan die Geologiese Eenheid van die Raad op Atoomkrag verleen. Die metode wat, vir die bepaling van uraan en torium in ertsmonsters met versteurde ewewig, ontwerp is, is verder verbeter, en word tans vir roetine bepaling aangewend. Die werk word egter voortgesit met die oog op die ontwikkeling van nog meer omvattende en noukeurige metodes.

'n Verstopping in een van die reënwaterafvoerpyp van die Voortrekkermonument is met behulp van 'n radioaktiewe bron opgespoor. Aangesien die pyp in dik granietblokke ingemessel is, het die bepaling van die posisie van die verstopping in die pyp daartoe bygedra om die herstelwerk aansienlik te vergemaklik. Gedurende die jaar is ook 'n begin gemaak met die aanwending van radioaktiewe tallium vir die uitskakeling van lastige statiese elektrisiteit by drukperse, en so'n bron is by 'n drukpers wat aan 'n myngroep behoort, geïnstalleer.

BIOFISIKA

Studie van die Opname van Radioaktiewe Jodium

Radioaktiewe jodium word steeds in toenemende mate gebruik in skildkliediagnose en -terapie. Elke veertien dae word 'n besending I^{131} van die buiteland ontvang wat in geskikte dosisse onderverdeel en uitgereik word aan gekwalifiseerde geneeshere vir toediening aan pasiënte. Die opname deur pasiënte in die hospitale van Pretoria en Johannesburg word gereeld gemeet en meetmetodes word gedurig verbeter. In hierdie verband word 'n oorsiggewende studie van die gebruik van radioaktiewe jodium gemaak en navorsing in verband met die korrelasie van jodiumopname met kliniese bevindings het 'n aanvang geneem.

Met behulp van 'n uitruilingsreaksie, waarin radioaktiewe jodium as gidselement gebruik word, word 'n nuwe metode vir die bepaling van die hoeveelheid skildklierhormone in die bloed ondersoek. Indien geslaagd, sal die metode van onskatbare waarde wees in die diagnose van skildklierkwale.

A series of experiments has proved that it is possible to use a 4π scintillation counter or standardizing pure alpha emitters such as polonium. The standardization of such isotopes is extremely difficult on account of the very high absorption of the alpha particles in conventional solid sources. This effect can be eliminated, and an accuracy of $\pm 3\%$ attained, by mixing the alpha emitter with the phosphor of the scintillation counter.

A 4π proportional counter was designed and constructed. It can unfortunately not be put into operation before more laboratory space becomes available in the new building.

Application of the Methods of Nuclear Physics

The testing of bauxite blocks on behalf of glass manufacturers and the value of these tests to the manufacturers were mentioned in the last annual report. During the year under review more than three times as many blocks were tested as in the previous year.

Assistance is being rendered on an increasing scale to the Geological Unit of the Atomic Energy Board. The method which was developed for assaying uranium and thorium in ore samples with disturbed equilibrium, was improved further, and is now being used for routine measurements. This work is being continued in an effort to develop even more general and accurate methods of assay.

A blockage in one of the rain water down pipes of the Voortrekker Monument was traced by using a radioactive source. As the pipe concerned was embedded in thick blocks of granite, the location of the blockage greatly facilitated the repair work. During the year a start was also made with the application of radiothallium for the elimination of static electricity in printing presses. Such a source was installed in a printing press belonging to one of the mining groups.

BIOPHYSICS

Study of the Uptake of Radioactive Iodine

Radioactive iodine is still being used in increasing quantities for thyroid diagnosis and therapy. Every fortnight a batch of I^{131} received from overseas is subdivided by the laboratory into suitable doses and then delivered to qualified physicians for administration to patients. The patients of the Pretoria and Johannesburg hospitals are measured regularly and the methods are continuously being improved. In this connection a review of the use of radioactive iodine is being made and an attempt is being made to correlate iodine uptake measurements with clinical findings.

A new method is being investigated for the determination of the amount of thyroid hormone in the blood. It is based on an exchange reaction using radioactive iodine as tracer element. If this turns out to be a success, the method will be invaluable in the diagnosis of thyroid ailments.

Verskaffing en Aanwending van Radio-isotope

Daar is tans 33 goedgekeurde verbruikers van radioisotope in die Unie, waarvan 14 toestemming het om radioaktiwiteit vir mediese doeleindes aan te wend. Die waarde van isotope wat bestel is, het dan ook in hierdie jaar toegeneem tot meer as £6,500 teenoor £2,600 vir verlede jaar. Verbruikers is van advies bedien en waar nodig is eksperimentele werk op hierdie gebied in die laboratorium uitgevoer. Voornemende verbruikers is onderrig in die hantering van radio-isotope, terwyl die vervoer van isotope in die vlerkpunte van vliegtuie uitgebrei is na die binneland.

In samewerking met die Navorsingseeheid vir Menslike Biochemie in Johannesburg is die eerste fase van die studie van haakwurmbesmetting met Fe⁵⁹ as gids-element afgehandel. Verskille in dikte van sekere materiale is bepaal deur gebruik te maak van die beginsel van absorpsie van radioaktiewe straling. In samewerking met die Departement van Geneeskunde van die Universiteit van die Witwatersrand is die studie van die yster-metabolisme van pasiënte wat aan haemochromatosis ly, voltooi. Deur radioaktiewe koolstof (met 'n halveringstyd van sowat 5,000 jaar) met 'n fluoriserende materiaal te meng, is standaardligbronne vir die sterrewag te Kaapstad vervaardig.

Vir die meting van swak betastralers is 'n doeltreffende metode ontwikkel wat daarop berus dat absorpsie-effekte vermy word deur die isotoop op te los in 'n oplossing wat dan dien as fosfor van 'n sintillasiemeter.

Beskadiging deur Straling

Die studie van die beskadiging van bakteriofage deur bestraling met elektrone, is aansienlik vertraag as gevolg van 'n tekort aan personeel. Intussen is vordering gemaak met die verbetering van die kollimasie en energiedistribusie van die elektronbundel.

Beskerming teen Straling

Die weeklikse filmwapendiens, waardeur die hoeveelheid straling wat personeel ontvang vasgestel word uit die swarting van die film, is in stand gehou. Bykans 100 wapens word elke week aan X-straal-inrigtings en verbruikers van isotope, uitgestuur.

Volledige opnames is in verskeie X-straaldepartemente uitgevoer om vas te stel of die betrokke personeel gevaar loop om blootgestel te word aan 'n oormaat straling.

X-straalstandaardisering en -dosimetrie

Met behulp van die 200KV X-straal-eenheid en -dosimeters wat as substandaarde in stand gehou word, is dosimeters uit hospitale en ander X-straal-inrigtings geëyk.

MASSASPEKTROMETRIE

Geologiese Ouderdomsbepaling

Die bepaling van die isotoopsamestelling van lood in 'n radioaktiewe mineraal, tesame met 'n skeikundige ontleding van die uraan-, torium- en loodinhoud daarvan, verskaf gegewens waaruit die geologiese ouderdom van die mineraal bereken kan word. In samewerking met 'n

Supply and Use of Radioactive Isotopes

There are 33 authorised users of radioisotopes in the Union of which 14 have permission to use radioactivity for medical purposes. The value of isotopes imported has increased this year to over £6,500 compared to £2,600 for last year. Users have been given advice and wherever necessary, experimental work has been done for them in the laboratory. Training in the handling of radioisotopes has been given to a number of prospective users and the transport of isotopes in the wing tips of aircraft has been extended to routes inside the Union.

In co-operation with the Human Biochemistry Research Unit in Johannesburg, the first phase of the study of hookworm infestation with Fe⁵⁹ as tracer, has been concluded. The variation in thickness of various materials has been determined by using the principle of the absorption of radiation. In co-operation with the Department of Medicine of the University of Witwatersrand, the study was made of the iron metabolism of patients who suffer from haemochromatosis. Standard light sources have been prepared for the Observatory in Cape Town from a mixture of radiocarbon (with a half-life of about 5,000 year) with a fluorescent material.

An efficient method of measuring weak beta-emitters, has been developed. Absorption effects are avoided by dissolving the isotopes in a solution which then serves as phosphor for a scintillation counter.

Radiation Damage

The study of damage of bacteriophage by irradiation with electrons has been delayed considerably as a result of a shortage of staff. In the meantime progress has been made on the improvement of the collimation and energy distribution of the electron beam.

Radiation Protection

The weekly film badge service, in which the quantity of radiation received by personnel is measured by the amount of blackening of a piece of film worn by each individual, has been continued. Almost 100 badges are sent out each week to X-ray departments and users of isotopes.

Surveys of various X-ray departments have been made to determine whether the staff is in danger of being exposed to excessive radiation.

X-ray Standardization and Dosimetry

Sub-standard dosimeters are kept by the laboratory and various X-ray dosimeters from outside bodies have been calibrated with the aid of a 200 KV machine.

MASS SPECTROMETRY

Determination of Geological Age

The geological age of uranium- and thorium-bearing minerals may be calculated from data obtained by a chemical analysis for lead, thorium and uranium, together with an isotopic analysis of the extracted lead. During the past year a mineralogist and an analytical

mineraloog en 'n skeikundige is hierdie metode toegepas.

Die eerste fase van 'n ondersoek na die geologiese ouderdom van uraniniet in die Witwatersrandsisteem is tans afgehandel. 'n Aantal uraninietkonsentrate en galena-lood is verkry van 'n gebied wat strek vanaf die Verre Oosrand tot by Klerksdorp. 'n Monster uit die Vrystaatse goudveld is ook by die reeks ingesluit. Die resultate wat tot dusver behaal is verleen steun aan die opvatting van Suid-Afrikaanse geoloë dat die uraan- en goudneerslae in die Witwatersrandsisteem primêr sedimentêr van aard is.

Ontledings vir ouderdomsbepaling is ook uitgevoer op minerale uit Gordonia (Kaapland), Rhokana (Rhodesië), Salem (Suidwes-Afrika), Miami (Rhodesië), Phalaborwa (Transvaal), en Pulau Attap (Maleise Skiereiland).

Vordering is gemaak met die opbou van die hoogs gevoelige massaspektrometer vir ouderdomsbepalings op minerale met lae konsentrasies van uraan. Daar word gehoop dat hierdie instrument binne die volgende ses maande gereed sal wees.

Toepassing van Massaspektrometriese Tegnieke

Die Departement van Landbou word bygestaan met 'n ondersoek in verband met die vermoë van natuurlike grasse om die humusgehalte van gronde te verhoog. Hierdie ondersoek sluit die bemesting van proefpersele met verrykte N-¹⁵ ammoniumsulfaat in, en die massaspektrometriese bepaling van die stikstof in die oes sowel as van die oorblywende stikstof in die grond. Hierdie ondersoek sal oor vier seisoene strek.

Boorgate in die omgewing van onderaardse olie bevat koolwaterstowwe en die konsentrasie van hoër koolwaterstowwe neem toe hoe nader die boorgat aan die oliebron geleë is. Koolwaterstofontleding van sulke gasse is dus van onskatbare waarde vir olieprospektering. In verband met 'n program vir olieprospektering is 'n aantal gasmonsters, ten behoeve van die Brandstofnavorsingsinstituut van Suid-Afrika, met behulp van 'n massaspektrometer, kwalitatief ontleed.

Heliumgas is 'n moontlike bestanddeel in gasse wat ontsnap by natuurlike warmwaterbronne. As gevolg van die industriële waarde van helium, is voorlopige massaspektrometriese ontledings gedoen op gasse van 'n paar warmwaterbronne in Transvaal. Tot dusver is geen noemenswaardige hoeveelhede helium gevind nie en die ondersoek is voorlopig gestaak.

Ten behoeve van die Geologiese Eenheid van die Raad op Atoomkrag word die isotoopverhouding van die koolstoflaag wat met die goud- en uraanneerslae van die Witwatersrand geassosieer is, bepaal. Gehoop word dat die massaspektrometriese ontledings sal aandui of die sogenaamde „Rand Carbon” van organiese of anorganiese oorsprong is. Hierdie inligting sal van groot waarde vir geoloë wees vir sover dit betrekking het met ander gegewens en teorieë in verband met die ontstaan van die goud- en uraanneerslae in die Witwatersrandsisteem.

chemist have been working in close collaboration with the laboratory on this project.

The first phase in a study of the geological age of uraninites from the Witwatersrand system has been completed. Uraninite concentrates and galena lead were obtained from several localities, covering the area from the Far East Rand to Klerksdorp and extending to the Free State goldfields. The samples were chosen to represent all of the main geological series of the system. The results obtained seem to support the views of South African geologists about the origin of the gold and uranium mineralization, viz., that it is primarily due to a sedimentary process.

Age determinations were also made on mineral samples from Gordonia (Cape Province), Rhokana (Rhodesia), Salem (South West Africa), Miami (Rhodesia), Phalaborwa (Transvaal), Pulau Attap (Malaya).

Progress has been made on the construction of a highly sensitive mass spectrometer for age analyses of minerals with low uranium content. It is hoped that this instrument will be in operation within the next six months.

Application of Mass Spectrometric Techniques

The Department of Agriculture is being assisted in an investigation concerning the ability of natural grasses to enhance the humus content of soils. The study includes the fertilization of experimental plots with N-¹⁵ enriched ammonium sulphate and mass spectrometric analyses of the nitrogen present in the harvested products as well as the nitrogen remaining in the soil. This work will be continued to cover at least four harvesting seasons.

Bore-holes in the vicinity of underground oil reservoirs emit gases which contain hydrocarbons, the relative proportion of higher hydrocarbons increasing with proximity to the oil. Hydrocarbon analyses on such gases are, therefore, very valuable in oil prospecting. A number of borehole gases have been qualitatively analyzed on the mass spectrometer on behalf of the Fuel Research Institute of South Africa in connection with their programme of oil prospecting.

The gases which escape from natural hot springs contain varying amounts of helium. In view of the growing importance of helium in industry, a few preliminary mass spectrometric analyses were carried out on gases from some of the hot springs in the Transvaal. Thus far no significant quantities of helium have been found and the investigation has been temporarily discontinued.

On behalf of the Geological Unit of the Atomic Energy Board, isotopic ratio analyses are being made of the carbon layer associated with the gold and uranium veins of the Witwatersrand system. It is hoped that these mass spectrometric analyses will indicate whether the "Rand carbon" is of organic or inorganic origin. The information will be of considerable importance to geologists and may have a direct bearing on theories relating to the origin of the gold and uranium deposits in the Witwatersrand system.



Bo: 'n Massaspektrometer met 'n 12 dm.-krommingstraal in aanbou in die N.F.L.
 Regs: Die mikroskopiese ondersoek van die oppervlakteverskynsels van 'n metaalmonster. Die elektronmikroskoop is op die agtergrond.

Komitee vir Geokronologie

Gedurende die jaar is 'n Nasionale Komitee vir Geokronologie gestig. Die doelstellings van hierdie komitee is om kennis te neem van ontwikkelinge op die gebied van geokronologie, nie alleen in Suid-Afrika nie maar ook in die buiteland, en om sover moontlik sulke ontwikkelinge te bevorder. Drie wetenskaplikes van die Nasionale Fisiese Laboratorium dien op hierdie komitee.

ELEKTRONMIKROSKOPIE

Elektronmikroskopiese Ondersoeke van Metale

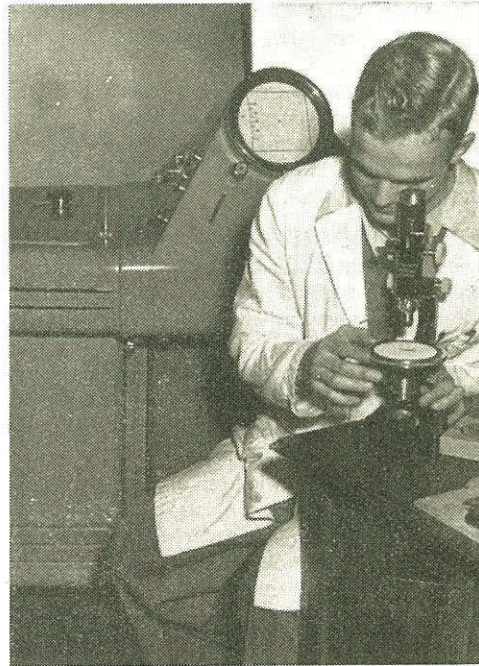
In sekere oorversadigde legerings kan verwag word dat uitskeiding by voorkeur sal plaasvind op dié plekke waar ontwigtings of groepe ontwigtings in die kristalrooster voorkom. Aangesien die uitskeidingsdeeltjies onder die elektronmikroskoop sigbaar is, is dit voor die hand liggend dat hulle mag dien as aanwysings vir die verspreiding van ontwigtings in metaalroosters. Om hierdie teorie op die proef te stel is waarnemings van korrelgrense, subkorrelgrense en afskuiwingspore in aluminium-koperlegerings gemaak. Uit 'n stelselmatige studie van die bevindings is vasgestel dat strukture voorkom wat in alle opsigte ooreenkom met dié wat teoreties uit die ontstaan van ontwigtings verwag kan word. Hierdie eksperimente skyn die eerste regstreekse bewys te lewer van die voorkoms van ontwigtings in metale.

Committee on Geochronology

During the year a South African National Committee on Geochronology was formed. The aims of this Committee are to take note of developments in the field of geochronology in this country and overseas and to further such developments wherever possible. Three scientists of the National Physical Laboratory are members of this Committee.

Below: The microscopic examination of the surface phenomena of a metallic specimen. The electron microscope is in the background.

Left: A 12 in. radius of curvative mass spectrometer under construction in the N.P.L.



ELECTRON MICROSCOPY

Electron Microscopical Investigations of Metals

In certain supersaturated alloys preferred precipitation is to be expected where dislocations or groups of dislocations are present in a crystal lattice. Since particles of the precipitate can be made visible under the electron microscope, it seems plausible that they might serve as indicators and reveal the distribution of dislocations in a metal lattice. In order to test this theory a number of observations on grain boundaries, sub-grain boundaries and slip traces were carried out on aluminium-copper alloys. A systematic study of the observations revealed structures which agreed in all respects with those predicted to arise as a result of dislocations. These observations seem to constitute the first direct evidence of the presence of dislocations in metals.

Roetine Elektronmikroskopiese Ondersoeke

Ten behoeve van buiteliggame is die deeltjie-grootte en vorm van 'n groot aantal monsters van rubber, klei, verf, ens., bepaal met die doel om hul bruikbaarheid in vervaardigingsprosesse vas te stel. In samewerking met Onderstepoort en verskeie mediese navorsingsinstitute is ondersoek op 'n groot aantal bakterie- en virus-monsters uitgevoer.

X-STRAALDIFFRAKSIE

Bepaling van Kristalstruktuur

In 'n poging om die ontstaan van metaal-tot-metaal-bande te probeer verklaar, is verdere werk op divalente metaalasetate onderneem. Die kristalstrukture van nikkel-, kobalt en sinkasetaat is volledig bepaal en daar is gevind dat hierdie drie soute normale strukture het wat geensins verwant is aan die strukture van chroom- en koper-asetaat nie. Dit is interessant om daarop te wys dat onafhanklike magnetiese waarnemings wat onlangs op laasgenoemde twee soute uitgevoer is, in alle opsigte die vroeëre X-straalgegevens bevestig. Ten einde die reeks te voltooi is etlike pogings aangewend om ysterasetaat te kristalliseer maar tot dusver het alle pogings misluk.

Onder: 'n X-straalspektrometer wat gebruik word vir 'n ondersoek van plastiese vervorming in metale.

Regs: Die ondersoek van die grofheid van 'n metaal-oppervlakte met behulp van 'n interferensie-mikroskoop.



In samewerking met die Nasionale Skeikundige Navorsingslaboratorium is die strukture van 'n groot aantal koolwaterstofverbindinge wat uit wolvette voor-

Routine Electron Microscopical Investigations

On behalf of outside organizations the particle size and shape of a large number of samples of rubber, clay, paint, etc., were determined in order to estimate their suitability in manufacturing processes. In conjunction with Onderstepoort and various medical research units, investigations on a large number of bacteria and viruses were made.



Above: The examination of the surface roughness of a metallic specimen with the aid of an interference microscope.

Left: An X-ray spectrometer used for an investigation of plastic deformation in metals.

X-RAY DIFFRACTION

Determination of Crystal Structures

Further work on divalent metal acetates was undertaken with the object of explaining the peculiar structures involving such unexpected features as direct metal-to-metal bonds. The structures of nickel, cobalt and zinc acetate were determined fully and it was shown that these three compounds have normal structures which are not in any way related to those determined for cupric and chromous acetate. It is interesting to note that recent independent magnetic measurements, carried out on the two last mentioned compounds, confirm the previously determined X-ray data. In order to complete the series several attempts were made to crystallize iron acetate, but so far all attempts have failed.

In collaboration with the National Chemical Research Laboratory, the structures of a large number of hydrocarbon compounds, prepared synthetically from wool

berei is, bepaal. Vir hierdie bepalings is metodes en tegnieke ontwikkel wat dit moontlik maak om op grond van sekere waarnemings van laagrefleksies, die aantal koolstofatome wat in hierdie langkettingverbindings voorkom, noukeurig vas te stel.

Invloed van Plastiesvervormde Metale op Diffraksiever-skynsels

Hierdie ondersoek is onderneem om plastiese ver-vorming by metale te bestudeer en om sulke verskynsels soos die verbreding van X-straaldiffraksielyne, wat ont-staan wanneer metale koudbewaterk word, in terme van die ontwrigtingsteorieë van metale te probeer ver-klar.

Vir hierdie doel is 'n gebuigde kristalmonokromator ontwerp en in werking gebring wat dit moontlik maak om alle waarnemings met suiwer monokromatiese straling uit te voer. Silwer is ondersoek en die koudbewaterk is aangebring deur die metaal te vyl. Omdat silwer selfs by kamertemperatuur vinnig herstel moes eksperimente ontwerp word om die silwer onder vloeibare suurstof te vyl en die waarnemings by -30°C . te maak. By hierdie temperatuur kan die herstelspoed verontagsaam word. Tot onlangs is dit algemeen aangeneem dat interne rooster-spannings, eerder as klein greintjies, verant-woordelik is vir die breë X-straaldiffraksielyne wat ont-staan wanneer metale koudbewaterk word. Alhoewel dit moeilik is om die afsonderlike bydraes van rooster-spannings en klein greintjies tot lynbreedte algeheel te skei, is daar tog in geslaag om metodes te ontwikkel waardeur die afsonderlike bydraes bevredigend bepaal kon word. In die geval van silwer is daar gevind dat klein greintjies (van die orde van $1/30\mu$) verantwoordelik is vir 'n aansienlike persentasie van die totale verbreding van die waargenome X-straaldiffraksielyne. Dergelike ondersoeke op ander metale word beplan en hopelik sal die koudbewerkte metaaloppervlakke mettertyd reg-streks ondersoek word.

Ontwikkeling en Toepassing van X-straalmetodes

Verbeteringe van monsterbereidingtegnieke, X-straal-intensiteitsmetinge en verbeteringe in die fokusserings-eienskappe van Geigerteller-spektrometers, het daartoe gelei dat betroubaarder en noukeuriger kwantitatiewe bepalinge met behulp van X-straalmetodes gedoen kon word.

In samewerking met die Brandstofnavorsingsinstituut is 'n uitgebreide ondersoek op Suid-Afrikaanse koolsoorte onderneem om 'n moontlike verhouding tussen die ver-brandingseienskappe van die koolsoorte en hulle chemiese samestelling te probeer vasstel. Dit is bewys dat die ver-naamste verbinding wat in oondslakke voorkom kal-sium-aluminiumsilikaat is en dat die betreklike hoë CaCO_3 -konsentrasie wat in sommige koolsoorte voor-komst, verantwoordelik mag wees vir die ontstaan van hierdie ongewenste oondslakke gedurende die verbran-dingsprosesse.

Ten behoeve van buiteliggame is talryke ondersoeke van 'n meer roetine aard onderneem ten einde onbekende

fats, have been determined. For this purpose methods and techniques have been developed whereby it is possible, from the measurements of basal plane reflections, to determine accurately the number of carbon atoms in these long chain compounds.

Influence of Plastically Deformed Metals on Diffraction Phenomena

This investigation was undertaken to study plastic deformation in metals and to explain such phenomena as X-ray diffraction line broadening, which occur when metals are cold-worked, in terms of the dislocation theories of metals.

For this purpose a curved crystal monochromator was designed and built. This has made it possible to carry out all observations with strictly monochromatic radiation. Metallic silver has been studied, the cold work being introduced by filing. Because of the rapid recovery of silver even at room temperature, experiments had to be devised whereby the silver was filed under liquid oxygen and the measurements on the filings were taken at -30°C . At this temperature the recovery rate is negligible. Until quite recently the general view was held that retained lattice strains, rather than small particles, were responsible for the broad X-ray diffraction lines obtained from cold-worked metals. Although it is difficult to separate completely the contribution of lattice strains and small particles, methods were developed whereby their separate contributions could be studied satisfactorily. In the case of silver it was shown that small particles (of the order $1/30\mu$) are responsible for a large percentage of the total X-ray-like broadening observed. The investigations are being extended to include other metals and it is hoped finally to make direct observations on the surfaces of cold worked specimens.

Development and Application of X-ray Methods

Improvements in sample preparation techniques, in measurements of X-ray intensities and in the focusing properties of Geiger counter spectrometers have led to more reliable and accurate determinations when using X-ray methods for quantitative investigations.

In conjunction with the Fuel Research Institute an extensive survey of South African coals was undertaken in an endeavour to correlate the burning properties of the coals with their chemical composition. It was shown that the chief constituent of furnace slags was a calcium-aluminium-silicate, and that the relatively high CaCO_3 -concentration of some of the coals may in some way be connected with the formation of such undesirable slags during the burning processes.

On behalf of outside organizations many investiga-tions of a more routine nature were undertaken to iden-tify unknown substances. These included such diverse investigations as a comparison of synthetic cements, a study of mine dusts for free silica content, an investiga-

monsters te identifiseer. Hierdie ondersoek het onder andere die volgende ingesluit : vergelyking van sinteties-voorbereide sementsoorte ; studie van mynstowwe vir kwartsgehalte ; bepaling van die eienskappe van vuur-vaste stowwe ; identifikasie van korrosieprodukte op metaaloppervlakte en van onsuiverhede op wolwesels ; bepaling van deeltjiegrootte in verfmonsters, van mineraal-konsentrasie in ertsmonsters, van die komponente in bemestingsprodukte, van die kristallyngraad van sekere plant- en kunsvessels en van greingrootte in korbied-monsters.

SPEKTROSKOPIE

Aluminiummonofluoried-spektrum

Die studie van hierdie spektrum is voortgesit en al die waargenome sisteme, behalwe een, is ontleed en die molekulkonstantes noukeurig bepaal. Die molekule se spektrum in die vakuultraviolet is ondersoek en twee verdere nuwe sisteme is waargeneem. 'n Studie van laasgenoemde het die berekening van 'n noukeurige dissoiasie-energie waarde van die molekule moontlik gemaak. Die gebruiklike waarde vir die dissoiasie-energie was tot dusver nog aan sterk twyfel onderhewig.

Spektra van Meeratomige Molekules

Die absorpsiespektra in die vakuultraviolet van 'n aantal kankerverwekkende organiese verbindings is ondersoek, met die doel om moontlike reëlmatighede bloot te lê. Vir hierdie ondersoek moes 'n hele aantal nuwe instrumente ontwikkel word. Tot dusver kon geen reëlmatighede vasgestel word nie.

Spekro-isotopiese Metode vir die Bepaling van Lood-isotoopverhoudings

Isotoopverhoudings van lood in radioaktiewe ertse kan aangewend word om die geologiese ouderdom van sulke ertse vas te stel. Vordering is gemaak met die spekro-isotopiese metode deur verhoging van die oplosvermoë van die etalon en die opbou van 'n versterker vir die fotovermenigvuldiger wat gebruik word om die relatiewe intensiteite van die isotooplyne te meet.

SPEKTROCHEMIE

Meganisme van Vonke en Boë

Terwyl gegewens oor die aangesteekte wisselstroomboog ingesamel is, is vasgestel dat die grootte van die kapasiteit wat nodig is om die lae spanningsgedeelte van die wisselstroomboog teen die hoë spanning van die tesla te beskerm, die karakter van die uitgestraalde spektra beïnvloed. Wanneer hierdie tipe ligbron vir ontledingsdoeleindes gebruik word, moet hierdie kapasiteit dus krities beheer word.

Direklesende Metodes

Die noukeurigheid van die spektrochemiese ontledingsmetode kan aansienlik verbeter word indien die fotografiese plaat deur die fotovermenigvuldigerbuis as fotosensitiewe elemente vervang word. Aangesien die gebruik van direklesende metodes van groot belang is in die nywerheid vir produksiekontrolle, is besluit om so 'n

tion of the properties of ceramic materials, identification of corrosion products on metal surfaces and of impurities scraped from wool fibres, determination of particle size in paint samples, the mineral concentration in various ore samples, the constituents of fertilizer products, the degree of crystallinity in certain plant and synthetic fibres, and of grain size in carbide specimens.

SPECTROSCOPY

Aluminium Monofluoride Spectrum

The study of this spectrum was continued and, with one exception, all the observed systems were analysed and the molecular constants determined. The vacuum ultraviolet spectrum of the molecule was investigated and two further new systems were observed, a study of which has made it possible to determine the dissociation energy of the molecule accurately. Hitherto, the accepted value of the energy of dissociation has been subject to doubt.

Spectra of Poly-atomic Molecules

The absorption spectra of some organic carcinogens were investigated in the vacuum ultraviolet in an attempt to reveal possible regularities in their spectra. For this study a number of new instruments had to be developed. No such regularities have so far been found.

Spectro-isotopic Method for the Determination of Lead Isotope Ratios

Isotope ratios of lead can be applied to determine the geological age of radioactive ores. Progress in the spectro-isotopic method was made by increasing the resolution of the etalon and by constructing an amplifier for the photo-multiplier which is used for measuring the relative intensities of the isotopic lines.

SPECTROCHEMISTRY

Mechanisms of Arcs and Discharges

While collecting data concerning the mechanism of the triggered alternating current arc, it was observed that the capacity, which protects the low tension circuit against the high tension generated by the tesla coil, affected the character of the radiated spectra. This means that, when this light source is used for analyses, the size of this blocking condenser must be critically controlled.

Direct Reading Methods

The accuracy of the spectrochemical method of analysis can be increased appreciably if the photographic plate is replaced by a photomultiplier tube as the photo-sensitive element. It was decided to investigate the possibilities of this new method, as the use of direct reading methods is of importance in industry for production control. An instrument designed for this purpose

instrument te bou. Die instrument nader nou voltooiing en sal binnekort in gebruik geneem word.

Spoorelementnavorsing

Om spoorelementnavorsing in Suid-Afrika te bevorder is 'n ooreenkoms met die Departement Landbou aangegaan waarvolgens die Raad verantwoordelikheid aanvaar vir die ontwikkeling van spektrochemiese ontledingsmetodes en die opleiding van die nodige personeel terwyl die roetine ontledings deur die Departement self behartig sal word. Deur bemiddeling van die Departement word 'n bedrag van £3,000 per jaar vir drie jaar vir hierdie doel beskikbaar gestel.

Die ontwikkeling van ontledingsmetodes vir die doeleindes van die ondersoek het bevredigend gevorder. 'n Vlamfotometriese metode vir die bepaling van Na, K en Ca is ontwikkel asook 'n metode vir die bepaling van die spoorelemente Co, Mo, Zn, Pb, V, Cr, Ni en S. Die resultate wat met behulp van die wisselstroomboogmetode, vir die bepaling van Al, Fe, Mn, Ba, Cu, B, P en Sr, verkry is, was nie so bevredigend nie en verdere navorsing sal in hierdie verband gedoen moet word.

Spektrochemiese Ontledings

Die nywerheid en ander organisasies het weer van die beskikbare fasiliteite van hierdie laboratorium gebruik gemaak. Gedurende die jaar is ongeveer 130 ontledings ten behoeve van sulke liggame uitgevoer, terwyl twee persone vir nywerheidsorganisasies opgelei is. Die ontledings wat gedoen is, het onder andere die volgende ingesluit: die bepaling van germanium in steenkool, palladium en ander metale in platinum, residuele elemente in suiwer aluminium en onsuiverhede in water.

Kwaliteit van Steenkool

In samewerking met die Brandstofnavorsingsinstituut van Suid-Afrika is 'n ondersoek onderneem om vas te stel of die kwaliteit van steenkool met behulp van spektrochemiese ontleding bepaal kan word. 'n Reeks monsters afkomstig van die mees belangrike steenkoolmyne in Suid-Afrika, is spektrochemies vir die volgende elemente ontleed: Ca, K, Na, Ti, Al, Fe, Cu, Mg, Si en P. Alhoewel sekere korrelasies verkry is, kon die kwaliteit van die steenkool nie van die metaalinhoud afgelei word nie.

Infrarooi-spektrometrie

'n Reeks veranderinge wat in die geheuesisteam van die laboratorium se infrarooi-spektrometer aangebring is, het die werking van die instrument aansienlik verbeter. Die elektroniese gedeelte daarvan is egter so onbetroubaar dat geen bevredigende ontledings met die instrument gedoen kan word nie en die vervanging daarvan word oorweeg.

OPTIKA

Daglig in Geboue

'n Studie van daglig in geboue met die doel om ontwerpsbeginsels vir optimum verligting te formuleer is van die uiterste belang. In samewerking met die Nasionale

is nearing completion and will shortly be put into operation.

Trace Element Research

In order to promote trace element research in South Africa, the Department of Agriculture has recently entered into an agreement with the Council by virtue of which the laboratory will undertake research in connection with the development of new methods of spectrographic analysis and be responsible for the training of technologists, while the routine analysis will be undertaken by the Department. For this purpose the sum of £3,000 p.a. for a period of three years is being made available to the Council.

The development of analytical methods in connection with this project is progressing satisfactorily. A flame photometric method has been developed for the determination of Na, K and Ca and development of methods for the determination of the trace elements Co, Mo, Zn, Pb, V, Cr, Ni and S have been completed. The analytic results for Al, Fe, Mn, Ba, Cu, B, P and Sr, using the a.c. arc method, have been less satisfactory and further research in this connection is at present being undertaken.

Spectrochemical Analyses

During the past year industry and other organizations made extensive use of the facilities available in the laboratory. About 130 analyses were carried out and two technologists were trained for outside organizations. The analyses have included the determination of germanium in coal, palladium and other metals in platinum, residual elements in pure aluminium and impurities in water, etc.

Quality of Coal

In collaboration with the Fuel Research Institute of South Africa the possibility of determining the quality of coal from its chemical composition, was investigated. A number of samples, coming from the most important coal mines in South Africa, were analysed spectrochemically for Ca, K, Na, Ti, Al, Fe, Cu, Mg, Si and P. The results indicated certain correlations, but were found to be too inconclusive for the general quality determination of coal.

Infra-red Spectrometry

A series of modifications to the memory system of the laboratory's infra-red spectrometer has considerably improved its operating characteristics. The electronic control unit is, however, so unreliable that it is impossible to carry out satisfactory investigations with this instrument, and its replacement is under consideration.

OPTICS

Daylight in Buildings

In order to formulate design principles for optimum light conditions in buildings, it is of paramount importance to study the distribution of daylight in buildings.

Bounavorsingsinstituut is 'n kunsmatige hemelruim ontwerp en gebou. Binnekort sal 'n aanvang gemaak word met die studie van die ligeienskappe in geboue deur gebruik te maak van geboumodelle. Spesiale miniatuur-fotoselle is reeds vir hierdie doel ontwerp.

Fotometriese Standaarde

Fotoëlektriese metodes word tans ontwikkel om die huidige visuele metodes aan te vul vir die standaardisasie van lampe. Eersgenomde is nie alleen noukeuriger nie, maar bied die verdere voordeel dat die standaardisasie met minder personeel behartig kan word.

Soos in die verlede is 'n aantal standaardlampe aan die Suid-Afrikaanse Buro vir Standaarde en sekere nywerhede uitgereik. 'n Nuwe stel standaardlampe vir gebruik in hierdie laboratorium word tans deur die Nasionale Fisiese Laboratorium te Teddington geëyk.

Lensontwerp

'n Kleurkopieerlens met 'n groot opening en gekorrigeer vir byna alle aberrasies is ontwerp en vervaardig vir die Filmdiens van die Unie van Suid-Afrika. Afdrukke wat met hierdie lens gekopieer is, het dieselfde definisie gegee as afdrukke wat met die kontakmetode verkry is.

'n Tydbesparende metode, waarvolgens brekingsindekse van optiese glas voldoende noukeurig bepaal kan word vir lensontwerp-doeleindes, is ontwikkel. Die noukeurigheid van hierdie metode kan verhoog word deur die vervanging van die kollimator en teleskoop-lense van die spektrometer deur beter gekorrigeerde lense.

In collaboration with the National Building Research Institute an artificial sky was designed and constructed. In the near future a start will be made with a study of the distribution of light in building models. For this purpose special miniature photocells have been designed.

Photometric Standards

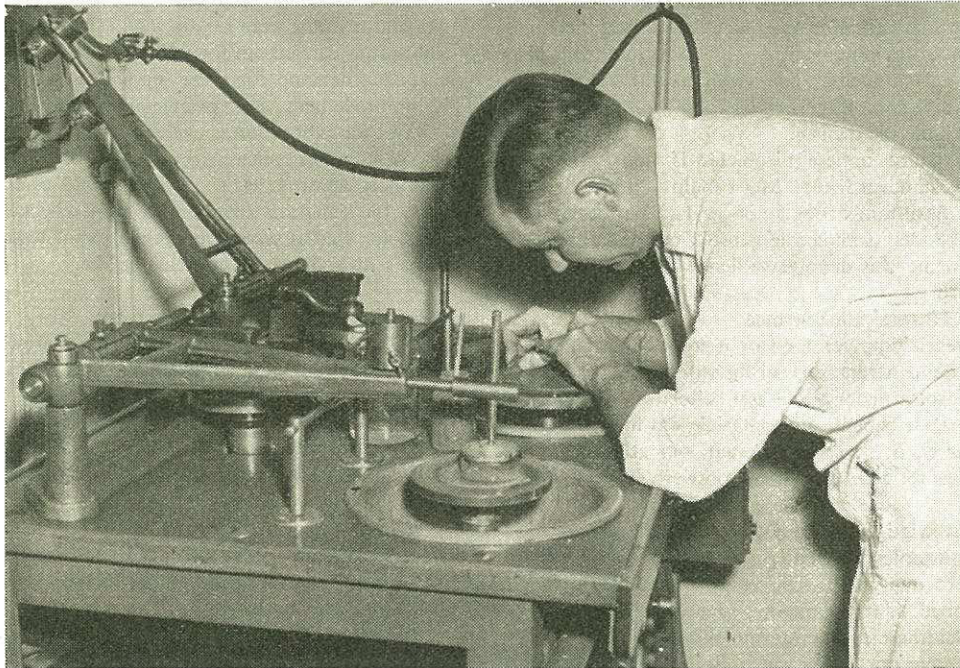
To supplement the existing visual methods of standardization of lamps, photo-electric methods are now being developed. Not only are the latter more accurate, but they offer the additional advantage that the standardizations can be carried out with less staff.

As in the past, a number of standard lamps were issued to the South African Bureau of Standards and to certain industrial concerns. A new set of standard lamps for this laboratory is at present being calibrated by the National Physical Laboratory, Teddington.

Lens Design

A colour copying lens with large aperture, corrected for nearly all aberrations, was designed and manufactured for the Film Service of the Union of South Africa. Using this lens, prints with the same definition as those obtained by contact printing could be made.

A time saving method, giving data of the required accuracy for lens design purposes, was developed for the determination of the refractive indices of optical glass. The accuracy of the method can be increased by replacing the collimator and telescope lenses of the spectrometer by more highly corrected lenses.



Polering van hoë gehalte-lense in die optika-werkplaas van die N.F.L.

Polishing of high quality lenses in the N.P.L. optics' workshop.

Foto-elektriese Elemente

Die spektrometriometer wat in die laboratorium ontwerp en gebou is, het dit moontlik gemaak om die meting van spektrale verdeling, wat gewoonlik tot die sigbare gebied beperk word, tot die ultravioletgebied uit te brei.

Met behulp van 'n vloeistoffilter is die spektrale gevoeligheid van 'n KMV-6-fotobuis gelyk aan dié van die gemiddelde oog gemaak. Hierdie eenheid is ten behoeve van die Suid-Afrikaanse Buro vir Standaarde ontwikkel. Verder is 'n lineêriteitstoetsers voltooi en suksesvol toegepas in die yking van G. E.-fotometers.

Ander Dienste

Die optiese werkplaas het waardevolle dienste aan die nywerheid en ander navorsingsinrigtings verleen. Gedurende die jaar is onder andere 'n Goëtz Artar-lens oorgepoleer en kwarts- en glaslense, optiese plattes, spieëls, glasplate, filters, prisma's en lensproefoppervlakke vervaardig.

HITTE

Standaarde van Temperatuur

Die daarstelling van primêre temperatuur-standaarde is verder gevoer. Twee drievoudpunt van waterselle is in die laboratorium vervaardig om die nulpunt op die internasionale temperatuurskaal noukeurig te bepaal. Hulle is vergelyk met 'n sel wat in Engeland vervaardig en by die National Physical Laboratory te Teddington geïk is.

Weerstandtermometers wat as primêre meetinstrumente oor 'n groot gedeelte van die temperatuurskaal gebruik word, is herkalibreer. Die behoefte aan die verbetering en uitbreiding van die laboratorium se kalibreergeriewe is duidelik. Die groot aantal kalibrasies wat vir buiteliggame uitgevoer is, toon die toenemende behoefte aan hierdie dienste.

Die standaard optiese pirometer is noukeurig tot 1,500° C. gestandaardiseer. Met behulp van hierdie instrument is Wolfram-strooklampe geïk. Hierdie lampe word as sekondêre standaarde gebruik by die kalibrasie van instrumente wat deur verskillende buiteliggame ingestuur word.

Meting van Hittegeleidingsvermoë

Die hittegeleidingsvermoë van 'n groot aantal materiale wat in Suid-Afrika vervaardig word, soos plastiese stowwe en isoleermateriale, is ten behoeve van verskillende nywerhede bepaal. Vir materiale wat in plaatvorm verkrygbaar is, is 'n nuwe apparaat, om geleidingsvermoëbepalings tot 500° C. te doen, ontwerp en word tans vervaardig.

'n Onewewigtige metode vir die bepaling van die termiese konstantes van materiale soos rots en plastiese stowwe word ondersoek. Die voordeel van die metode lê in die spoed waarmee metings uitgevoer kan word.

Die geleidingseienskappe van Wondersteen, 'n rots van sedimentêre oorsprong wat in Suid-Afrika voorkom word tans intensief ondersoek. Die mineraal wat groot, toepassings vind in die nywerheid het anisotropiese ge-

Photo-electric Elements

The spectro-radiometer designed and built in the laboratory has made it possible for spectral distribution measurements, which are usually restricted to the visible region, to be extended to the ultra-violet region.

Using a liquid filter the relative spectral sensitivity of a KMV-6 phototube was altered to correspond to that of the average eye. This unit was developed for the South African Bureau of Standards. The linearity test apparatus was completed and used with success for calibrating G.E. photometers.

Other Services

The optical workshop has rendered valuable service to industrial and other research organizations. During the year under review a Goëtz Artar lens was repolished and glass and quartz lenses, optical flats, mirrors, glass plates, filters, prisms, and lens test plates were manufactured.

HEAT

Standards of Temperature

Further work was done towards the establishment of primary temperature standards. Two cells for the triple point of water were made in the laboratory for the accurate fixing of the zero point on the International Temperature Scale. They were compared with a cell that was made in England and calibrated at the National Physical Laboratory, Teddington.

The resistance thermometers which are used as the primary measuring instruments over a large range of the temperature scale were recalibrated. The large number of calibrations carried out for outside concerns indicates an increasing demand for these services, and the need for the improvement and extension of the laboratory's facilities for calibration is evident.

The standard optical pyrometer has been standardized accurately up to 1,500°C. With the aid of this instrument, the tungsten strip lamps were checked. These lamps are used as secondary standards for testing instruments sent in by various outside bodies.

Measurement of Thermal Conductivity

On behalf of various industries, the thermal conductivity of a large number of materials such as plastics and insulation materials of South African manufacture was determined. For materials available in slab form, a new apparatus for the measurement of conductivity up to 500°C. has been designed and is now under construction.

A transient method for determining the thermal constants of materials such as rocks and plastics is being investigated. The advantage of this method is the rapidity with which measurements can be made.

The thermal properties of a rock of sedimentary origin, known in South Africa as Wonderstone, are being investigated. This stone which has many industrial and other uses shows anisotropic thermal conductivity

leidingseienskappe en 'n poging word aangewend om die verband tussen die mineraalsamestelling en die geleidingsvermoë te bepaal.

Algemeen

Ten behoeve van ander W.N.N.R.—navorsingsinrigtings en buiteliggame is 'n groot aantal roetinetoetse uitgevoer om die soortlike warmte en die stralingsvermoë van oppervlakke te bepaal.

GEOFISIKA

Magnetisering van Rotse

Met die doel om lig te werp op die aarde se vroeëre magnetiese geskiedenis, is die studie van die magnetiese eienskappe van rotse, afkomstig uit ondergrondse myngange, voortgesit. Ongeveer 250 georiënteerde monsters is uit gange van vier diep myne op die Rand gehaal.

Voordat magnetiese intensiteitsmetinge op hierdie swak gemagnetiseerde ondergrondse monsters uitgevoer kon word, moes die sensitiwiteit van die bestaande beskikbare magnetometer verhoog word. Intensiteitsbepalings op monsters uit twee van die myne is reeds voltooi en dit is gevind dat die magnetiseringsrigtings van hierdie monsters besonder konsekwent is. Hierdie bevinding is beslis nie in ooreenstemming met die teorie van 'n dipoolveld wat langs die as gerig is nie, en dit is moontlik dat hierdie resultate veel daartoe mag bydra om te bewys dat die aarde se veld omgeswaai het van 'n teenoorgestelde na die huidige normale rigting. Die ondersoek sal nog aansienlik uitgebrei moet word alvorens finale gevolgtrekkings gemaak kan word.

Hittevloei in die Aardkors

Bestaande gegewens aangaande die vloei van hitte in die aardkors, wat gebaseer is op temperatuurbepalings in boorgate in die Transvaal en die Vrystaat, is verder aangevul deur temperatuurmetings in vier diep boorgate in die suidelike Karoo. Hierdie temperatuurmetings, tesame met geleidingsvermoëbepalings wat tans uitgevoer word op die boorgatkerne, sal dit moontlik maak om die opwaartse vloei van hitte deur die aardkors op hierdie vier plekke noukeurig te bereken.

Seismiese Opnames

Die kortafstand seismiese apparaat, wat ontwikkel is om ondergrondse rotsstrukture mee vas te stel, is weereens met sukses aangewend gedurende opnames by die bouterrein van 'n voorgestelde elektrisiteitsverspreidingsstasie. Hierdie werk is onderneem ten behoeve van 'n groot nywerheidsorganisasie.

FISIKA VAN MATERIE

Massastandaarde

Verbeterings aan die mikroweegskaal was so geslaagd, dat tien opeenvolgende vergelykings van twee vyfgramgewigte afwykings van die gemiddelde toon wat nie groter as $1\frac{1}{2}$ mikrogram is nie. Die werking van die weegskaal is egter nog onreëlmatig en verdere verbeterings sal aangebring moet word om die gewenste noukeurigheid by een mikrogram of minder, te verkry.

Die primêre standaard kilogramgewig is nog nie uit Engeland ontvang nie. Toetse wat deur die Nasionale

and an attempt is being made to correlate the conductivity with its mineral composition.

General

On behalf of other C.S.I.R. laboratories and outside bodies a number of tests have been carried out to determine specific heat of materials and emissivity of surfaces.

GEOPHYSICS

Magnetization of Rocks

In an effort to throw light on the earlier history of the earth's magnetic field, further work was done on the magnetic properties of rock samples taken from dykes in mines. For this purpose approximately 250 magnetically oriented samples were secured from four deep mines on the Rand.

The sensitivity of the existing magnetometer had to be increased before intensity measurements on these weakly magnetized samples could be undertaken. Measurements on samples taken from two of the four mines have already been completed and it was found that the direction of magnetization in these samples was remarkably consistent. This result is not in agreement with the theory of a dipole field directed along the axis. It is possible that these observations may help to show that the earth's field has reversed its direction. Considerable extensions to this investigation are, however, envisaged before a final answer to this question can be given.

Heat Flow in the Earth's Crust

Existing data regarding the flow of heat in the earth's crust derived from temperature measurements in the Transvaal and the Orange Free State have been further augmented by temperature measurements in four deep boreholes in the Southern Karoo. These measurements, together with thermal conductivity measurements which are at present being carried out on the borehole cores, will make it possible to calculate accurately the upward flow of heat in the earth's crust at these four places.

Seismic Investigations

The short-range seismic apparatus, developed for the purpose of exploring rock structures underground, has been used with success during a survey of the proposed site for an electricity distribution station. This survey was undertaken on behalf of a large industrial concern.

PHYSICS OF MATTER

Standards of Mass

Work on the modified microbalance has reached the stage that, when comparing two five gram weights, the variation in values obtained in ten successive comparisons is not greater than $1\frac{1}{2}$ microgram and the mean of the ten values has an accuracy of better than one microgram. However, the performance of the balance is erratic and further work is necessary to reach the desired accuracy of comparison.

The primary standard kilogram weight and its four

Fisiese Laboratorium te Teddington op hierdie standaard uitgevoer is, was egter hoogs bevredigend.

Lengtestandaarde

Die lengtestandaarde is in stand gehou en in talryke aanwendinge is die golflengte-komparator gebruik vir die standaardisering van maatblokke.

Drukstandaarde

Die primêre standaardbarometer met sy bybehorende druktenk is in werking geneem. Drukbepalings in die tenk kan met 'n noukeurigheid van 0.001 cm. gedoen word, wat vyf keer beter is as bepalings met 'n gewone kommersiële kwikbarometer.

Snelheid van Windvlae

Deur middel van versnellingsmeters, wat in vliegtuie van die Suid-Afrikaanse Lugmag en die Suid-Afrikaanse Lugdiens aangebring is, is gegewens oor windsnelhede vir ongeveer 600 vliegre versamel. 'n Stelselmatige ontleding van hierdie gegewens sal teen die einde van volgende jaar voltooi wees. Die verwagting is dat hierdie ondersoek 'n aanduiding sal gee van nie alleen die frekwensie waarmee windvlae oor die belangrikste Suid-Afrikaanse lugroetes voorkom nie, maar ook van dié streke waar lugsteuringe verwag kan word.

Ontwikkeling van Foto-elastiese Metodes

'n Fotografiese metode is ontwikkel om isokliniese lyne in 'n model onder spanning voor te stel. Die suksesvolle aanwending van hierdie metode sal nie alleen 'n groot tydbesparing teweegbring nie, maar die berekening van spannings sal ook met groter noukeurigheid uitgevoer kan word.

'n Reeks ontledings is uitgevoer om die spanningsverspreiding in die nabyheid van holtes van verskillende vorms vas te stel. Hierdie ondersoek staan in verband met 'n uitgebreide studie oor rotsstorting.

Meganika van die Aksie van die Baarmoeder

Meer as 500 potensiaalpatrone wat tydens die baarperiode waargeneem is, is statisties ontleed. Hierdie ontledings, tesame met eksperimentele ondersoek op baarmoeders, het veel bygedra tot ons kennis van die spierkragte wat in verskillende dele van die baarmoeder ontwikkel word.

AKOESTIEK

Die nuwe gebou vir akoestiese navorsing is onlangs voltooi en is reeds betrek.

Akoestiese Eienskappe van Boumateriaal

Ten behoeve van Suid-Afrikaanse vervaardigers is 'n aantal klankabsorpsiemetings op akoestiese monsters uitgevoer met behulp van 'n metode waarin die impedansiebuis gebruik word. In die nuwe gebou se weerkaatsingskamer sal dit moontlik wees om groot panele direk te ondersoek en om die resultate wat op hierdie wyse verkry word, te vergelyk met dié van die impedansiebuis.

Verstaanbaarheid van Spraak

Aangesien die akoestiese ontwerp van auditoria saamhang met 'n hele aantal faktore, is studies wat in verband hiermee staan in die laboratorium onderneem.

copies have not yet arrived from England but interim tests on the weights at the British National Physical Laboratory have been satisfactory.

Standards of Length

Length standards were maintained and in several applications the wavelength comparator was used in the standardization of gauge blocks.

Standards of Pressure

The pressure tank for use in conjunction with the primary standard barometer has been put into commission. Pressures in the tank can be measured with an accuracy of 0.001 cm. which is five times the ultimate accuracy of the normal commercial mercury barometer.

Velocity of Air Gusts

A year's work with accelerometers carried on aircraft of both the S.A. Air Force and the S.A. Airways has resulted in nearly 600 hours of records now being available. By the end of the next working year it should be possible to make a systematic analysis of the frequency of occurrence of gusts on South African air routes, and to indicate which sections of the routes are most liable to air turbulence.

Development of Photoelastic Methods

Work has been done on developing a photographic method of presenting the isoclinic lines of a stressed model. If the method can be perfected, it will shorten the time taken for a stress study and will increase the accuracy of computation.

A series of studies of the stress distributions around cavities of different shapes was made as a contribution to an engineering study of the cause of rock bursts in mines.

Mechanics of Uterus Action

A statistical analysis of over 500 recordings of potential patterns associated with the uterus during labour has been made. Two laboratory studies of uteri have been made and considerable light has been thrown upon the problem of the relationship between the muscular forces being developed in different parts of the uterus during labour.

ACOUSTICS

The new building for acoustic research has recently been completed and occupied.

Acoustic Properties of Building Materials

On behalf of South African manufacturers a number of sound absorption measurements have been carried out on samples of acoustic materials using impedance tube methods. In the reverberation room of the new building it will be possible to test directly large panels and to compare the results obtained in this way with those of the impedance tube.

Intelligibility of Speech

Since the acoustical design of auditoria depends on a number of factors, studies related thereto have been undertaken in the laboratory. To measure intelligibility

Om verstaanbaarheid te meet word 'n standaardmetode gebruik wat aanvanklik in die Verenigde State van Amerika ontwikkel is. Die metode berus daarop dat 'n lys van sorgvuldig uitgesoekte woorde van 'n aantal waarnemers voorgelees word in die ouditorium of oor die luidsprekersisteesem of telefoonverbinding, wat getoets moet word. Die persentasie woorde wat deur die waarnemers reg verstaan word, word geneem as maatstaf vir verstaanbaarheid van spraak in die betrokke geval. Standaardwoordelyste spesiaal geskik vir Suid-Afrikaanse toestande is in Engels en Afrikaans opgestel, en is deeglik onder laboratoriumtoestande getoets. Die lyste moet nog onder veldtoestande uitgetoets word.



*'n Ondersoek van die verstaanbaarheid van spraak in die weerklankvrye kamer.
An investigation of the intelligibility of speech in the anechoic chamber.*

Een van die faktore wat die verstaanbaarheid van spraak beïnvloed is die aanwesigheid van vertraagde weerkaatsings. Om hierdie faktor te bestudeer word 'n apparaat opgebou wat geskik sal wees om die vertragsperiode en die intensiteit van 'n kunsmatige eggo te beheer. 'n Apparaat wat die aanwesigheid van 'n eggo in 'n saal sal vasstel, is in aanbou. Die apparaat berus daarop dat dit klankenergie oor vooruitgekose tydperiodes integreer.

Tydens die ontwerpstadium van 'n ouditorium het die gebruik van modelle baie nuttig geblyk te wees. Voorlopige pogings om die metode wat vanweë onvoldoende geriewe in die tydelike huisvesting gestaak is, toe te pas, sal in die nuwe gebou hervat word.

a standard method, first developed in the United States, is used. A list of carefully selected words is read to a number of observers in the auditorium or over the loud-speaker system or telephone line being tested. The percentage of words which is correctly understood by the observers is taken as a measure of the intelligibility of speech for the relevant case. Standard word lists for use under South African conditions were prepared in English and in Afrikaans and thoroughly tested in the laboratory. The lists have still to be tested under field conditions.

One of the factors which influence the intelligibility of speech is the presence of delayed echoes. In order to be able to study this factor an apparatus is being built to make it possible to control both the intensity and the delay time of an artificial echo. An apparatus which will detect the presence of echoes in an auditorium by integrating the sound energy over preselected time intervals is being built.

During the design stage of an auditorium, the use of models has proved to be very useful. Work on the application of this method, previously abandoned because of inadequate facilities in the temporary quarters, will be resumed.

Acoustics of Buildings

In co-operation with the architects concerned, a number of auditoria have been designed, including two university great halls, a number of churches and some general purpose halls. Advice was also given in the planning of the Trans-Oranje School for the Deaf, while the laboratory has acted as consultant to the S.A.B.C. in the building of its new studios in Cape Town.

It was also consulted on the design of a loudspeaker system for the new airport being built at Port Elizabeth. In addition tests have been carried out in a number of halls as for instance the Feather Market Hall in Port Elizabeth and the House of Parliament in Cape Town, with the object of improving their acoustics. The investigation on the mechanical recording of court proceedings was concluded with a report and recommendations to the Department of Justice.

Noise and Vibration

Noise surveys were carried out on behalf of two outside bodies and as a result recommendations for noise abatement were made. Architects were advised on the elimination of noise in air-conditioning systems. A vibration analysis was carried out for the Electricity Supply Commission on one of its high tension transmission lines.

Mechanical Properties of Materials

Equipment which was developed for rapid testing of the elastic properties of concrete, has been used on rock samples. In this connection the Mechanical Engineering Research Unit is being assisted in its investigations on rockbursts, and equipment is being developed for determining by sonic methods the extent to which the walls of an underground excavation are fractured.

Akoestiek van Geboue

In samewerking met argitekte is 'n hele aantal ouditoria beplan. Voorbeelde hiervan sluit twee universiteite, 'n aantal kerke en etlike sale vir algemene doeleindes in. Advies is ook gegee met die beplanning van die Trans-oranje Skool vir Doves, terwyl die S.A.U.K. met raad bygestaan is tydens die oprigting van laasgenoemde se nuwe ateljees in Kaapstad.

Die laboratorium is ook geraadpleeg tydens die ontwerp van 'n luidsprekersisteam in die nuwe lughawegebou wat tans in Port Elizabeth gebou word. Verder is toetse uitgevoer op 'n aantal sale, soos byvoorbeeld die Vere-marksaal in Port Elizabeth en die Parlementsuis in Kaapstad, met die doel om die akoestiese eienskappe daarvan te probeer verbeter. 'n Ondersoek in verband met die meganiese opname van hofverrigtinge is met 'n verslag en aanbevelings aan die Departement van Justisie afgesluit.

Geraas en Vibrasie

Opnames van geraas en aanbevelings in verband met die demping daarvan, is ten behoeve van twee buite-liggame gedoen en argitekte is met raad bedien in verband met die uitskakeling van lawaai in lugreëlinsinstallasies. Vibrasieopnames is vir die Elektrisiteitsvoorsieningskommissie op een van hulle hoogspanningstoeverlyne uitgevoer.

Meganiese Eienskappe van Materie

Apparaat wat ontwikkel is om die elastiese eienskappe van beton te toets, is ook vir rotsmonsters gebruik. In hierdie verband word die Navorsingseenheid Werktuigkundige Ingenieurswese bygestaan met ondersoeke in verband met rotsstortings, en 'n apparaat word ontwikkel om, deur die aanwending van soniese metodes, die mate waarin 'n rotswand gekraak is, te bepaal.

ELEKTROTEGNOLOGIE

Standaardisasie

Die verwysingstandaarde van spanning en weerstand is in stand gehou deur gebruik te maak van die normale ykingsroetine waarvolgens afsonderlike eenhede van 'n groep met die ander vergelyk word. Vir die groep van 23 Weston normaalselle en ook vir die groep van 6 Thomas weerstande het sodanige vergelyking getoon dat, ten opsigte van die gemiddelde van die groep, geeneen van die groep met meer as 3 dele per miljoen verander het nie.

Hoogstroom-weerstande

By hoë stroom standaardisasie is dit belangrik dat weerstande gebruik word wat onafhanklik van die stroom is. Hiervoor is dit nodig dat die weerstande se temperatuur konstant kan gehou word. 'n Aantal standaardweerstande met 'n hoë stroomkapasiteit is ontwerp en is voorsien van ingeboude verkoelings- en verwarming-sisteme vir temperatuurbeheer.

Wyserinstrumente

Die noukeurige elektrodinamometer-standaard en die gelykstroom wisselstroom oordraginstrument, wat in

ELECTROTECHNOLOGY

Standardization

The reference standards of voltage and resistance have been maintained using the normal procedure of inter-comparing the members of the group forming the standard. In the case of both the 23 Weston normal cells and of the 6 Thomas-type resistors, these inter-comparisons show that no member of the group has changed relative to the average by more than 3 parts per million.

High Current Shunts

In calibrating resistances which carry high currents it is important that the standard shall have a resistance value which is independent of the current it is carrying. To this end the standard should be so constructed that the heat generated by the highest current it is designed to carry, will be dissipated with a negligible temperature rise. Such standards have been designed and constructed.

Pointer Instruments

The precision electro-dynamometer standard and AC/DC transfer instrument designed and built in this laboratory is now in regular use. A paper describing the instrument has appeared in the *Journal of the Institute of Electrical Engineers* (London).

Calibration of Instruments

During the year a large number of standard cells, fixed and variable resistors, potentiometers, volt-ratio boxes, bridges and pointer instruments have been calibrated.

Magnetic Properties

The permeameter which was under construction in this laboratory in accordance with the National Bureau of Standards design, has been completed.

An investigation into the mutual effect in ferromagnetic materials of magnetomotive forces at right angles to each other has begun.

Vacuum Tube Construction

Two special tubes have been built for investigating the fluorescence of organic materials in the vacuum-ultraviolet region. A double thyratron tube was built to study the effects of a strong magnetic field on the plasma in a narrow tube. A tungsten filament diode and a simple magnetron are being constructed for one of the universities.

Servomechanisms

During the year the following problems were presented to the laboratory for solution: speedcontrol of a whirling arm for the calibration of air-speed instruments; constant power supply and constant temperature of the hot plate and guard ring in a thermal conductivity apparatus; voltage regulator for a 12 volt D.C. supply; pulp density control; a constant current supply for spectroscopic arcs, and an improved model of an automatic weighing machine in a chemical plant.

hierdie laboratorium ontwerp en gebou is, word nou gereeld gebruik. 'n Beskrywing daarvan het in die *Journal of the Institute of Electrical Engineers* (London) verskyn.

Yking van Instrumente

Gedurende die jaar is 'n groot aantal standaardselle, standaard- en ander weerstande, potensiometers, spanningsdelers, brûe en wyserinstrumente geyk.

Magnetiese Eienskappe

Die permeameter, wat volgens die Amerikaanse Nasionale Buro vir Standaarde-ontwerp in aanbou was, is voltooi. 'n Begin is gemaak om die wederkerige invloed van magnetiese velde wat reghoekig op mekaar gerig is in ferromagnetiese materiaal te ondersoek.

Vervaardiging van Vakuumbuise

Om die fluoresensie-eienskappe van organiese materiaal in die vakuultraviolet te ondersoek, is twee spesiale buise gebou. 'n Dubbele tiratronbuis is gebou om die uitwerking van sterk magnetiese velde op die plasma in 'n nou buis te bestudeer. 'n Wolframgloeidraaddiode en 'n eenvoudige magnetron word vir een van die universiteite vervaardig.

Servomeganismes

Die volgende probleme is gedurende die jaar aan hierdie onderafdeling vir oplossing voorgelê: spoedbeheer van 'n draai-arm vir die yking van lugspoed-instrumente; beheer van spanningstoevoer en konstante temperatuur van warmplaat in termiese geleidingsapparaat; spanningsbeheer vir 'n 12-volt gelykstroombron; digtheidsbeheer van steenkoolpap; beheer van die stroomtoevoer vir spektroskopiese boë; en ontwerp van apparaat vir die outomatiese weeg in 'n chemiese nywerheid.

Instrumentasie

Om fotografiese plate by spektrochemiese ontledings uit te skakel, en sodoende die proses te bespoedig, is elektroniese stroombane vir 'n direklesende spektrograaf ontwerp. In die toerusting val die spektraallyne wat waargeneem moet word op fotovermenigvuldigerbuise wat elk 'n kondensator laai. Die spektraallyne se intensiteitsverhouding word weergegee deur die spanningsverhoudings op die kondensatore. Die spannings op die kondensatore word gemeet met behulp van twee verskillende stroombane. Indien die resultaat op registreerders waargeneem word, moet die meetnaukeurigheid van die stroombaan slegs 0.3—0.5% wees. Met behulp van 'n alternatiewe terugkoppel-stroombaan waarin die waarnemings op 'n wyserplaat geskied wat direk aan die servomotor-sisteem gekoppel is, word 'n noukeurigheid van 0.1% verkry.

Met die doel om die beligting van fotografiese plate te beheer, is 'n integrerende fotometer vir 'n sterrewag ontwerp met behulp waarvan die totale hoeveelheid lig wat van die ster ontvang word in relatiewe eenhede gemeet kan word. Dit sal daartoe bydra dat die verskuiwing van spektraallyne meer noukeurig bepaal word sodat die



Toerusting vir die vervaardiging van spesiale vakuumbuise in die Onderafdeling Elektronika.

Equipment for the manufacture of special-purpose vacuum tubes in the N.P.L. Electronics Sub-division.

Instrumentation

For eliminating the photographic plate in spectrochemical analysis and thus speeding up the process, electronic circuits for a direct-reading spectrograph have been designed. In this apparatus the spectral lines being observed, fall on photomultiplier tubes each of which charges a condenser. The ratio of the intensities of the spectral lines is given by the ratio of the voltages on the condensers, these voltages being measured by two separate circuits. If the ratio is read on a recording instrument, the error of the measuring circuits may be as much as 0.3-0.5%. By means of an alternative feedback circuit whereby the values are read directly on a dial coupled to the servomotor system, an error as small as 0.1% is attained.

An integrating photometer has been designed for an observatory with the object of controlling the exposure of photographic plates. By its aid the total amount of light received from the star can be measured in relative units. This will make possible a more accurate determination of spectral line shift and consequently of the radial velocities to stars

straalspoed van sterre in die Suidelike halfgrond noukeuriger berekenbaar sal wees.

In 'n saadteller, wat vir 'n landbouorganisasie opgebou is, moes kleiner wysing op 'n vorige ontwerp aanbring word sodat die instrument groter saadkorrels kan tel.

WISKUNDE

Meerveranderlike Funksies

'n Begin is gemaak met basiese navorsing oor meerveranderlike funksies in die wiskunde. Veral daardie funksies wat van belang is vir die kansleer is ondersoek bv. hipergeometriese funksies in meerveranderlikes, die multi-nominaal en ander diskrete funksies.

Statistiese Ontledings

In samewerking met die Navorsingseenheid Werktuigkundige Ingenieurswese is statistiese ontledings uitgevoer van gegewens oor rotsstortings. Onder andere is 'n studie voltooi van die verspreiding van stortings vir verskillende jare, vir die seisoene van 'n jaar asook van die invloed van ontploffingstyd.

Ten behoeve van 'n Regeringskommissie is hulp en leiding gegee om ontledings van bevolkingsyfers ten opsigte van huistaal, offisiële taal en inkomstegroepe te maak. Hierdie omvattende bevolkingstudie is nou voltooi, maar die kommissie word egter nog met raad bedien aangaande die toepassing van die bevindings.

A seed counter built for an agricultural institution involved minor modifications of a previous design to make the counting of larger seeds possible.

MATHEMATICS

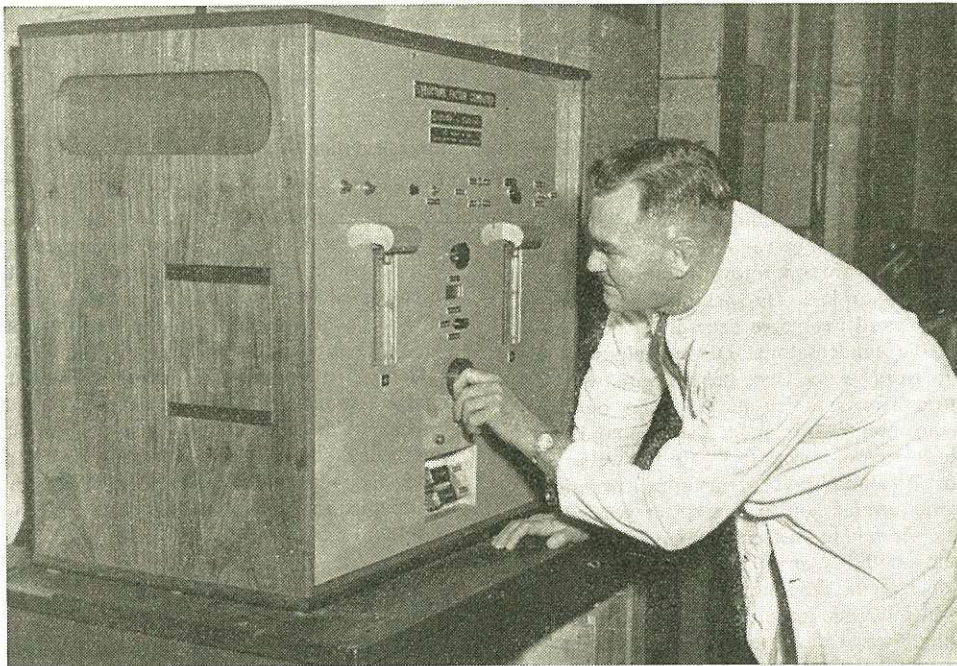
Multivariable Functions

A start has been made with basic research on multivariable functions. Special attention was given to those functions which are of importance in probability theory, e.g., hypergeometric functions in more variables, the multinomial and other discrete functions.

Statistical Analyses

In conjunction with the Mechanical Engineering Research Unit statistical analyses were made of data on rockbursts. These included, among others, the distribution of bursts for the various years, for the seasons of a year and the influence of blasting time.

On behalf of a Government commission, assistance and guidance were given on the analysis of census data of home language, official language and income groups. This comprehensive population study is now completed, but advice on the application of the results is still being given to the commission.



'n Struktuurfaktor-rekenmasjien wat gebruik word om die rangskikking van atome in 'n kristalverbinding te bepaal.

A structure-factor computing machine used to determine arrangement of atoms in a crystalline compound.

Navorsingseenheid vir Werktuigkundige Ingenieurswese

Direkteur: DR. A. J. A. ROUX.

Gedurende die tydperk onder bespreking het die Navorsingseenheid vir Werktuigkundige Ingenieurswese goeie vordering gemaak om fasiliteite te skep vir navorsing op die gebied van werktuigkundige ingenieurswese. Die beleid was om hierdie geriewe daar te stel sodat dit beantwoord aan die dringende probleme waarmee die nywerheid in Suid-Afrika te kampe het. Hierdie beleid het nie net verseker dat noue voeling en in sommige gevalle noue samewerking met die nywerheid bewerkstellig word nie, maar het ook daartoe bygedra dat die Eenheid op 'n gesonde basis kon ontwikkel om aan die behoeftes van die nywerheid te voldoen. Dit is nietemin duidelik dat die beskikbare navorsingsgeriewe baie uitgebrei moet word as die laboratorium moet voldoen aan die menige dringende navrae om navorsing te onderneem op die gebied van werktuigkundige ingenieurswese.

METAALKUNDE

Voorvervorming en Plastiese Eienskappe van Metale

Die ondersoek om die invloed van voorvervorming op die plastiese eienskappe van metale vas te stel, word voortgesit. 'n Begin is gemaak met die ondersoek van sink enkelkristalle. Hierdie materiaal was uitgesoek aangesien dit 'n redelike lae smeltpunt het wat die noodsaaklikheid van gespesialiseerde toerusting uitskakel, en omdat dit slegs 'n enkele glyvlak toon. 'n Geskikte tegniek vir die kweek van sink -enkelkristalle is ontwikkel nadat sekere probleme soos die uitskeiding van opgeloste gasse en die verkryging van 'n gladde kristalvlak opgelos is.

STERKTE VAN MATERIALE

Uitputting van Metale

'n Schenk-Avery Uitputtingstoetsmasjien vir klein monsters is al 'n tydlank in gebruik terwyl 'n Baldwin Sonntag Universal-vermoeidheidstoetsmasjien met 'n 10 ton vermoë onlangs ontvang en in diens gestel is. Twee ander vermoeidheidstoetsmasjiene, 'n 100 ton Amsler en 'n Krouse buigvermoeidheidstoetsmasjien, word binnekort verwag.

'n Begin is gemaak met die fundamentele ondersoek na die effek van onderbreekte belasting en periodieke oorbelasting op die uithouvermoë van metale. Die resultate sal van groot belang vir die nywerheid wees aangesien die belastingsiklus van masjienonderdele selde uniform is en die beskikbare inligting oor hierdie onderwerp beperk is tot egalige sinusvormige belasting van monsters in toetsmasjiene.

'n Ondersoek na die uithouvermoë van spoorstawe ten behoeve van die Suid-Afrikaanse Spoorweë is aan die gang. Die vervorming van spoorstawe, onderworpe aan groot horisontale kragte wat by draaie intree, is gedurende veldtoetse deur die Suid-Afrikaanse Spoorweë

Mechanical Engineering Research Unit

Director: DR. A. J. A. ROUX

During the period under review the Mechanical Engineering Research Unit has made considerable progress in establishing facilities for research in the field of mechanical engineering. The policy has been to build up these facilities around urgent problems with which Industry in South Africa is faced. This has not only ensured close contact and in many cases intimate collaboration with industry, but has contributed towards the sound development of the Unit towards the fulfilment of the essential research needs of industry. It has become clear, however, that the available research facilities will have to be extended quite appreciably if the laboratory has to entertain the numerous urgent requests for research in the field of mechanical engineering.

METALLURGY

Predeformation and the Plastic Properties of Metals

The investigation into the influence of predeformation on the plastic properties of metals is being continued. A start has been made with the investigation of single crystals of zinc. This metal was selected since it has a reasonably low melting point obviating the necessity for specialized equipment and since it possesses only one slip plane. A suitable technique for the growing of zinc crystals has been developed after certain problems such as the removal of dissolved gases and the attainment of a smooth crystal surface were solved.

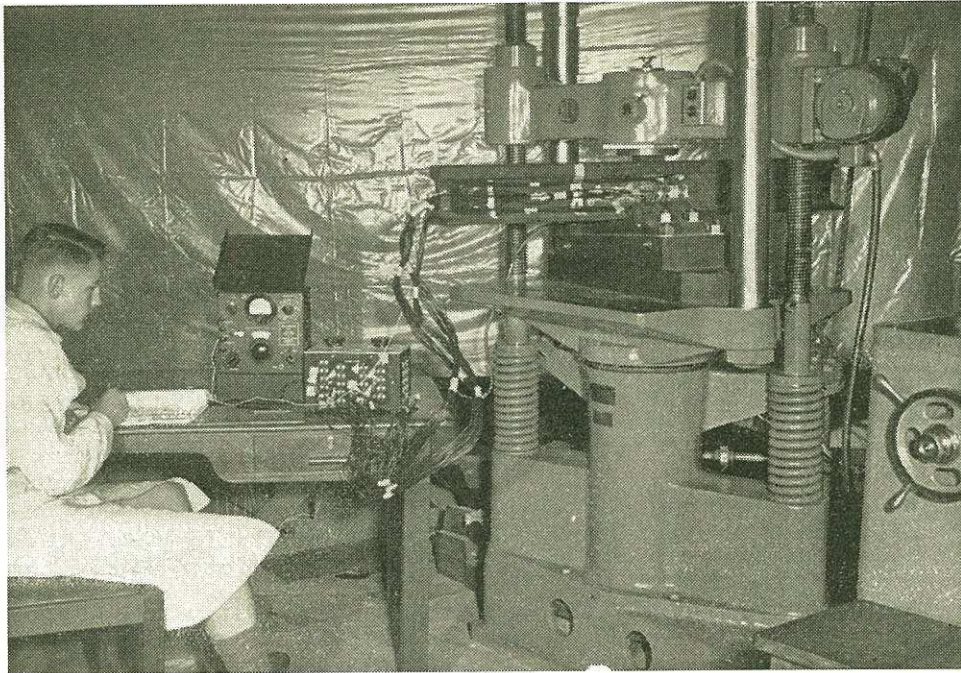
STRENGTH OF MATERIALS

Fatigue of Metals

A Schenck Avery Fatigue Testing Machine for small specimens has been in use for some time while a Baldwin Sonntag Universal Fatigue Testing Machine with a capacity of 10 tons has recently been received and placed into commission. Two further fatigue testing machines, a 100 ton Amsler and a Krouse Bending Fatigue Testing machine are expected shortly.

A start has been made with a fundamental investigation into the effect of interrupted loading and periodic overloading on the fatigue properties of metals. The results will be of considerable value to industry since the cyclic loading of machine elements is seldom uniform and the available information on the subject is limited to continuous sinusoidal loading on samples in testing machines.

An investigation into the fatigue strength of rails on behalf of the South African Railways is in progress. The strain in rails round curves when subjected to large horizontal forces has been determined during field tests carried out by the South African Railways. Work has



Meting van die spanning in 'n monster onder lading in 'n groot toetsmasjien.

Measurement of the strains produced in a specimen under load in a large testing machine.

bepaal. 'n Aanvang is gemaak om die ingewikkelde belastingspatroon wat onder praktiese omstandighede gevind is, in die laboratorium na te boots. Hierdie ondersoek mag die moontlikheid skep om die waarskynlike lewensduur van verskeie spoortipes vas te stel en mag dui op moontlike wysigings van die spoorprofiel om vermoeidheidsbreuke te voorkom.

'n Ondersoek is begin ten behoeve van 'n waaiervervaardigingsfirma om die oorsaak of oorsake van die swigting van aluminiumlegering waaierlemme onder korrosiewe toestande ondergronds in die Oranje-Vrystaatse goudmyne te bepaal. Monsters van die waaierlemmateriaal is aan korrosie-vermoeidheidstoetse onderwerp om vas te stel of die swigting hieraan toegeskryf kan word.

Rotsstorting in Diep Myne

Op versoek van die opdraggewer is die navorsingstempo op hierdie projek aansienlik vergroot om die werk te bespoedig.

'n Groot aantal ondergrondse besoeke aan gebiede waar rotsstorting plaasgevind het, is afgelê om die toestande wat die rotsstortings voorafgegaan het en die karakteristieke eienskappe van hierdie verskynsels te bestudeer. Uit hierdie ondergrondse besoeke en van eksperimentele laboratoriumstudies op modelle is tot

commenced in an attempt to reproduce in the laboratory the complicated stress pattern found to exist under practical conditions. This may make it possible to determine the probable life of various types of rails and may suggest ways of modifying the rail sections to avoid fatigue failure.

An investigation has been undertaken on behalf of a fan manufacturing company to establish the cause or causes of the failure of aluminium alloy fan blades under the corrosive conditions underground in the gold mines of the Orange Free State. Specimens of the fan blade material have been subjected to corrosion fatigue tests to determine whether the failure can be attributed to this cause.

Rock Bursts in Deep Level Mining

At the request of the sponsor the research effort on this project has been considerably increased in order to speed up the work.

A large number of underground sites, where rock bursts had occurred, were visited to study the conditions under which bursts occurred and the characteristic features associated with these phenomena. From observations during underground visits and from experimental studies on models in the laboratory it was concluded that

die gevolgtrekking gekom dat 'n diepgeleë uitgraving omgrens word deur 'n gebied van gekraakte rots wat hoofsaaklik in posisie gehou word deur 'n Voissoir-boogsisteem, en wat ontspan is in dié sin dat die ongebroke rots bo-op, nie op hierdie sisteem inwerk nie. Waarnemings is ook ondergronds gemaak om die konfigurasie van die gekraakte rots vas te stel. Dit wil voorkom dat wanneer 'n uitgraving uitgebrei word die gekraakte gebied verbreed, wat lei tot 'n vaspakking van die rots binne die boogsisteem. Hierdie herrangskikking mag van 'n gewelddadige aard wees, wanneer dit bekend staan as 'n „binnekoepelstorting”. 'n „Buitekoepelstorting” vind plaas wanneer die werksvlak uitgestoot word tot by die grens van die gespanne rots en die spanning groot genoeg is om 'n skielike swigting te veroorsaak.

Volgens die getuienis sover ingewin wil dit voorkom dat die samedrukkingspanning in die ongebroke rots, as gevolg van die invloed van die boliggende rots, na die kante van die uitgraving vergroot en 'n omsluitende sisteem van vergrote spanning rondom die uitgraving vorm. Die presiese aard van die spanningsverdeling rondom die uitgraving word nou wiskundig en foto-elasties bestudeer. Om die foto-elastiese studies uit te voer is 'n belastingsraam ontwerp met 'n vermoë van 0 tot 1,500 lbs. in die horisontale en vertikale rigtings vir foto-elastiese plate tot 20 duim vierkant.

Eksperimentele ondersoek na die meganiese eienskappe van rots is aan die gang om die omstandighede waaronder swigting kan plaasvind te bestudeer. Tot dusver het die resultate aangetoon dat die lineêre druksterkte en die elastisiteitskoëffisiënt nie noemenswaardig verskil wanneer die belasting loodreg of parallel met die bedvlakke toegepas word nie.

Heelwat vordering is gemaak met die statistiese ontleding van beskikbare inligting op drukstortings. Hierdie werk is van groot waarde om uit al die faktore wat moontlik 'n invloed op drukstortings mag hê, die belangrikste te kies.

Swigtings in die Praktyk

Die daarstelling van 'n diens om die nywerheid met advies te bedien op die gebied van meganiese swigtings in die praktyk, het groot byval gevind. Van die belangrikste gevalle wat ondersoek is, is die swigting van 'n randrat in 'n sementmeule, van 'n hoëspoed sentrifugeermasjien en van verskeie gevalle van waaiierlemme wat in die korrosiewe ondergrondse atmosfeer van die Vrystaatse goudmynne geswig het.

Dit is die voorneme om hierdie diens aansienlik in die komende jaar uit te brei.

Meganiese Eienskappe van Materiale

Roetineoetse om treksterkte, hardheid en slagsterkte van verskeie materiale te bepaal is gedurende die jaar ten behoeve van buiteliggame uitgevoer.

an excavation at depth is surrounded by a zone of fractured ground which is held in position mainly by a Voussoir arch system and which is de-stressed in the sense that forces due to the overlying virgin ground do not act in this zone. Observations have also been made underground to ascertain the configuration of the fractured zone. It appears that when an excavation is extended, the fractured zone broadens with a consequent settlement of the ground within the arch system mentioned above. This readjustment may take place violently in which case it is termed an "intradossal burst". An "extradossal burst" occurs when an advancing face reaches the boundary of the stressed ground and the stress is high enough to cause sudden failure.

Evidence so far obtained tends to indicate that the compressive stress in the virgin ground due to the overlying rock increases towards the sides of the excavation and forms an envelope of increased stress round the excavation. The exact nature of the stress distribution round excavations is being studied mathematically and photo-elastically. For the photo-elastic studies a loading frame with a range of from 0 to 1,500 lb. in horizontal and vertical directions has been designed for plates of photo-elastic material up to 20 inches square.

Experimental investigations into the mechanical properties of rock are in progress to determine the conditions under which failure can be expected. The results so far obtained show that the linear compression strength and Young's modulus do not change significantly when the load is applied perpendicular or parallel to the bedding planes.

Considerable progress has also been made with statistical analyses of available records on pressure bursts. This work has great value in selecting the significant factors from those which are thought to have a bearing on pressure bursts.

Failures in Service

The establishment of a service to give advice on mechanical failures in practice has met with an enthusiastic response from Industry. Among the more important failures that have been investigated are the failures of a gear of a cement mill, of a high speed centrifuge and several instances of failure of blades of fans operating under the corrosive atmospheres underground in the gold mines of the Orange Free State.

It is intended to extend this service appreciably during the coming year.

Mechanical Properties of Materials

Routine testing to determine the tensile strength, hardness or impact strength of a variety of materials have been carried out on behalf of outside bodies.

MEGANIKA

Dempingsvermoë van Materiale

Die dempingsvermoë van 'n materiaal is die vermoë daarvan om die vry uitwisseling van potensiele en kinetiese energie gedurende trilling teen te werk en 'n gedeelte van die aangewende meganiese energie deur onomkeerbare inwendige prosesse te absorbeer. As gevolg van hierdie eienskap van 'n materiaal word trillings gedemp sodat die gevaar van uitputtingsswigting van 'n struktuur byvoorbeeld verminder kan word deur die keuse van 'n materiaal met 'n hoë dempingsvermoë.

Aangesien die demping van struktuurtrillings van die materiaal sowel as van die vorm en grootte van die struktuuronderdeel asook van die belasting waaraan dit onderworpe is, afhanklik is, word 'n poging aangewend om formules op te stel wat al hierdie faktore in ag neem en verder uitgebrei kan word om aan alle praktiese ingenieursvereistes te voldoen. 'n Spesiale toetsapparaat is onlangs voltooi vir hierdie ondersoek en die eksperimentele werk is aan die gang.

Ontwerp van 'n Lugdraadsisteem

Wysigings aan die ontwerp van 'n prototipe radar-lugdraadsisteem, wat verlede jaar op versoek van die Telekommunikasie-navorsingslaboratorium vir die Departement van Verdediging onderneem is, word tans aangebring.

TERMODINAMIKA

Gasturbiennavorsing

'n Verslag is gedurende die jaar opgestel in verband met die ontwikkeling van die gasturbien en die moontlike toepassing daarvan as 'n kragbron in Suid-Afrika.

Aansienlike vordering is alreeds gemaak met die opbou van apparaat om die gebruik van Suid-Afrikaanse steenkool as gasturbienbrandstof te ondersoek. 'n Termoakoestiese resonator word vir hierdie doel ontwikkel aangesien hierdie instrument besonder geskik skyn te wees vir die doeltreffende verbranding van verpoeierde steenkool in gasturbiene. Die ontwerp van die eerste termoakoestiese resonator, wat gebruik sal word in die basiese studie van die golfbewegings en drukke wat voorkom in die resonator, is voltooi. Sodra die nodige ontwerpgegevens daargestel is, sal 'n groter model gebou word vir die verbranding van verpoeierde steenkool.

Een van die grootste probleme verbonde aan die verbranding van steenkool in 'n binnebrandgasturbien is die erosie van die turbienlemme deur die asdeeltjies. Toerusting wat nodig is om hierdie verskynsel te bestudeer is reeds bestel. Daar word egter gehoop dat die termoakoestiese resonator die asdeeltjies in so 'n mate sal vergruis dat dit nie meer ernstige skade aan die lemme sal veroorsaak nie.

Die Ontwerp van 'n Verbrandingsoond

Nadat hulle verskeie vrugtelose versoeke aan buite-firmas gerig het om 'n oond vir die verbranding van banknote te ontwikkel en te voorsien, het die Suid-Afrikaanse Reserwebank hierdie laboratorium versoek om die ontwikkeling van 'n geskikte eenheid te onderneem.

MECHANICS

Damping Capacity of Materials

The damping capacity of a material is its ability to resist the free exchange between potential and kinetic energy during vibration and to absorb part of the applied mechanical energy by means of irreversible internal processes. By virtue of this property of a material, vibrations are damped so that the danger of fatigue failure in a structure, for example, can be diminished by the choice of a material with high damping capacity.

Since the damping of the vibration of a structure depends on the material as well as on the shape and size of the structural member and the loading to which it is subjected, an attempt is being made to establish formulae which will account for these factors and which can be extended to meet practical engineering requirements. A special testing apparatus has recently been completed for this investigation and the experimental work is in progress.

Design of Aerial System

Modifications are being made to the design of a prototype radar aerial system, developed last year at the request of the Telecommunications Research Laboratory for the Department of Defence.

THERMODYNAMICS

Gas Turbine Research

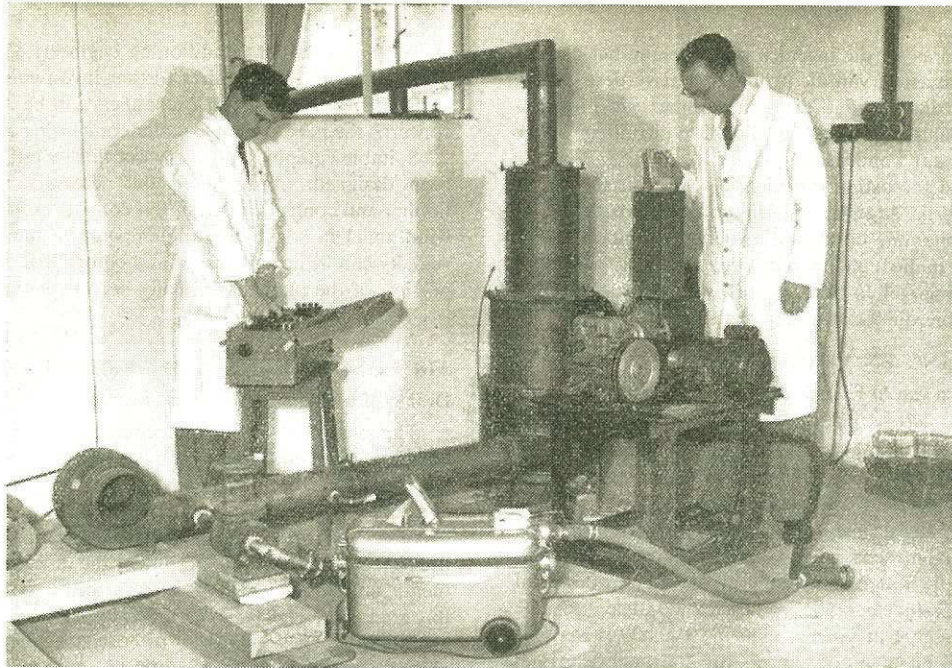
In the course of the year a report has been prepared on the development of the gas turbine and its possible application as prime mover in South Africa.

Considerable progress has now been made with the building up of apparatus to investigate the possible application of South African coal as gas turbine fuel. A thermo-acoustic resonator is being developed for this purpose as this instrument appears to be eminently suitable for the effective combustion of powdered coal in gas turbines. The design of the first thermo-acoustic resonator, which will be used for fundamental studies on the wave motions and pressures occurring in the resonator, has been completed. As soon as the necessary design data have been obtained, a larger model will be built for the combustion of powdered coal.

One of the main problems associated with the combustion of coal in internal combustion gas turbines is the erosion of the turbine blades by ash particles. Equipment for the purpose of studying this phenomenon has, therefore, been placed on order. It is hoped, however, that with the use of the thermo-acoustic resonator, the ash particles will be pulverized to such an extent that they will no longer cause serious damage to the blades.

Design of an Incinerator

After several unsuccessful approaches to outside firms to develop and supply an incinerator for the purpose of burning bank notes, the South African Reserve Bank requested the laboratory to undertake the development of a suitable unit.



'n Eksperimentele oond ten bate van die Suid-Afrikaanse Reserwebank ontwikkel vir die verbranding van gebruikte banknote wat uit sirkulasie onttrek is.

An experimental furnace developed on behalf of the South African Reserve Bank for the incineration of used bank notes withdrawn from circulation.

Die verbranding van banknote lewer unieke probleme op, aangesien banknote met 'n vernis behandel word wat dit minder brandbaar maak. Dit is verder van belang dat die note geheel-en-al verbrand word sonder dat onverbrande deeltjies deur die skoorsteen ontsnap.

'n Eksperimentele eenheid wat ontwerp en gebou is, word tans op die proef gestel.

HITTEVOORTPLANTING

Hitte-oordraging Tussen Vaste Wande en Vloeistowwe

Verdere vordering is gemaak met die ontwikkeling van die apparaat wat gebruik word vir die studie van hitteuitruiling tussen vaste wande en vloeistowwe. Hierdie tipe van hitte-oordraging is nie slegs van aansienlike belang in die ingenieursbedryf in prosesse waar hittevloei plaasvind nie, maar is ook van regstreekse belang vir die boubedryf waar geboue ontwerp moet word om aan te pas by die heersende klimaatstoestand.

Die apparaat waarmee die ondersoek voortgesit word, is reeds voltooi en gemonteer in die 10 vt. laespoed windtunnel. Daar is begin met die eerste deel van die ondersoek, nl. die studie van die gesamentlike invloed van geforseerde en natuurlike konveksie in die geval van 'n plat horisontale plaat in 'n horisontale lugstroom.

Die Hitte-oordragingseienskappe van 'n Gevinde Buis

Die hitte-oordragingseienskappe van 'n gevinde buis is van groot belang vir die vervaardigers van verkoelings-

The problem of burning bank notes is rather unique, since notes are treated with a varnish which affects the burning adversely. Furthermore, it is essential that all the notes are completely burnt and that no unburnt portions escape through the chimney.

An experimental unit was designed and built and is now being tested.

HEAT TRANSFER

Heat Transfer Between Solid Surfaces and Fluids

Further progress has been made with the development of apparatus for the study of heat transmission between solid boundaries and fluids. Heat exchange phenomena of this type are not only of fundamental importance to the engineering industry in processes where heat flow takes place but the study is also of direct interest to the building industry in connection with the design of buildings in relation to climate. The apparatus on which the investigation will be conducted has now been completed and set up in the 10 ft. low velocity wind-tunnel. A start has been made with the first part of the investigation which aims at a study of the combined effects of natural and forced convection for the case of a flat horizontal plate in a horizontal air stream.

Heat Transfer Characteristics of Finned Tubing

The heat transfer characteristics of finned tubing are of major importance to manufacturers of cooling coils

klosse sowel as vir die ingenieurs wat belang het by lugreëling. Een aspek van die probleem wat verdere ondersoek regverdig voordat die kenkrommes vir hitte-uitruilers bepaal kan word, is die hitte-uitruiling onder toestand waar kondensasie plaasvind.

Geskikte toerusting om hierdie toetse uit te voer is reeds ontwerp. Afgesien van die nodige lugreëlings- en kontrole-apparaat, bestaan die toerusting uit 'n windtunnel waarin die lugtemperatuur, vogtigheid en lugspoed-noukeurig ingestel en beheer kan word. Die grootste gedeelte van hierdie toerusting is reeds bestel.

LUGREËLING EN VERKOELING

Die Ontwerp van 'n Klimaatkamer

Die ontwerp van 'n klimaatkamer ten behoeve van die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese is nou voltooi. Die klimaatkamer vorm die hoofitem van die geriewe wat deur die Kamer van Mynwese se Fisiologiese Navorsingseenheid daargestel sal word om die reaksies van 'n mens, onder omgewingstoestande soortgelyk aan die wat ondergronds in die myne ondervind word, te bestudeer. Die samestellende dele van die klimaatkamer, wat volgens skatting £90,000 sal kos, is reeds bestel en 'n groot aantal van die onderdele is al afgelewer. Die klimaatkamer sal opgerig word in 'n gebou wat spesiaal deur die Kamer van Mynwese vir hierdie doel aangebou is. Die opbou van die roosterpaneel vir die twee toetskamers, wat deur die laboratorium onderneem is as gevolg van hulle ingewikkelde aard, het reeds 'n gevorderde stadium bereik.

'n Spesiale apparaat is ook ontwerp en gebou om 'n nuwe tipe vogtigheidsmeter te ontwikkel wat gebruik sal word om die hoë vogtigheidsgrade, wat in die klimaatkamer gehandhaaf moet word, te meet en te reguleer.

Die ontwerp en yking van die klimaatkamer tesame met die bou van die roosterpaneel word ten behoeve van die Kamer van Mynwese uitgevoer teen 'n koste van £11,500.

Die Ontwerp van 'n Menskalorimeter

Voorlopige werk aan die ontwerp van die kalorimeter ten behoeve van die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese is ondeneem vir 'n bedrag van £2,250. Hierdie deel van die projek is nou voltooi en 'n baie bevredigende oplossing is gevind om die vereiste gelykmatige verdeling van lug in die kalorimeterdop te verseker. Deur gebruik te maak van die beginsels van die vrywerwel en die luginlaat op die longitudinale as van die kalorimeter te plaas, word 'n eweredige lugvloei oor die toetsvoorwerp bewerkstellig, wat 'n gelykmatige en stabiele hitte-oordraging tussen die liggaam en die bewegende lug tot gevolg het.

Ontwerp van 'n Lugreëlingseenheid

Die laboratorium is telkens deur verskillende navorsingsinstitute en eksterne liggames genader om hulle met raad te bedien en aanbevelings te maak in verband met lugreëlingsisteme vir spesiale doeleindes.

as well as to the air conditioning engineer. One aspect of the problem that requires further investigation before performance tests on heat exchangers can be conducted, concerns the heat exchange under condensing conditions.

Suitable equipment to carry out this investigation has been designed. Apart from the necessary air conditioning and control equipment, it consists essentially of a windtunnel in which the air temperature humidity and velocity can be accurately set and controlled. The major portion of the plant has already been ordered.

AIR CONDITIONING AND REFRIGERATION

Design of a Climatic Chamber

The design of a climatic chamber, undertaken on behalf of the Transvaal and Orange Free State Chamber of Mines, has been completed. The climatic chamber constitutes the major item of the facilities which the Chamber of Mines Physiological Research Unit will use to study human reactions under the different environmental conditions which are experienced underground in the gold mines. The component parts of the climatic chamber, which is estimated to cost £90,000, have been placed on order and a large number of individual units have already been delivered. The plant will be erected in a building specially built by the Chamber of Mines. The manufacture of the grid panels of the two test chambers, undertaken by the laboratory because of their specialized nature, has reached an advanced stage.

Special apparatus has been designed and constructed to develop a new type of humidity meter which will be used to measure and control the high humidities which have to be maintained in the climatic chamber.

The design and calibration of the climatic chamber together with the manufacture of the grid panels has been carried out under contract with the Chamber of Mines at a cost of £11,500.

Design of a Human Calorimeter

Preliminary work on the design of the calorimeter has been undertaken on behalf of the Transvaal and Orange Free State Chamber of Mines at a cost of £2,250. This portion of the project has now been completed and a very satisfactory solution has been found for the problem of uniform air distribution in the calorimeter shell. By making use of free vortex motion and by introducing the air outlet of the longitudinal axis of the calorimeter, a uniform flow is attained over the test subject resulting in a uniform and stable heat transfer between the test subject and the moving air.

Design of Air Conditioning Plant

The laboratory has been approached by various research institutes and other outside bodies for advice and recommendations on air conditioning systems for special purposes.

VLOEISTOFMEGANIKA

Die Meting van Lae Lugspoede

Hulpapparaat word tans ontwikkel vir die toets en yking van instrumente wat gebruik word om lae lugspoede akkuraat te meet. Sulke instrumente vind veral toepassing in ventilasieprobleme. 'n Roterende arm wat ontwerp is vir die yking van instrumente oor 'n spoed-bereik van 3 tot 900 vt./min., word tans gemonteer.

Die ontwikkeling van nuwe instrumente vir gebruik in die lae spoedbereik, geniet ook aandag. Enkele nuwe meters, waaronder 'n rigtings-onafhanklike warmdraad-instrument vir die meting van lugspoede in vertrekke waar lugreëling toegepas word, is reeds ontwerp. Hierdie instrumente sal volledig ondersoek en geïk word sodra die roterende arm gebruiksvaardig is.

'n Studie van die Werksvermoë van Spoorwa-ventilatore

'n Ondersoek na die werksvermoë van ses tipes ry-tuigventilatore is ten behoeve van die Suid-Afrikaanse Spoorweë deurgevoer. Ter afsluiting van die reeks toetse, wat in die laboratorium se twee windtonnels gedoen is, is 'n volledige verslag aan die ondersteuners voorgelê.

'n Studie van Dakventilatore

In sisteme waar daar nie van kunsmatige aandrywing gebruik gemaak word nie, berus die lugleweringvermoë van dakventilatore op die effektiewe temperatuurverskil tussen die buite- en binnelug van die gebou, en op die spoed en rigting van die heersende wind. Die invloed en rigting van die heersende wind. Die invloed van temperatuurverskille op die lewering kan toeties goed bereken word mits die weerstand van die ventilator teen lugvloei bekend is. Hierdie weerstand, asook die invloed van die heersende wind op die werking van 'n ventilator, is twee faktore wat egter alleenlik deur eksperimentele metodes bepaal kan word.

Ten einde die werksvermoëns van verskillende tipes ventilatore onderling te kan vergelyk, is daar enkele jare gelede reeds in samewerking met die Suid-Afrikaanse Buro vir Standaarde 'n voorlopige toetskode opgestel. Aan die hand van toetsresultate op 'n paar tipiese ventilatore, sal die voorlopige kode tot 'n finale, omvattende vorm verwerk word.

'n Aanvang is met voorlopige toetse gemaak en daarbenewens is die fundamentele toetsmetodes wat gevolg sal word ook reeds vasgestel. Die ondersoek wat in die 10 vt. laespoed windtunnel uitgevoer word, behels al die aspekte wat betrekking het op die keuse van meet-apparaat en meetmetodes.

Lugweerstand in Mynskagte en -tonnels

Die beplanning van doeltreffende ventilasiesisteme in myne berus op die beskikbaarheid van betroubare gegewens oor die lugweerstand van skagte en tonnels, en veral op gegewens oor die weerstand van die interne struktuur in skagte.

Ten einde sodanige gegewens in te win, sal 'n grondige ondersoek deurgevoer word op mynskagmodelle wat deur

FLUID MECHANICS

The Measurement of Low Velocities

Facilities are being developed for the testing and calibration of instruments to measure accurately the low air speeds which frequently prevail in ventilated spaces. A whirling arm which has been designed is at present being erected for the calibration of instruments in the range of air speeds between 3 and 900 ft./min.

Consideration has been given to the development of new instruments for the measurement of low velocities. A few new types such as an omni-directional hot wire anemometer for the measurement of air speeds in air conditioned rooms have already been designed. These instruments will be tested and calibrated as soon as the whirling arm has been installed and its characteristics determined.

A Study of the Performance Characteristics of Railroad Coach Ventilators

An investigation into the performance characteristics of six types of railroad coach ventilators was undertaken on behalf of the South African Railways. The investigation which was carried out in the two wind-tunnels of the laboratory was successfully completed and a report submitted to the sponsors.

Studies of Roof Ventilators

In natural ventilation systems the extracting capacity of any roof ventilator depends on the difference between temperatures inside and outside the ventilated building and on the speed and direction of the prevailing wind. The thermal effect can be evaluated theoretically if the resistance to air flow through the ventilator is known, but this resistance as well as the influence of wind on ventilator performance can only be assessed experimentally.

To enable comparable estimates of roof ventilator efficiencies to be made, a draft test code was prepared in collaboration with the South African Bureau of Standards a few years ago. In order to develop this code into a final and comprehensive form, the performance characteristics of some typical ventilators are to be determined.

Preliminary experiments are at present under way and basic experimental techniques have already been established. The work is being carried out in the 10 ft. low velocity windtunnel and is planned to embrace an investigation into all the relevant aspects of instrumentation and method.

Air Flow Resistance in Mine Shafts

The effective planning of a mine ventilation system depends on the availability of reliable data concerning the resistance of mine shafts and tunnels to air flow and in particular of data on the resistance associated with internal structures in shafts.

To obtain these data fundamental investigations are to be performed on scale model shaft sections incor-



Die natuurlike frekwensie van vibrasie van 'n waaierlem word gemeet.

Measurement of the natural frequency of vibration of a fan blade.

'n spesiale windtunnel daargestel word. Die tunnel wat vir hierdie doel ontwerp word, sal ongeveer 150 vt. lank wees, en voorsiening word gemaak om die afmetings van die toetsseksie veranderbaar te maak, met 'n grootste snit van 2 vt. by 4 vt. Die dryfkrag word deur 'n waaier en 'n 100 p.k. elektriese motor verskaf. Die ontwerp van die toets-apparaat sal eersdaags voltooi wees.

Lugvervoer van Gekorrelde Stowwe

Drukluksisteme vir goedkoop en doeltreffende vervoer van gekorrelde stowwe kan 'n wye toepassing in die landbou en nywerheid vind, mits die ontwerp van sulke sisteme meer oordeelkundig aangepak word as wat tot dusver die geval was. Om die nodige basiese gegewens in hierdie verband te versamel, is 'n uitgebreide navorsings-program opgestel en die nodige toetsapparaat word tans gebou.

'n Studie van Waaierontwerp met Betrekking tot Geraas

Die geraas van waaiers het 'n probleem geword in die industrie, en veral in die mynbedryf, waar waaiers op groot skaal vir ondergrondse ventilasie gebruik word. Die doel van die ondersoek waarmee onlangs 'n begin gemaak is, is om geskikte ontwerpmetodes vir waaiers voor te stel waarvolgens die geraas verminder kan word. Hierdeur sou die geestelike en liggaamlike uitputting wat deur oordrewe ventilasiegeraas by die werkers veroorsaak word, verlig kan word, sonder om toevlug te

porated into a windtunnel of special design. The tunnel which is being designed for this purpose will be roughly 150 ft. long, will have variable cross-sectional dimensions, the largest being 2 ft. x 4 ft., and will be equipped with a fan driven by a 100 horsepower motor. The design of the experimental plant is nearing completion.

Pneumatic Conveyance of Granular Material

Extensive industrial and agricultural application of pneumatic systems for the conveyance of granular material requires, for purposes of effective and economic handling of material, that these systems be more rationally designed than is being done at present. To obtain the essential fundamental data an extensive research programme has been planned and the experimental equipment required for the investigation is under construction.

A Study of Fan Design in Relation to Noise

The problem of fan noise has become one of great concern to industry and particularly the mining industry where fans are used extensively underground for purposes of ventilation. The object of the investigation which has recently been started, is to suggest methods of noise reduction in terms of suitable fan design so that some relief in the physiological and psychological problems associated with ventilation noise may be achieved without resorting to relatively expensive devices

neem tot duur hulpmiddels, soos akoestiese demping deur middel van filters.

Met hierdie doel voor oë is die oorsake van oordrewe geraas in die geval van aksiale waaiers bestudeer en gewens oor waaierontwerp is uit tegniese publikasies versamel. Hierdie opname het getoon dat die bestaande kennis van waaiergeraas in baie opsigte so gebrekkig is dat verdere navorsing in die verband dringend noodsaaklik is. 'n Sistematiese ondersoek is beplan en die nodige toetsapparaat word tans ontwikkel.

Ander Lug- en Hidrodinamiese Toetse

Afgesien van bogenoemde hoofprojekte, was daar ook 'n aantal kleiner probleme wat op 'n basis van korttermynse navorsing deur die laboratorium opgelos is. Op versoek van die fabrikante — 'n waaiermaatskappy — is 'n ontleding gedoen van lugdinamiese kragte op die lemme van twee ventilasie-waaiers wat in die myne onder las geswig het. 'n Verdere ondersoek is op 'n groot waaier in die Oranje-Vrystaat gedoen, waar resonante vibrasies van die lemme met behulp van elektriese vervormingsmeters bepaal is. Die werking van 'n hidrouliese apparaat, wat gebou is om die rookintensiteit in skoorstene te verminder deur wegsputting van die roet, is in die laboratorium ondersoek.

Ten slotte is daar, op versoek van die patenthouer, 'n aanvang gemaak met 'n reeks toetse om die werksvermoë van die verskillende onderdele van 'n hidrouliese lugkompressor, wat van 'n rattipe waterpomp gebruik maak, te bepaal. Uit die toetsresultate sal daar vasgestel word of die beste bedryfstoeestand in die huidige ontwerp bereik word.

such as acoustic lagging and filters.

With this object in view the causes of excessive noise emission by axial-flow ventilating fans have been studied and the technical literature on fan design has been searched for information on the subject. This survey has revealed many important gaps in the knowledge of this phenomenon so that further research has become urgently necessary. A systematic investigation has been planned and the equipment required is now being developed.

Other Aero- and Hydrodynamic Investigations

In addition to the foregoing major investigations, the laboratory has been called upon to assist with the solution of numerous problems which required short-term research. At the request of a fan manufacturing company analyses were made of the aerodynamic forces acting on the blades of two different mine ventilating fans that had failed. Another investigation involved the measurement of blade flutter by the use of wire strain gauges a large fan in the Orange Free State. The performance of a water spray soot-extracting device intended to be used in chimneys for purposes of smoke abatement was tested.

At the request of a patentee, an investigation has recently been started to determine the performance characteristics of the various components of a hydraulic air compressor which utilizes a gear type water pump. It is the purpose of this investigation to establish whether optimum operating conditions are achieved in the present design.

Telekommunikasie- Navorsingslaboratorium

Direkteur: MNR F. J. HEWITT.

Gedurende die afgelope jaar was die werk van die Radio-afdeling van die Laboratorium hoofsaaklik toegespits op die gebied van radiogolfvoortplanting en atmosferiese ruispeile, die ontwikkeling van metodes van kristalbeheer van veranderbare frekwensie en die studie van weerlig deur middel van radar.

Die Afdeling Verdedigingsradar wat uitsluitlik gemeoid is met werk vir die Departement van Verdediging op 'n kontrakgrondslag, was besig met die ontwikkeling van nuwe toerusting met sekere besondere kenmerke.

Die Frekwensie-voorrekeningsdiens

Die diens is met weinig verandering gedurende die afgelope jaar voortgesit. Die doel daarvan is om die beste gebruik van kortgolf-radiovoortplanting moontlik te maak deur die voorspelling van die kenmerke van die ionosfeer en die mees-geskikte frekwensies vir verskeie doeleindes.

Die meting van die kenlyne by vertikale lesings is in Johannesburg en Kaapstad voortgesit en resultate is maandeliks gepubliseer. Die voorrekening is op dié waarnemings en op gegewens wat van oorsee ontvang word, gebaseer.

Die Raad is dank verskuldig aan die Departement van Pos- en Telegraafwese wat verantwoordelik is vir die instandhouding van die ionosfeerregistreerder in Kaapstad. Resultate uit gebiede noord van die Unie, is van belang vir radioverbinding tussen Suid-Afrika en Europa. Daar word gereeld gegewens ontvang uit Leopoldville, wat toegerus is met 'n ionosfeerregistreerder wat in die Laboratorium gebou is, maar daar word nog moeilikheid ondervind met die toerusting in Nairobi. Die laasgenoemde toerusting is deeglik nagesien en herinstalleer op 'n beter perseel en daar word nou beter resultate verwag.

Ionosferiese Studies

Die ontwikkeling van 'n dubbelpulsmetode vir die bepaling van elektrondigtheid en botsingsfrekwensie in die laer ionosfeer is gedurende die jaar voortgesit.

Toerusting wat gebou is, word nou getoets. Die gewenste soort uitwerking is reeds verkry, maar verbeteringe moet aangebring word om meer positiewe resultate te bereik.

Radioruispeile en Navigasiehulpmiddels

Die meet van radio-ruispeile teen 100 kp/s is onderneem met die doel om die uitwerking van atmosferiese radiogeruis op verskeie radio-navigasiehulpmiddels wat deur die Afdeling van Burgerlike Lugvaart en die Departement van Verdediging oorweeg word, te bepaal.

Daar is moeilikheid ondervind met die verkryging van 'n reeks bevredigende registrasies in Noord-Rhodesië en Oeganda en die toerusting is gedurende die jaar terug-

Telecommunications Research Laboratory

Director: MR. F. J. HEWITT

During the past year the work of the Radio Section of the Laboratory has continued primarily in the field of radio wave propagation and atmospheric noise levels, the development of methods of variable frequency crystal control and the study of lightning by radar.

The Defence Radar Section, concerned entirely with work for the Department of Defence on a contract basis, has been engaged on the development of new equipment with certain special features.

The Frequency Prediction Service

This service has continued with little change during the past year. Its object is to enable the best use to be made of short-wave radio propagation by predicting ionospheric characteristics and the most suitable frequencies for various purposes.

Measurement of these characteristics at vertical incidence has continued in Johannesburg and Cape Town. Results have been published monthly. The predictions are based on these observations and on data received from overseas.

The Council is indebted to the Department of Posts and Telegraphs which is responsible for the operation of the ionosphere recorder at Cape Town. Results from territories to the north of the Union are of importance for radio communication between South Africa and Europe. Data are received regularly from Leopoldville which is equipped with an ionosphere recorder built in the Laboratory, but difficulty has still been experienced with the equipment in Nairobi. This latter equipment has recently been overhauled and re-installed on a better site and improved results are expected.

Ionospheric Studies

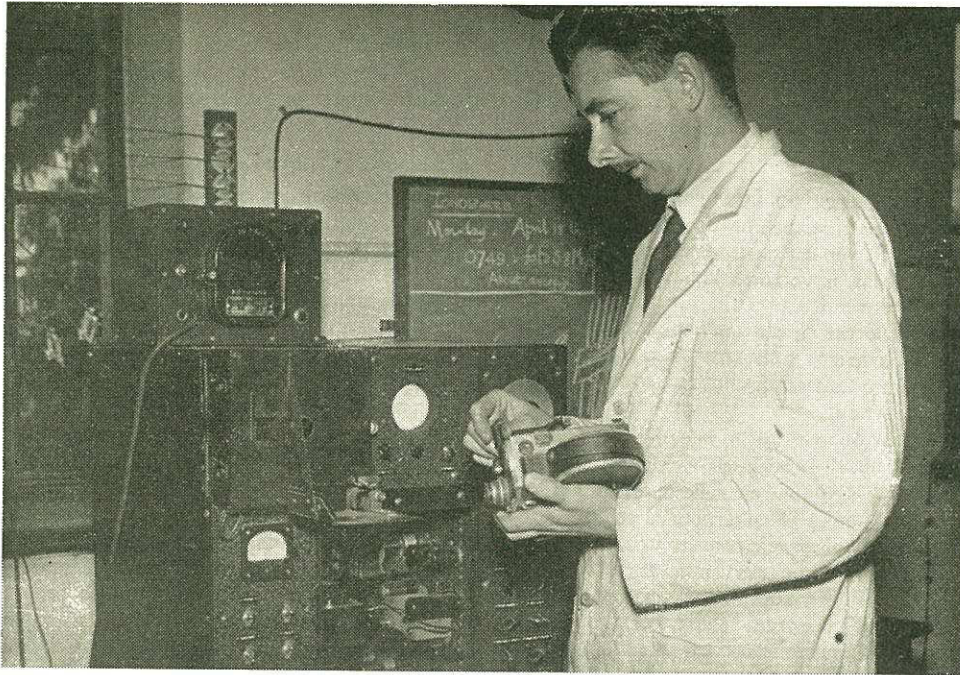
The development of a double pulse method for the determination of electron density and collision frequency in the lower ionosphere has continued during the year.

Equipment has been built and is now being tested. An effect of the nature sought has been detected, but improvements are needed for more positive results.

Radio Noise Levels and Aids to Navigation

The measurement of radio noise levels at 100 Kc/sec. was undertaken with a view to assessing the effect of atmospheric radio noise on various radio aids to navigation under consideration by the Division of Civil Aviation and the Department of Defence.

Difficulty has been experienced in obtaining a series of satisfactory records in Northern Rhodesia and Uganda and this equipment has been recalled during the year to



Die outomatiese ionosfeerregistreerder in die Telekommunikasie - navorsingslaboratorium wat die gegewens vir die W.N.N.R. se frekwensie-voorspellingsdiens vir suidelike Afrika verskaf.

The automatic ionospheric recorder in the Telecommunications Research Laboratory which provides the data for the C.S.I.R. frequency prediction service for southern Africa.

gebring en in verskeie opsigte verander. Een van die registreerders is aan Lusaka teruggestuur en is nou in werking. 'n Nuwe terrein vir die tweede registreerder in Oos-Afrika word oorweeg.

Die studie van die voorkoms van neerslagsteurings en korona-effekte op vliegtuie tydens vlugte is voortgesit in 'n vliegtuig van die Suid-Afrikaanse Lugdiens wat op binnelandse roetes vlieg. Tot dusver is gevind dat die effek nie buitensporig is nie, maar daar word by tye korona-effekte waargeneem en verdere toetse word uitgevoer.

Die Raad is dank verskuldig aan die Afdeling Burgerlike Lugvaart, die Suid-Afrikaanse Lugvervoerraad en aan die Suid-Afrikaanse Lugdiens vir hul bystand in die werk.

Hopelik sal 'n veelgolf-geruisregistreerder wat deur die Sentrale Radiovoortplantingslaboratorium van die Verenigde State se Nasionale Buro vir Standaarde ontwikkel is, binnekort aan die Laboratorium beskikbaar gestel word en daar word nou reëlins getref vir die installasie. Met die oog hierop is daar geen verdere werk gedoen met die laagfrekwensie-hoogfrekwensie-geruisregistreerder wat in die Laboratorium ontwikkel is nie.

Opname van Aardkonstantes

Die doel van die opname was om die uitwerking van grond en terrein op die voortplanting van laagfrekwensieradiogolwe in Suid-Afrika vas te stel.

enable various modifications to be introduced. One of these recorders has been returned to Lusaka and is now in operation. A new site for the second recorder in East Africa is under consideration.

The study of the occurrence of precipitation static and corona effects in aircraft in flight has continued in an aircraft of the South African Airways flying on internal routes. These effects so far have not been found to be excessive, but spasmodic corona effects are observed, and further tests are being made.

The Council is indebted to the Division of Civil Aviation, the Southern Africa Air Transport Council and to the South African Airways for their assistance in this work.

It is hoped that an all-wave noise recorder developed by the Central Radio Propagation Laboratory of the United States National Bureau of Standards will shortly be made available to the Laboratory and arrangements are being made for its installation. In view of this, no further work on the low frequency/high frequency noise recorder developed in the Laboratory has taken place.

Ground Constants Survey

The object of this survey was to determine the effect of soil and terrain on the propagation of low-frequency radio waves in South Africa.

Alle veldmetings is in die afgelope jaar voltooi en die resultate is gepubliseer. 'n Uitvoerige kaart wat 'n opsomming van die resultate gee, word nou gereedgemaak met die hulp van die Driehoeksmetingkantoor.

Kristalbeheer van Veranderbare Frekwensie

Die metode van kristalbeheer wat in die Laboratorium ontwikkel is, verskaf doeltreffende kristalstabiliteit en noukeurigheid, is volkome buigbaar en gebruik slegs een kristal.

Ses proefmodelle van 'n ontvangtoestel wat volgens die beginsel werk is deur 'n Suid-Afrikaanse vervaardiger volgens die laboratorium se spesifikasies vir die Unie-Verdedigingsmag gebou.

Die ontwerp en opbou van 'n vereenvoudigde ontwikkelelaar volgens dieselfde beginsels vir die frekwensiebeheer van senders, is voltooi en volle besonderhede is aan die Suid-Afrikaanse Uitsaaikorporasie verstrekk. 'n Aantal ontwikkelelaars volgens dié ontwerp word nou deur die S.A.U.K. gebou vir die frekwensiebeheer van die senders wat by die nuwe kortgolfuitsaaisentrum naby Bloemfontein gebruik sal word.

'n Noukeurighedsontwikkelelaar wat enige frekwensie tot by 20 mp/s. met 'n noukeurigheid van een p/s kan ontwikkel, sonder enige spesiale opstellingsproses, is voltooi.

Ondergrondse Verbindings

Weens die moeilikhede wat in die nywerheid ondervind word met die opbou van toerusting wat dieselfde werkvermoë besit as die toerusting wat in die Laboratorium ontwikkel is, het die Navorsingslaboratorium van die Kamer van Mynwese nou begin om werkmodelle van toerusting te vervaardig. Advies en besonderhede i.v.m. die ontwerp word deur die Telekommunikasie-navorsingslaboratorium verskaf wanneer nodig.

Ondersoek van Weerlig met Radar

Die gebruik van radar by die bestudering van sekere prosesse in weerligontlading wat moeilik met ander middels waargeneem kan word, is voortgesit. Dit lyk of radar veral aansienlike inligting kan verskaf oor die gedrag en plekbeplanning van die wimpelprosesse wat tussen opeenvolgende slae voorkom en wat nie direk deur ander metodes verkry kon word nie. Die werk word voortgesit.

Yking van Dempers

Toerusting om die yking van dempers oor 'n wye gebied van frekwensies te vergemaklik word ontwikkel deur vergelyking met 'n substandaard-demper op 'n bepaalde frekwensie.

Afstandsmeting

'n Teoretiese ontleding van afstandsmeting deur radio vir opmeetdoeleindes is uitgevoer en moontlike praktiese stelsels is aan die hand gedoen, met die oog op 'n vereiste van die Driehoeksmetingskantoor vir die soort toerusting.

All field measurements were completed during the past year and the results have been published. A detailed map summarizing these results is in the course of preparation, with the assistance of the Trigonometrical Survey Office.

Variable Frequency Crystal Control

The method of crystal control developed in the Laboratory provides effectively crystal stability and accuracy with complete flexibility, using only one crystal.

Six trial models of a receiver based on these principles have been built by a South African manufacturer to the Laboratory's specifications for the Union Defence Force.

The design and construction of a simplified generator on these principles for the frequency control of transmitters, has been completed and full details have been supplied to the South African Broadcasting Corporation. A number of generators based on this design are now in course of construction by the S.A.B.C. for the control of frequency of the transmitters to be used at the new short-wave broadcasting centre near Bloemfontein.

A precision generator capable of generating any frequency up to 20 Mc/sec., with an accuracy of one cycle per second without any special setting up procedure, has been completed.

Underground Communications

Owing to difficulties experienced in the construction of equipment by industry to meet the performance achieved by the equipment developed in the Laboratory, work has now commenced in the Research Laboratory of the Chamber of Mines on prototype equipment, with advice and design details supplied by the Telecommunications Research Laboratory where required.

Investigation of Lightning by Radar

The study by radar of certain processes occurring in lightning discharges which are difficult to observe by other means has continued. In particular, it appears that radar can give considerable information on the behaviour and location of the streamer processes which occur between successive strokes, which could not be obtained directly by other methods. Further work is in progress.

Calibration of Attenuators

Equipment is being developed to facilitate the calibration of attenuators over a wide range of frequencies by reference to a sub-standard attenuator at a particular frequency.

Distance Measurement

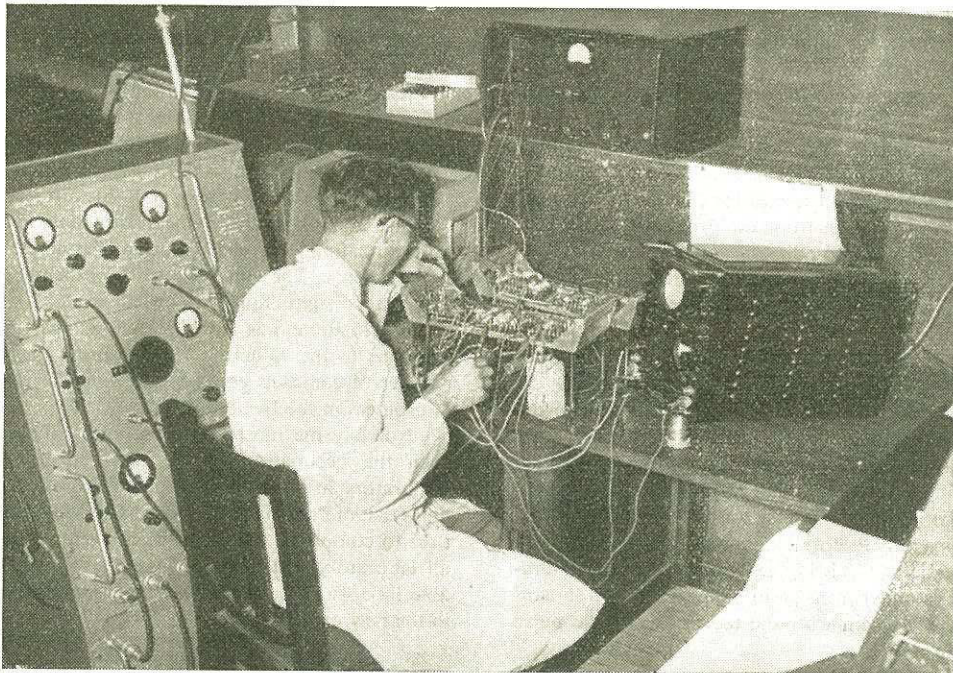
A theoretical analysis of distance measurement by radio for survey purposes has been carried out and possible practical systems postulated, in anticipation of a requirement by the Trigonometrical Survey Office for equipment of this nature.

Afdeling Verdedigingsradar

Die tweede en groter projek wat vir die Departement van Verdediging onderneem word, naamlik die ontwikkeling van radartoerusting met sekere spesiale kenmerke wat spesiaal geskik is vir Suid-Afrikaanse toestande, maak vordering. Voorlopige veldproewe met 'n eenvoudige vorm van die apparaat is voltooi. Daar is begin met werk aan 'n tweede verbeterde model.

Defence Radar Section

The second and larger project undertaken for the Department of Defence, namely the development of radar equipment with certain special features to suit South African conditions, is progressing. Initial field trials of a simple version of the equipment have been completed. Work has commenced on a second improved model.



Die drade van die ingewikkelde stroombane van 'n radar-toestel wat in aanbou is, word gespan.

Wiring complex circuits for the construction of a radar set.

Nasionale Bounavorsingsinstituut

Direkteur: MNR. J. E. JENNINGS.

Die Adviserende Komitee vir Bounavorsing het gereeld elke twee maande vergader en steeds waardevolle leiding verleen in die werk van die Instituut. Die Streeks-onderkomitee in Kaapstad het beklemtoon dat daar 'n behoefte bestaan aan navorsingswerk op probleme wat eie is aan die Kaapse Skiereiland, veral i.v.m. vraagstukke van die waterdigmaking van geboue. Die navorsings-program in hierdie verband het 'n aanvang geneem. 'n Ander projek wat op 'n streeksgrondslag in die Kaap onderneem word, staan in verband met fondament-bewegings en 'n lid van die onderkomitee het onderneem om opmetings te maak van die relatiewe bewegings van uitgesoekte geboue in Kaapstad. Die onderkomitee vir die Koste van Naturellebehuising (die Louw-komitee) was baie besig om verslae oor die projek op te stel. 'n Nuwe Loodskomitee is in die lewe geroep om raad te gee oor die projek i.v.m. die verslegting van beton in kusgebiede. Die vrywillige werk van lede van hierdie komitees word met dank erken.

Gedurende die jaar het die Instituut beurse, bydraes en kontrakte ter waarde van £17,700 gehanteer. 52 Kontrakte is gedurende die jaar voltooi of nog aan die gang in die Instituut.

Die belangrikste gebeurtenis van die jaar was waarskynlik die ingebruikneming van die nuwe Bounavorsingslaboratorium by die Raad se nuwe navorsingsterrein sewe myl oos van Pretoria. Dit het 'n aansienlike tyd geduur om die verskuiwing te voltooi. Al die laboratoriumwerk is onderbreek en in baie gevalle was 'n aansienlike tyd nodig om weer die toerusting op die nuwe perseel op te rig.

ARGITEKTUUR

Sosio-ekonomiese Studies

Dié studies is gedeeltelik gesteun deur 'n toekenning van die Maatskaplike Navorsingsraad. Die veldwerk van al die sosio-ekonomiese opnames (Port Elizabeth, Durban, Vereeniging, Alexandra-dorp, Bantule (Pretoria), Kaapstad en Springs) is nou voltooi en die meeste van die gegewens is getabuleer. Die vorige bevinding dat die stedelike Bantoebevolking in drie verskillende ekonomiese groepe ingedeel kan word vir elk waarvan 'n ander soort behuising verskaf moet word, is in elke sentrum waar die tabulering voltooi is, bevestig. Dit het egter geblyk dat die persentasies in elke groep verskil. So is daar bv. meer in die hoër groepe in die Kaapse Skiereiland as op die Rand.

Beplanning van Dorpe vir Stedelike Bantoes

Die werk i.v.m. die beplanning van die Kwa-Thema proefdorp by Springs is nou voltooi. Die dele wat onlangs ontwerp is, sluit baie digbevolkte gebiede in (9 huise per akker). Om plek te spaar, is slegs toegang vir voetgangers toegelaat. Aangesien daar min ryhuise in die

National Building Research Institute

Director: MR. J. E. JENNINGS.

The Building Research Advisory Committee has met regularly at two-monthly intervals and continued to give valuable guidance to the work of the Institute. The regional sub-committee in Cape Town has stressed the need for research work which is applicable to the Cape Peninsula, in particular problems of water-proofing of buildings. A start has been made on this programme of research. Another project being undertaken on a regional basis in the Cape is related to foundation movements, and a member of the sub-committee has undertaken to make level observations of the movements of selected buildings in Cape Town. The sub-committee on the Costs of Native Housing (the Louw Committee) has been active in completing reports on this project. A new Steering Committee has been constituted to advise on the project relating to the deterioration of concrete in marine environments. The voluntary work of members of these committees is gratefully acknowledged.

The Institute has handled fellowships, grants and contracts to the value of £17,700 during the year. The number of contracts completed during the year, or still in progress in the Institute is 52.

Probably the most important event of the year has been the occupation of the new Building Research Laboratory at the Council's new research centre seven miles east of Pretoria. The move has taken a considerable time to complete: it caused a complete interruption of all laboratory work and in many cases quite considerable time was required for the re-erection of equipment in the new premises.

ARCHITECTURE

Socio-economic Studies

These studies have been partly sponsored by the Council for Social Research. Field work on all socio-economic surveys (Port Elizabeth, Durban, Vereeniging, Alexandra Township, Bantule (Pretoria), Cape Town and Springs) has now been completed and most of the data have been tabulated. The previous finding that the urban Bantu population can be considered to fall into three distinct economic groups, each requiring a different class of housing, has been confirmed in each centre for which tabulation is complete. It has been observed that the percentages in each group vary, there being a larger proportion in the upper groups in the Cape Peninsula than on the Reef.

Planning of Urban Bantu Towns

Work on the planning of the Kwa-Thema experimental town at Springs has now been completed. The most recently designed sections incorporate areas of very high density (9 dwellings/acre) and pedestrian access has been used to reduce the area given to roads. As little

ontwerp vir die digbevolkte gebied ingesluit was kan verwag word dat die bevolking nog digter sal wees as die gebruik van ryhuise vryelik toegelaat word.

Huisontwerpe vir die Stedelike Bantoe

Na die wedstryd wat deur die S.A. Instituut van Argitekte georganiseer is vir goedkoop huise geskik vir bewoning deur Bantoes, is daar begin met die opstel van 'n brosjure waarin die planne wat ingedien is so ontwikkel is dat dit die Staatsvereistes vir beplanning en koste sal bevredig. Dit was 'n baie groot werk, want daar moes publikasie- en werkstekeninge gemaak word van 20 huise wat vir die doel gekies is. Die koste van die druk van die brosjure sal gedek word uit 'n toekenning van die Instituut van Argitekte.

Hulp aan die S.A. Nasionale Tuberkulose-Vereniging

Die Pretoriase Nedersettingskema is ontwerp en word tans naby Atteridgeville gebou. Hopelik sal die koste laag wees en die algemene werking van die skema net so suksesvol soos dié van Alexandra-dorp, wat ook deur die Instituut ontwerp is. Dit sal die laaste skema wees wat vir S.A.N.T.A. ontwerp word, aangesien twee suksesvolle lae-koste-skemas as voldoende beskou word om die beginsels van die Instituut te demonstreer.

Skoolgeboue

Daar is begin met 'n ondersoek van skoolgeboue. In medewerking met die Transvaalse Onderwysdepartement, word ontwerpstandaarde vir skoolgeboue opgestel. 'n Brosjure, getitel *'n Gids tot die beplanning van laerskole vir Bantoes* is vir die Departement van Naturellesake opgestel. Twee eksperimentele Bantoeskole is ontwerp en na verwagting sal die bouwerk binnekort 'n aanvang neem.

INGENIEURSAFDELING

Koste van Huise vir Stedelike Bantoes

Die resultate van waarnemings wat gemaak is in proefnemings i.v.m. kostevermindering is in die jaar getabuleer en ontleed en ander ondersoeke wat die inligting moes aanvul is ook voltooi. Die verslae van vyf onderkomitees van die Louw-komitee is geskryf en vier is gereed om voor die Hoofkomitee gelê te word. Die verslag van die Hoofkomitee word opgestel.

Dié verslae, tesame met 18 gekeurde herdrukke uit die Bounavorsingsbulletin, sal die boek *Navorsingstudies oor die Koste van Behuising van Stedelike Bantoes* vorm. Dit sal hopelik binnekort gepubliseer word.

Gewapende Baksteenmure vir Geboue op Uitsettende Kleifondamente

Toetse op die eksperimentele huis wat op drie punte steun het aanvanklik goeie resultate gelewer, maar later het dit misluk toe die volle belastings nog op die gebou

row housing has been incorporated into the area of high density, higher densities can be expected if the free use of row houses is allowed.

House Plans for the Urban Bantu

Following on the competition organised by the S.A. Institute of Architects for low-cost houses for house ownership by the Bantu, work has been undertaken on the preparation of a brochure in which the plans submitted have been developed into a form which satisfies the State requirements for planning and cost. This task has proved to be of some magnitude as it involved the making of publication and working drawings of 20 house plans selected for the purpose. The costs of printing the brochure will be met from a grant made by the Institute of Architects.

Assistance to S.A. National Tuberculosis Association

The Pretoria Settlement Scheme has been designed and is at present being built in the vicinity of Atteridgeville. It is hoped that the costs will be as low and the general working of this scheme as successful as that at Alexandra Township which was also designed by the Institute. This is to be the last scheme designed for S.A. National Tuberculosis Association, since two successful low-cost schemes are considered sufficient to demonstrate the principles enumerated by the Institute.

School Buildings

A start has been made on an investigation into school buildings. Working with a committee of the Transvaal Education Department, design standards for school buildings are being written. A brochure entitled *A Guide to the Planning of Bantu Primary Schools* has been prepared for the Department of Native Affairs. Two experimental Bantu schools have been designed and it is expected that the building of these schools will commence shortly.

ENGINEERING DIVISION

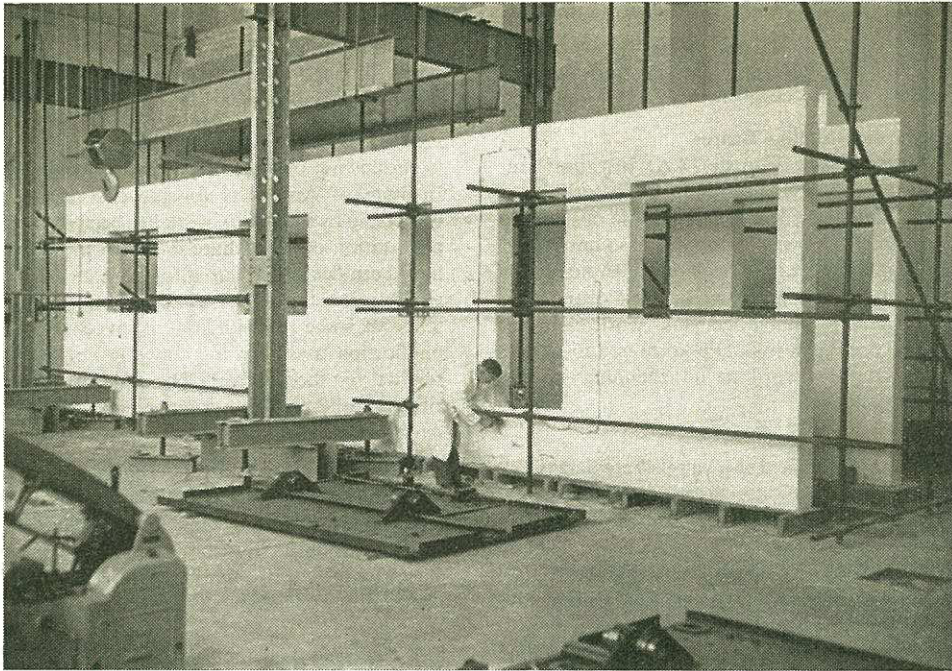
Costs of Urban Bantu Houses

The year has been devoted to the tabulation and analysis of the results of observations made on the experiments in connection with the reduction of costs, and in completing other investigations which were required to supplement this information. The reports of five sub-committees of the Louw Committee have been written and four are ready for presentation to the Main Committee. The report of the Main Committee is being written.

These reports, together with 18 selected reprints from the Building Research Bulletin will form the book *Research Studies on the Costs of Urban Bantu Housing*, which it is hoped will shortly be published.

Reinforced Brick Walls for Buildings on Expansive Clay Foundations

Tests on the experimental three-point supported house gave satisfactory results initially but failure occurred later while full loads were still on the building. This



Spanningsmeters word verbind aan 'n eksperimentele muur van gewapende baksteenwerk vir huise met drie puntfondamente op stygende gronde.

Connecting strain gauges to an experimental wall of reinforced brickwork for houses with three-point foundations on heaving soils.

was. Dit het na 'n swaar reënval gebeur en daar is eers gemeen dat dit veroorsaak is deurdat die bakstene sag geword het, maar verdere berekeninge het getoon dat 'n tekort aan skuifstaal in die mure daartoe bygedra het.

'n Hersiene teorie vir die ontwerp van gewapende baksteenmure is opgestel volgens die beginsels van sekondêre spanningsontleding. Proefnemings waarin 'n gedeelte van die vertikale staal vooraf onder spanning geplaas sal word, is tans onderweg om die nuwe teorie te kontroleer.

Veldtoetse op Bouwerke

'n Aantal bouwerke, insluitende twee brúe en 'n paar voorgespanne vloere is vir verskeie organisasies getoets. Die toetse het die berekening van moontlike spannings en vervorming ingesluit en waarnemings van die reaksie van die bouwerke onder belasting is gedoen.

GRONDMEGANIKA

Slykdamme

Na 'n voorlopige ondersoek van die meganika van verdigting van 'n afsaksel wat voortdurend opgebou is en na 'n beperkte aantal laboratoriumsproewe om die teorie op klein skaal in 'n besinkseltenk uit te toets, is daar besluit op 'n meer direkte benadering deur die toestande van hellingstabiliteit van 'n aantal slykdamme te ondersoek. Daar was reeds opgemerk dat party van die damme moeilikheid veroorsaak. Boorwerk en die verkryging van onverstoorte monsters van sagte slyk, het

took place after heavy rain and it was at first believed to be caused by the softening of the bricks, but further calculations have indicated that an insufficiency of shear steel in the walls was a contributory cause.

A revised theory for the design of reinforced brick walls has been developed using the principles of secondary stress analysis. Experiments in which portion of the vertical steel will be prestressed are at present in progress to check the new theory.

Field Testing of Structures

A number of structures, including two bridges and some prestressed floors, have been tested for various organizations. These tests involved calculation of probable stresses and deflections, and the observation of the behaviour of the structures when loaded.

SOIL MECHANICS

Slimes Dams

After a preliminary examination of the mechanics of consolidation of a continuously deposited sediment and a limited number of laboratory tests to test the theory in a small scale sedimentation tank, it was decided to adopt a more direct approach and examine the conditions of slope stability on a number of slimes dams. Some of the dams selected were observed to give trouble. Drilling and recovery of undisturbed samples of soft

die ontwikkeling van 'n nuwe monsternemingstegniek nodig gemaak.

Fondamente op Uitsettende Kleigronde

Die werk van dié projek was van 'n meer fundamentele aard. Eerstens is die oorsprong van uitsettende grondprofiel wat uit stolrotse ontwikkel het, bestudeer. Tweedens word die meganika van uitsetting bestudeer deur waarneming van die veranderinge in grondvolume wat saamgaan met veranderinge in die voginhoud onderwyl die grondmonster aan verskeie toestande van insluitingsdruk onderwerp word. Derdens is daar begin met die ontwikkeling van 'n instrument om die negatiewe druk van die water in die porieë van die grond te meet. Die instrument sal gebruik word in studies van voghellings en skuifvastheid van gedeeltelik-versadigde grond.

Gedurende die jaar is die teorie dat daar 'n toename in die voggehalte van die grond onder 'n gebou kan wees deur direkte metings bevestig.

Ondersoek- en Toetsdienste

Daar bestaan so 'n diens vir adviserende ingenieurs en organisasies wat ingenieurs in diens het. Dit sluit geologiese ondersoeke, grondondersoeke en toetse van grondmonsters in.

AFDELING VIR BOUSTOWWE

Betontechnologie

Vorige ondersoeke van die reaksie van sementprodukte in aggressiewe omgewings het getoon dat daar nog leemtes is in die bestaande kennis van die meganisme en die reaksies wat by verslegting plaasvind. Werk i.v.m. die gedrag van die hidrasieprodukte van sementminerale in aggressiewe oplossings is nou aan die gang. Studies van die tempo en graad van inwerking van 'n aantal belangrike nywerheidschemikalieë op produkte wat met verskeie soorte sement gemaak is, duur voort.

Die uitwerking van faktore soos gradering van aggregate, insluiting van lug en hardwordingstoestande op die deurdringbaarheid van beton, word bestudeer.

Verwerking van Beton

Die werk wat vir die Instituut van Munisipale Ingenieurs gedoen is oor die wegvreting van betonriole deur swawelsuur wat deur swaweloksiderende bakterieë gevorm word, is voltooi. Dit het die ondersoek van verskeie beskermingsmetodes vir bestaande rirole ingesluit.

Daar is nou begin met werk i.v.m. die verslegting van beton en gewapende beton in kusegebiede. Die projek word gesamentlik deur die S.A. Spoorweë en Hawens en die S.A. Instituut van Siviele Ingenieurs gesteun.

Oormatige Krimping van Beton

Die eienaardige gedrag van betongeboue in sekere dele van die Kaapprovinsie en aangrensende gebiede is nagespoor. Dit word veroorsaak deur die oormatige inkrimping van beton wat gemaak is met aggregate uit die Beaufort-reeks van sandsteen en skalies. Die belangrikste kenmerke was oormatige buiging van balke, plate en oorhangende dakke of balke, barste in die betonbe-

slime necessitated the development of new sampling techniques.

Foundations on expansive clay soils

Work on this project has been of a more fundamental nature. Firstly, a study of the genesis of expansive soil profiles developed from igneous rocks has been made. Secondly, the mechanics of swelling is being studied by observing the changes of volume of soils which take place with changes of moisture content, the sample of soil being subjected to varying conditions of confining pressure. Thirdly, work has been started on the development of an instrument to measure negative pore water pressure in a soil. This instrument is to be used in studies of moisture gradients and shear strength of partially saturated soils.

During the year there has been confirmation, made by direct measurements, of the theory that there is a gain in the moisture content of the soil under a building.

Exploration and Testing Services

A service which includes geological investigations, soil exploration and tests of soil samples is being supplied to consulting engineers and organizations employing engineers.

MATERIALS DIVISION

Concrete Technology

Investigations done in the past on the behaviour of cement products in aggressive environments have brought to light gaps in the existing knowledge regarding the reactions involved and the mechanisms whereby deterioration occurs. Work is in progress on the behaviour of the hydration products of cement minerals in aggressive solutions. Studies are being continued on the rate and degree of attack of a number of industrially important chemicals on products made with various types of cement.

The effects of factors such as grading of aggregates, entrainment of air and curing conditions on the permeability of concrete are being studied.

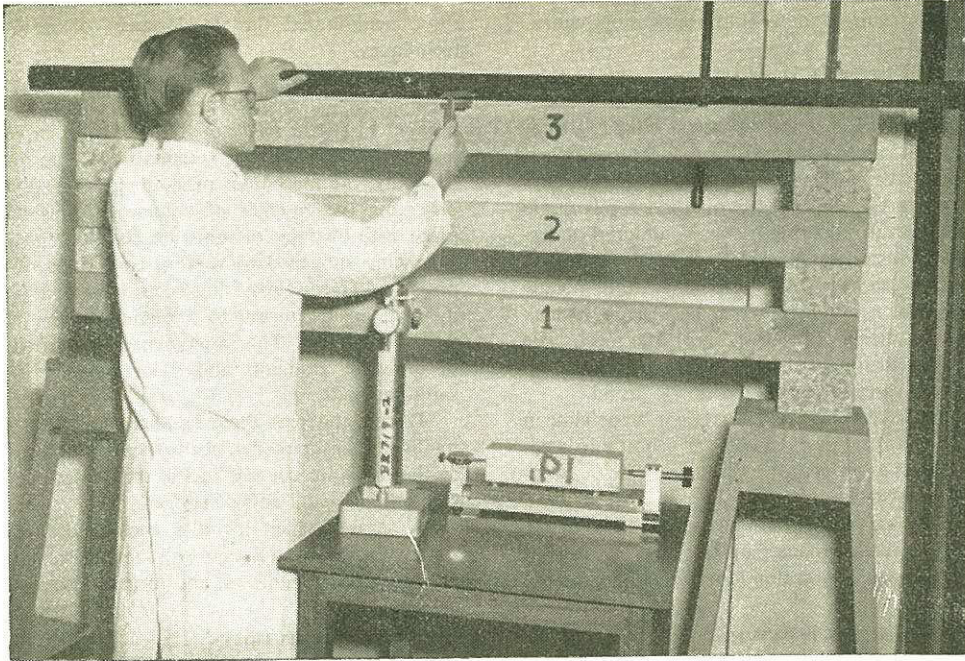
Corrosion of Concrete

The work done on behalf of the Institution of Municipal Engineers on the deterioration of concrete sewers due to attack by sulphuric acid produced by sulphur-oxidising bacteria has been completed. This included investigation of various methods of protecting existing sewers.

Work has now commenced on the deterioration of concrete and reinforced concrete in marine environments, a project sponsored jointly by the S.A. Railways and Harbours and the S.A. Institution of Civil Engineers.

Excessive Shrinkage of Concrete

The peculiar behaviour of concrete structures in certain parts of the Cape Province and adjacent areas was traced to excessive shrinkage of concrete made with aggregates derived from the Beaufort series of sandstones and shales. The main symptoms were excessive deflection in beams, slabs and cantilevers, cracking of concrete cover over reinforcement and severe weatherin



'n Studie van die vervorming van gewapende betonbalke wat met krimpende aggregate gemaak is.

A study of the deformation of reinforced concrete beams made with shrinking aggregates.

dekking van die bewapening en ernstige verwering. Werk i.v.m. die vraagstuk word voortgesit om te bepaal hoe moeilikhede in toekomstige geboue vermy kan word.

Kalk in Geboue

Die bevindinge van die Instituut se uitgebreide laboratorium- en veldondersoeke van die eienskappe van boukalk is op versoek van die S.A. Buro vir Standaarde in 'n memorandum saamgestel met aanbevelings vir 'n nuwe S.A. standaardspesifikasie vir boukalk.

'n Ontwerpspesifikasie gebaseer op die memorandum is in medewerking met die S.A. Buro vir Standaarde voltooi.

Verwe

Die eksperimentele werk i.v.m. die verhoging van die duursaamheid van verf vir gegalvaniseerde ysterdakke nader voltooiing en daar word aanbevelings opgestel vir verfformules en verfprosedures.

FUNKSIONELE DOELTREFFENDHEID VAN GEBOUE

Termiese Omgewing in Geboue

Die begrip van 'n „gesondheidsgebied” is ontwikkel as 'n uitbreiding op die „behaaglikheidsgebied” vir omgewingstemperature in lae-koste behuising. Die „gesondheidsgebied” stel die grense voor waarbuite die gesondheid van die inwoner benadeel mag word en die

Work on this problem is being continued to find means of avoiding trouble in future constructions.

Lime in Buildings

At the request of the S.A. Bureau of Standards, the relevant findings emerging from the Institute's extensive investigations into the properties of limes used in building, both in the laboratory and in the field, have been collated in a memorandum containing recommendations for a new S.A. standard specification for building limes.

A draft specification based on this memorandum has been completed in collaboration with the S.A. Bureau of Standards.

Paints

The experimental work on improving the durability of paints for galvanized iron roofs is reaching finality and recommendations regarding paint formulations and painting procedures are being drafted.

FUNCTIONAL EFFICIENCY OF BUILDINGS

Thermal Environment in Buildings

The concept of a “health range” as an extension of the “comfort range” for environmental temperatures in low-cost housing has been evolved. This “health range” visualizes thermal limits beyond which the health of the occupants might be impaired, and the limits have been

grense is vasgestel in oorleg met die Unie se Gesondheidsowerhede. Dit word nou op Bantoe-behuising in Suid-Afrika toegepas.

Klimaatgegevens vir Gebruik in die Ontwerp van Geboue

'n Verhandelingsopstelling is opgestel wat 'n opsomming gee van die ontwikkeling van ontwerpsdag-weerstoestande vir die winter en somer vir verskeie sentrums in die Unie. Dit is gebaseer op die beskikbare uurlikse waarnemings van lugtemperatuur, vogtigheid, sonstraling en windsnelheid wat oor 'n tydperk van vyf jaar deur die weerstasie gemaak is. Die ontwerpsdag-gegevens is gekies uit die meteorologiese gegevens vir dae waarop die buitelugtemperatuur — die belangrikste faktor — die hoogste of laagste was. Uit die proefnemings met die groep Naturellehuise in Atteridgeville is gevind dat die metode 'n goeie grondslag verskaf vir die voorspelling van binnenshuise termiese omgewingstoestande.

Hitte-oordrag in Geboue

Die ontleding van die resultate wat verkry is van 'n reeks proefhuise in Atteridgeville is voltooi en 'n verslag wat voorspellings gee vir termiese omgewings vir soortgelyke geboue in ander dele van die land is gepubliseer.

Daar is 'n reeks volskaalse toetse op plafonisolasies ontwerp en vyf identiese huise word nou by Atteridgeville gebou om die toetse op uit te voer.

Saam met die ondersoek is werk i.v.m. die meer fundamentele gesigspunte van hitte-oordrag in geboue ook hervat in die toetskamer op die buiteterrein in Jacob Maréstraat.

Ventilasie in Geboue

'n Reeks toetse wat by Atteridgeville uitgevoer is, het getoon dat met die huidige normale boumetodes, daar nie dikwels aan die aangenome vereistes vir permanente ventilasie voldoen word nie. Ondersoek word ingestel na die verbetering van ventilasie sonder dat meer trek veroorsaak word. Die grondslag vir die aangenome ventilasievereistes word ook ondersoek.

By Leeuhof, Vereeniging, word voortgegaan met toetse om die uitwerking van die afkoeling van geboue op termiese en ventilasietoestande binnenshuis te bepaal. Daar word ook gepoog om geleentheidsventilasie vir die somer te verbeter deur 'n stelsel wat voorsiening maak vir beheer gedurende die winter.

Verligting in Geboue

'n Reeks modelstudies van die dagligverligting van 'n voorgestelde standaardklaskamer is uitgevoer en aanbevelings gemaak i.v.m. verligtingswaardes, oriëntering van klaskamers, die grootte van vensters en die beste kleure vir mure en plafon. Daar is gevind dat weerkaatsing van die grond en van die binnekant van mure en plafon 'n baie belangrike rol speel in die verligting van die kamer. Dié inligting is ingesluit in die brosjure *Gids tot die beplanning van primêre Bantoeskole* wat vir die Departement van Naturellesake opgestel is.

set in association with the Union health authorities. It is now being applied to housing in South Africa.

Climatic Data for Use in the Design of Buildings

A paper summarizing the development of design-day weather data for winter and summer for various centres in the Union has been prepared. This is based on the available hourly weather station observations of air temperature, humidity, solar radiation and wind speed over a five-year period. The design-day conditions have been chosen from the meteorological data for days on which the air temperature, the most important factor, is most severe. This method has been found from the Atteridgeville group of Native house experiments to give a good basis for predicting indoor thermal environment.

Heat Transmission in Buildings

The analysis of the results obtained on a series of test houses at Atteridgeville has been completed and a report published, giving predictions of thermal environments for similar constructions in other parts of the country.

A series of full-scale tests on ceiling insulations has been designed and five identical houses are being constructed at Atteridgeville to enable these tests to be carried out.

In association with this investigation, work is being resumed on the more fundamental aspects of heat transmission in the test room on the Jacob Maré Street field site.

Ventilation in Buildings

A series of tests undertaken at Atteridgeville has shown that, with existing normal methods of construction, accepted requirements for permanent ventilation are not very frequently realised. Systems for improvement of ventilation without increasing draughts are being investigated: the basis of the accepted ventilation requirements is also being examined.

At Leeuhof, Vereeniging, tests to determine the effects of structural cooling on indoor thermal and ventilation conditions are being continued. An attempt is also being made to improve occasional ventilation during summer with provision for control during winter.

Lighting in Buildings

A series of model studies has been carried out on the daylighting of a proposed standard type of school classroom and recommendations made in regard to illumination levels, orientation of classrooms, window sizes and colour selection for the walls and ceilings. It has been found that ground reflection and internal wall and ceiling reflections play a very important part in the room illumination. The information has been incorporated in the brochure *Guide to the Planning of Bantu Primary Schools* prepared for the Native Affairs Department.

Nasionale Instituut vir Personeelnavorsing

Direkteur: DR. S. BIESHEUVEL.

In die navorsingsprogram vir 1952/53 was voorkeur gegee aan studies wat beter gebruik van die land se skaars mannekrag beoog het. Hierdie studies sluit in die instelling van verbeterde beroepswaarderingsmetodes; opleidingsnavorsing; die ontwikkeling van tegniek vir die ontleding van arbeidsomset, afwesigheids- en ongeluksgegewens; die formulering van maatstawwe vir produktiwiteitstudies en die beoordeling van die werker se houding teenoor sy werk.

Soos sal blyk uit die volgende breedvoerige gegewens, is die vordering van hierdie en ander navorsingsondernemings gestrem deur 'n tekort aan behoorlik opgeleide personeelnavorsingswerkers. Die praktiese toepassing van beroepsielkunde, wat deur die Instituut ontwikkel is, het gelei tot 'n aanvraag vir personeelsielkundiges in industrieë wat moeilik bevredig kon word. 'n Aantal senior staffede het betrekings in industrieë aanvaar en gegradueerdes in sielkunde vanaf die universiteite vind dit maklik om aantreklike betrekings as personeelbestuurders, personeelkeurders of beroepsvoorligtingsbeamptes te kry. In een opsig is dit 'n welkome ontwikkeling, daar dit verseker dat die resultate van personeelnavorsing behoorlik toegepas word, en dat daar 'n terugvloei van nuwe navorsingsprobleme sal wees.

Gegradueerdes van 'n genoegsame hoë gehalte is egter nie in genoegsame aantalle beskikbaar om die tweevoudige aanvraag vir navorsers en praktisyns te bevredig nie. 'n Aantal poste moes dus ongevol gelaat word. Die kontinuïteit van navorsing is verder gestrem deur 'n hoë mate van arbeidsomset in die Instituut wat gedurende die jaar gestyg het tot 27%. Die tekort aan staf is gedeeltelik tegemoetgekom deur die aanstelling van werkstudiespanne, bestaande uit werknemers van die organisasie wat die navorsingsprojek ondersteun en wat onder leiding van die N.I.P.N. taakbeskrywing, die versameling en ontleding van arbeidsomset- en afwesigheidsgegewens, die roetine-toepassing van aanlegtoetse en dergelike take onderneem.

Personeelkeuring

Alhoewel personeelkeuring geleidelik minder beklemtoon word as doeltreffende arbeidsgebruik, is nogtans 'n aansienlike hoeveelheid werk op die gebied van personeel-seleksie verrig. Geskikte toetse is toegepas op ingeskrewenes vir opleiding in ambagte aan tegniese skole, op mynbeamptes, administratiewe leerlinge, en op diegene wat gespesialiseerde opleiding in die Unie-Verdedigingsmag ondergaan. Tweehonderd sewe-en-dertig ambagsvakleerlinge is vir industrieë getoets, en 9% van die applikante is ongeskik gevind vir geskoolde arbeid. 'n Opvolgingstudie van hysbakvakleerlinge het getoon dat sukses in hierdie ambag bevredigend voorspel kan word deur die N.I.P.N. se toetsbattery. Werk word

National Institute for Personnel Research

Director: DR. S. BIESHEUVEL

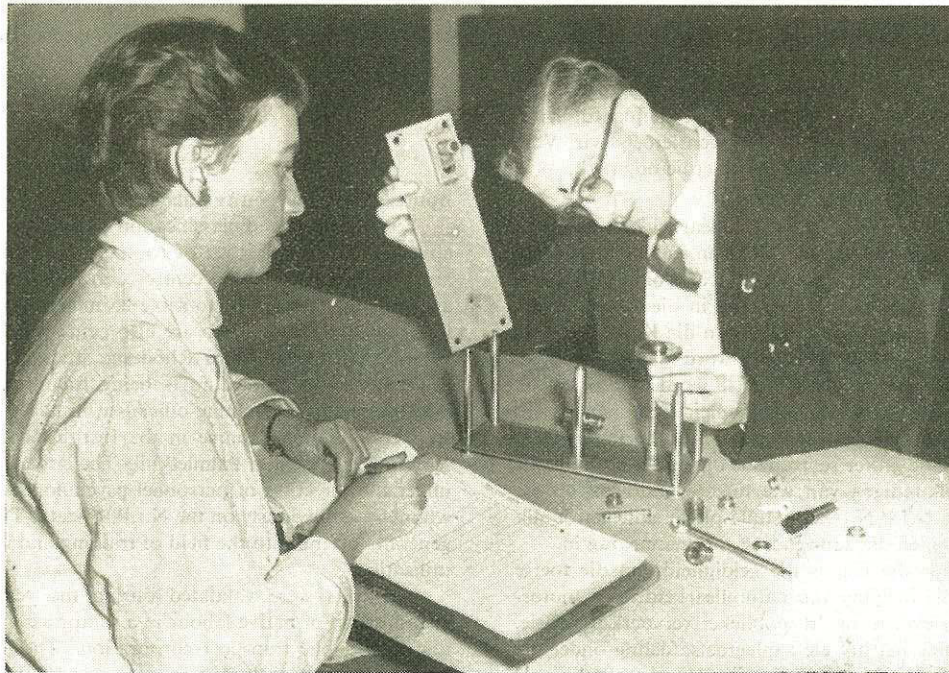
In the research programme for 1952/53 priority was granted to studies aimed at the better use of the country's scarce manpower. These studies included the introduction of improved job evaluation methods, training research, the development of techniques for the analysis of labour turnover, absence and accident data, the formulation of criteria to be used in productivity studies and the assessment of the worker's attitude towards his job.

As will be gathered from the more detailed accounts that follow, the progress of these and other research projects was hampered by the scarcity of properly trained personnel research workers. The practical applications of occupational psychology, which have been fostered by the Institute's work, have led to a demand for personnel psychologists in industry which it has been difficult to satisfy. A number of senior staff members has taken up industrial appointments and psychology graduates from the Universities have readily found attractive posts in personnel management or selection, and in vocational guidance. In one way this is a welcome development, for it ensures that the results of personnel research will be properly applied, and that there will be a feed-back of new research problems.

Graduates have not, however, become available in sufficient numbers, nor of sufficient quality, to meet the two-fold demand for research workers and practitioners. Thus a number of posts had to be left vacant and the continuity of research was further hampered by a high labour turnover rate in the Institute, which rose to 27% during this year. The staff shortage has partly been met by the establishment of work-study teams, consisting of employees of the organization sponsoring a research project, who work under the direction of the N.I.P.R. on such tasks as job description, the collection and analysis of labour turnover and absentee data and the routine administration of aptitude tests.

Personnel Selection

Though the shift in emphasis from the selection of personnel to their efficient use on the job has continued, considerable work has nevertheless been done on this subject. Previously constructed tests were applied to entrants for trade training into a technical college, to mine officials, administrative trainees, and to those undergoing specialist training in the Union Defence Forces. For industry 237 artisan apprentices were tested, and 9% of the applicants were found unsuitable for skilled work. A follow-up study of lift apprentices showed that success in this trade can be satisfactorily predicted by the N.I.P.R. test battery. Work continues on the merit rating scheme inaugurated by the Chamber of Mines for apprentices in the mines engineering workshops. Merit



'n Aanlegtoets vir ambagsvakeerlinge waarin hulle 'n meganiese model moet saamstel.

An aptitude test for artisan apprentices which involves the assembly of a mechanical model.

voortgesit aan die skema vir merieteskating wat ingestel is deur die Kamer van Mynwese vir vakeerlinge in die myningenieurswerkplase. Merieteskatings word bestudeer in verhouding tot geskrewe en praktiese ambagstoetsuitslae, en onderwerp aan statistiese ontleding om hulle betroubaarheid en betekenis te bepaal. Dit mag 'n nuttige opvolgingskriterium blyk te wees, met behulp waarvan die geldigheid van 'n toetsbattery vir roetine gebruik op die myne bepaal kan word. Met „geldigheidsbepaling”, 'n tegniese term wat telkens in hierdie verslag gebruik sal word, word bedoel die vasstelling van die mate van ooreenkoms tussen die toetsresultate en die opvolgingsgegewens. Dit word gegee in so 'n vorm dat dit moontlik is om die mate van sukses wat 'n kandidaat sal bereik in opleiding of in sy werk te voorspel op grond van sy toetsprestasie.

Roetine-toepassing van aanlegtoetse is nie een van die Instituut se funksies nie. Die hoofdoel van die toets van die bogemelde groepe was dus om die geldigheid van toetse na te gaan en om hulle voorspellingswaarde te verhoog. Met die uitvoering van hierdie navorsingswerk is daar terselfdertyd voorsien in 'n praktiese aanvraag.

Te oordeel na die aantal navrae is daar alreeds 'n groot aanvraag vir toetsfasiliteite. Herhaaldelike navrae vir beroepsvoorligting word ook ontvang. Weereens is dit 'n diens wat die Instituut nie veronderstel is om te verrig nie. Daar bestaan dus aansienlike geleentehede vir

ratings are being studied in relation to written and practical trade test results, and subjected to a number of statistical checks, to determine their reliability and significance. They may prove to be a useful follow-up criterion against which to validate the test battery for routine use on the mines. By “validation”, a technical term that will be used from time to time in this report, is meant the determination of the closeness of the agreement between test results and follow-up data, in such a form that it becomes possible to forecast from a test result the degree of success a candidate will achieve in training or on the job.

Routine aptitude testing is not one of the Institute's functions; the primary object in testing the categories that have been mentioned was, therefore, to check the validity of the tests, and to improve their predictive power. Whilst fulfilling this research function, a practical need was met at the same time.

Judging by the number of enquiries received, there is already a great need for testing facilities. Frequent requests are also received for vocational guidance, which again is a function the Institute is not intended to perform. Considerable scope, therefore, exists for the private consultant and to those with the proper qualifications and experience, tests can be made available as soon as they are out of the research stage. The standardization

private raadgewende beroepsielkundiges en aan diegene wat oor die nodige kwalifikasies en ondervinding beskik, kan toetse beskikbaar gestel word sodra die geldigheid en betroubaarheid daarvan bepaal is. Die standaardisering van die Wechsler-Bellevue Intelligensietoets vir Volwassenes word ook uitgevoer met hierdie oogmerk.

Aanlegtoetse vir Naturellearbeid

Keuring en indeling van naturellearbeid deur middel van toetse het alreeds die stadium van roetine-toepassing bereik. Daar is reeds 14 indelingsentrums of in werking of in oprigting, in diens van 25 myne in die Transvaal en Vrystaat. Twee word ook opgerig in die Koperstreek in Noord-Rhodesië. In elke geval word die N.I.P.N. se toetsprosedure gevolg en die toetse word toegepas deur mynbeampes wat 'n ses-weekse opleidingskursus in die Instituut se Mynnavorsingsdepartement te Palmietkuil gevolg het. Die groter sentrums is onder die bestuur van personeelsielkundiges van wie meeste voorheen op die staf van die N.I.P.N. was. Hulle pligte sluit gewoonlik ook opleiding en die aanwending van mannekrag in.

Gedurende die jaar is die geldigheid van die toetse bewys vir die indeling van naturellearbeid in 'n motor-monteerfabriek en in 'n publieke vervoer korporasie. Laasgenoemde het hul eie aanlegtoetsafdeling onder die beheer van 'n sielkundige opgerig. Hierdie afdeling sal die toepassing van toetse sowel as studie betreffende die oorsake van ongelukke behartig.

Menige navrae is ontvang van firmas in die Unie wat gebruik wil maak van die toetse. Eksperimentele gegewens dui daarop dat die toetse geldig sal wees vir 'n wye verskeidenheid van take wat deur naturelle verrig word, maar waar die werk 'n hoër opvoedkundige standaard as die primêre skool vereis, sal bykomende toetse van die verbale en numeriese tipe ingesluit moet word. Gevolglik kan die toetse voorlopig deur industrieë waarvoor hulle nog nie geldig bewys is nie, gebruik word om applikante in te deel in opsigters-, halfgeskoolde en ongeskoolde groepe.

'n Aantal reëlins word getref op hierdie grondslag, op die voorwaarde dat die persoon wat die toetse sal toepas deur die N.I.P.N. opgelei moet word en dat toetsresultate en opvolgingsgegewens in die vorm van werksindings, opleidingsresultate of merieteskattings verstrek moet word. Hieruit kan verdere kennis insake die omvang van die toepasbaarheid van die toetse verkry word. Af en toe vra firmas dat toetsstandaarde opgestel moet word in terme van die voorspellingswaarde van die toetse, spesiaal vir gebruik in hulle eie organisasie. Hoewel dit uit 'n wetenskaplike oogpunt verkieslik is, sal dit veroorsaak dat die praktiese toepassing van die toetse uitgestel moet word omdat daar nie genoegsame staf is om meer as een van hierdie geldigheidsbepalings op 'n slag uit te voer nie. Die uiteindelijke doelwit van die gelyktydige praktiese gebruik van die toetse en die versameling van opvolgingsgegewens is om 'n algemene indelingstoets vir naturellearbeiders en operateurs op te stel, wat ook sal dien as 'n siftingstoets vir hoër groepe.

of the Wechsler-Bellevue Adult Intelligence Test is also being carried out with this end in view.

Aptitude Tests for Native Labour

Test selection and classification of native labour has already reached the stage of routine application. There are now 14 classification centres either in operation or about to be established, to serve 25 mines in the Transvaal and Free State. Two are also being formed on the Copper Belt in Northern Rhodesia. In each case, the N.I.P.R. testing procedure is being followed, and the tests are applied by mining officials who have attended a six weeks' training course in the Institute's Mines Research Department at Palmietkuil. The larger centres are under the direction of personnel psychologists, most of whom were previously on the N.I.P.R. staff. Their duties generally extend into the field of training and manpower utilization.

The tests were validated during the year for the classification of native labour in a motor assembly plant and in a public transport corporation. The latter have set up their own aptitude test section under the direction of a psychologist. It will combine test application with studies of the causation of accidents.

Many enquiries were received from firms in the Union who wish to make use of the tests. Experimental evidence indicates that the tests will cover a wide range of jobs performed by natives, except that where these involve educational requirements beyond the primary school, additional tests of the verbal and numerical type will have to be included. Consequently they can be used tentatively by industries for which they have not yet been validated, to classify applicants into supervisory, semi-skilled and unskilled groups.

A number of arrangements is being made on this basis, a condition being that the person responsible for applying the tests should be trained by the N.I.P.R. and that test scores and follow-up data in the form of job classifications, training results or efficiency assessments should be submitted, from which further knowledge about the range of application of the tests can be gained. Occasionally firms request that test standards should be set, in terms of the forecasting capacity of the tests, specifically for their works. Whilst this is preferable from a scientific point of view, it defers practical application of the tests, as there is insufficient staff to handle more than one of these validations at a time. The ultimate object of the simultaneous practical use of the tests and the collection of follow-up information is to produce an all-purpose classification test for native labourers and operatives, which will also serve as a screening test for higher categories.

Many requests for permission to use the tests have been received from territories to the north of the Union.

Menige navraag vir die gebruik van die toetse is ontvang van gebiede ten noorde van die Unie. 'n Beampte van die Departement van Gevangenis, Kenia, is opgelei om die toetse toe te pas op Kikuyu-geïnterneerdes om hulle in te deel vir beroepsopleiding.

Die toetse sal ook gebruik word deur die Verkeers-opleidingsdepartement van die Oos-Afrikaanse Spoorweë en Hawens vir wie 'n toets binnekort in die Unie opgelei sal word. Te Dodoma in Tanganyika sal die toetse toegepas word op kwekelinge vir die sisalindustrie en in Juba, Sudan, sal dit waarskynlik gebruik word vir die keuring van leerlinge vir die Naturelle-Ambagskool. Die Instituut vir Opvoeding van die Universiteitskollege van die Goudkus pas die toetse toe vir die keuring van vakleerlinge en ondersoek hulle bruikbaarheid vir die indeling van natuurle militêre personeel in die tegniese leërambagte. Opvolgingsgegevens sal deur al hierdie bronne beskikbaar gestel word sodat dit uiteindelik moontlik sal wees om standarde vir toetsprestasie te stel vir die ganse Afrika ten suide van die Sahara.

Studies van die Mentaliteit van Inheemse Naturellerasse

'n Toelaag van £4,000 is deur die Carnegie Korporasie gemaak vir die bou van 'n mobiele toetslaboratorium wat gebruik sal word vir veldwerk betreffende die mentaliteit van inheemse naturelle. Dit word beplan beide vir groepeerlegtoetse wat deur middel van 'n rolprent toegepas word en vir individuele toetse van vaardigheid, temperament en psigofisiologiese funksies. 'n Elektroënsefalogram vir die bestudering van die elektriese bringolwe sal ook ingebou word. Die mobiele laboratorium sal dit moontlik maak om persone in verafgeleë stamgebiede te toets sowel as in lokasies en fabriek waar die omstandighede gewoonlik ongeskik is vir presiese metings onder beheerde omstandighede.

'n Eerste studie van die houding van opgevoede naturelle teenoor Westerse etiese en geregtelike begrippe en teenoor standarde van gedrag in die Westerse gemeenskap is voltooi. Dit is aangetoon dat betroubare metings verkry kan word deur middel van 'n vraelys van 'n nuwe tipe en dat hierdie metings ware houdings weergee, eerder as formele verklarings van wat as aanneemlik bekend staan vir Europese publieke opinie. In watter mate werklike gedrag in ooreenstemming met beweerde houding sal wees moet nog ondersoek word.

Oor die algemeen is gevind dat eties-geregtelike en godsdienstige beskouinge swaarder weeg as raadsaamheid, tradisionele waardes, ontsag vir die wens van blankes, vrees, plesier of aggressie. Aansienlike individuele en groepeersterke met betrekking tot ouderdom en opvoedkundige standaard is waargeneem. Ook is gevind dat die oorheersing van 'n bepaalde houding grootliks afhanklik is van die omstandighede wat die houding uitlok. Byvoorbeeld die etiese houding is ten sterkste onderskryf in alledaagse, onderlinge verhoudings, terwyl 'n neiging tot weerstand relatief sterker ondersteun is in die verhouding tussen die individu en die gemeenskap of die Staat, veral wanneer daar diskriminasie op die spel was.

An official from the Kenya Department of Prisons has been trained to apply the tests to Kikuyu internees, in order to classify them for vocational training. They will also be put into operation by the Traffic Training Department of the East African Railways and Harbours, for whom a tester will shortly be trained in the Union. At Dodoma, in Tanganyika, they will be applied to recruits for the sisal industry, and at Juba, Sudan, they are likely to be used for the selection of pupils for the African Trade School. The Institute of Education of the University College of the Gold Coast is applying the tests for the selection of apprentices, and is investigating their usefulness for the classification of native military personnel for technical army trades. From all these sources, follow-up material will be made available, so that eventually it will be possible to set standards for test performance on a pan-African basis for territories south of the Sahara.

Studies of the Mentality of Indigenous African Peoples

A grant of £4,000 was made by the Carnegie Corporation for the construction of a mobile testing laboratory, which will be used for field studies of the mentality of indigenous African peoples. It is being designed both for group aptitude tests applied by means of cine films, and for individual tests of skill, temperament, and psychophysiological functions. An electroencephalograph for the study of the electrical potentials generated by the brain will also be fitted. The mobile laboratory will make it possible to test people in remote tribal areas, as well as in locations or factories where as a rule conditions are unsuitable for precise measurement under controlled conditions.

A first study was completed of the attitudes of educated Natives towards Western ethical and legal concepts, and towards standards of conduct in Western society. It was shown that by means of a new type of questionnaire, reliable measures could be obtained and that these measures represent genuine attitudes rather than formal statements of what is known to be acceptable to European public opinion. To what extent actual behaviour would be in keeping with professed attitudes remains to be investigated.

On the whole, ethico-legal and religious attitudes were shown to be more dominant than expediency, traditional values, deference to European wishes, fear, pleasure or aggression as motivating forces. Considerable individual variations and group differences relating to age and education were found. It was also found that the dominance of an attitude was markedly affected by the nature of the situation evoking it. Thus the ethical attitude was most strongly endorsed in ordinary man-to-man relationships, whereas in relationships between the individual and the community or state, particularly if discriminatory elements entered, there was a tendency towards the relatively higher endorsement of the non-compliant attitude.

Die tegniek skyn geskik te wees vir gebruik in die keuring van naturelle in werk waar eerlikheid en 'n hoë mate van verantwoordelike gevoel verlang word. Dit sal op proef gestel word in 'n studie van werkaanpassing van naturelle in administratiewe poste en vir keuringsmetodes vir sulke werk.

Verdedigingsnavorsing

Hoewel al die siftingstoetse van applikante vir die Staande Mag tans toegepas word by Kommandement-Hoofkwartiere deur militêre toetsbeampies, is baie roetine-toetswerk nog gedoen vir gespesialiseerde opleidingkursusse, soos vir vliegtuigbemanning, vegter-beheerders, operateurs vir grondgeleide naderingstelsels, kadetoffisiere en ambagsmanne. 'n Totaal van 1,732 persone is gedurende die jaar in hierdie kategorieë getoets.

Twee belangrike opvolgingstudies is onderneem wat alle leerlingloodse en tegniese grondpersoneelleerlinge, getoets sedert die einde van die Tweede Wêreldoorlog, dek. Daar is gevind dat keuringstoetse wat gedurende die oorlog opgestel is vir vliegtuig-bemanning, hulle geldigheid behou het vir vredestrydse opleiding. Sukses in die opleiding van ambagsmanne blyk in 'n groot mate beïnvloed te wees deur die onderwys wat hul voor werwing ontvang het. Hierdie faktor, onder heersende opleidingsomstandighede, het meer voorspellingswaarde as aanlegtoetse, hoewel laasgenoemde 'n belangrike bydrae kan maak.

Navorsing in verband met metodes vir die skatting van vliegbekwaamheid is begin. Afgesien van sy onmiddellike praktiese belang mag hierdie navorsing ook lei tot verbeterings in aanlegtoetse vir vlieëners.

'n Nuwe siftings- en klassifikasietoets vir die Unie-Verdedigingsmag is byna voltooi. Verlede jaar is die toets op 3,000 aktiewe Burgermagleerlinge toegepas. Na afloop van hul opleiding is bevoegdheidstoetse op 1,500 van hierdie leerlinge in dertien landmaggroepe toegepas. Daar was 'n groot ooreenkoms tussen die resultate van die siftings- en die bevoegdheidsondersoek, en dit is duidelik dat die toets 'n nuttige instrument vir klassifikasie sal wees vir beide vredestrydse opleiding en mobilisasie in geval van oorlog. Die toepaslikheid van die toets op die Vloot en Lugmag sal ondersoek word. Dit is op so 'n wyse saamgestel dat dit nuttig sal wees vir opnames van die Nasionale bekwaamheidspotensiaal beide vir verdedigings- en siviele doeleindes.

Eksperimentele werk vir die skatting van leierskapsbevoegdheid en bekwaamheid vir spanwerk van 'n militêre aard is reeds begin.

Sekere bevoegdheidstoetse vir vlieëners, saamgestel vir die S.A.L.M. en waarvan die geldigheid bepaal is, word nou op 'n eksperimentele grondslag getoets in twee lande van die Statebond.

Werkstudies

Die metode van waardebeoordeling van werk wat ontwerp is as gevolg van 'n aanvoorstudie van 69 daaglikse betaalde take in 'n nywerheidskorporasie is verder ver-

The technique appears to be well suited for use in the selection of Natives for jobs involving integrity and a high sense of responsibility. It will be tried out in a study of job adjustment of, and selection procedures for Native administrative personnel.

Defence Research

Though all screening tests for Permanent Force applicants are now applied at Command Headquarters by military testing officers, much routine testing was still done for specialist training courses, such as aircrew, fighter controllers, ground controlled approach operators, officer cadets and artisan trades. A total of 1,732 persons was tested during the year in these categories.

Two major follow-up studies were conducted, covering all pupil pilots and all technical ground staff trainees tested since the end of the Second World War. It was found that aircrew selection tests constructed during the war retained their validity for peace-time training. Success in artisan training was found to be strongly influenced by pre-enlistment education. This factor, under prevailing training conditions, proved to have more forecasting value than aptitude tests, though the latter made a significant additional contribution.

Research has been started into methods of assessing flying proficiency. Apart from its immediate practical importance, this research may also lead to improvements in pilot aptitude tests.

A new General Screening and Classification Test for the Union Defence Forces is nearing completion. Last year the test was applied to 3,000 Active Citizen Force trainees. On the completion of their training, proficiency tests were applied to 1,500 of these trainees, in 13 land forces musterings. Agreement between the screening test and the proficiency examination results was found to be high and it is clear that the test will prove a useful classification device, both for peace-time training and for mobilisation in case of war. Its applicability to Navy and Air Force will be investigated. The test has been constructed in such a way as to be useful for surveys of the Nation's ability potential, both for defence and for civilian purposes.

Experimental work on the assessment of leadership ability and on capacity for team-work in a military context is under way.

Certain pilot aptitude tests, constructed and validated on behalf of the South African Air Force, are being tried out experimentally in two Commonwealth states.

Work Studies

The method of job evaluation, evolved in a pilot study of 69 daily-paid jobs in an industrial corporation has been further improved. Positive weights can now be

beter. Aan alle faktore waarop waardebeoordeling gebaseer is kan nou 'n positiewe gewig gegee word sonder om die doeltreffendheid van die tegniek van waardebeoordeling te beïnvloed, terwyl dit meer aanneemlik sal wees vir werknemers. Afwykings en teenstrydighede in lone is uit die weg geruim, maar 'n algemene verwantskap met die lopende skale vir take word behou en die totale loonbedrag is hoegenaamd nie verander nie. Die nuwe stelsel word toegepas op 350 werkverrigtings in 'n ander afdeling van die bedryf en spanne vir arbeidstudie is aangestel om dit na ander ondernemings wat deur dieselfde korporasie beheer word, uit te brei.

Ander studies van waardebeoordeling van take is begin in die Mynnywerheid. Arbeidspesifikasie en -beskrywings vir ondergrondse naturellearbeiders is opgestel en 'n begin sal eersdaags gemaak word met die beoordeling van die faktore wat in hierdie take belangrik is. Die pligte van blanke beamptes word ook ontleed en gespesifiseer. Die hoofdoel hier is nie 'n waardebeoordeling van take nie, maar om die spesifikasies te gebruik as 'n basis vir die opstelling van opleidingsprogramme wat alle aspekte van die werk behels, insluitende die bedrewenheid en houding wat nodig is vir die beheer van personeel. Die praktiese toepassing van die waardeberekeningstegniek wat tot volmaaktheid gebring is in die nywerheidsprojekte sal later volg.

Houding Teenoor Werk

In die agste Jaarverslag is verwys na 'n beoogde opname van die houding wat die gemiddelde werker teenoor sy werk inneem, en van die sosio-ekonomiese agtergrond waarteen hierdie houding ontstaan. Hierdie opname wat van besondere belang is vir 'n begrip van die grondoorse van afwesigheid en arbeidsomset, kon nie onderneem word nie weens 'n gebrek aan navorsers met die nodige kwalifikasies.

'n Studie van motivering by naturellearbeiders is egter in die mynbedryf voltooi. Die beperkte doel was om vas te stel hoe die houding teenoor werk op die myne in die algemeen vergelyk met die houding teenoor werk in die nywerheid, en meer in besonder die redes waarom arbeiders verkies om op sekere myne liewer as op ander te werk. Die ondersoek is onderneem op vier myne waar verskillende werks- en sosiale omstandighede heers. Definitiewe gevolgtrekkings is gemaak van hoe werk op die myne meer aantreklik gemaak kan word vir naturelle wat van verskeie gebiede en stamgroepe afkomstig is.

Liggaamlike Geskiktheidstoets

Eksperimentele werk is gedoen in samewerking met die Laboratorium vir Toegepaste Fisiologie van die Transvaalse Kamer van Mynwese i.v.m. die opstelling van toetse vir liggaamlike geskiktheid en uithouvermoë van arbeiders wat veeleisende liggaamlike werk doen. Apparate waarop 'n standaard taak, wat onder standaard omstandighede gedoen moet word, gestel kan word is ontwerp. Metodes word ondersoek om die polsslag aanhoudend aan te teken terwyl die proefpersoon werk.

given to all factors on which evaluation is based without affecting the efficiency of the evaluation technique, whilst making it more acceptable to employees. Anomalies and inconsistencies in wage rates are removed, but an overall relationship with the "going rates" for jobs is retained, and the total wage bill is not materially altered. The new system is being applied to 350 jobs in another division of the works, and job study teams have been formed to extend it to other works controlled by the same corporation.

Other job evaluation studies have been started in the mining industry. Job specifications and descriptions have been drawn up for native underground labour and the rating of the factors entering into these jobs is about to begin. The duties of European officials are also being analysed and specified. The immediate object here is not to evaluate jobs, but to use the specifications as a basis for the construction of training programmes which will take all aspects of the job, including the skills and attitudes required for man-management, into account. The application of the evaluation techniques perfected in the industrial projects will follow at a later stage.

Job Attitudes

The *Eighth Annual Report* mentioned a projected survey of the attitudes which the average worker brings to his job, and of the socio-economic background against which these attitudes are established. This survey, which is particularly important for an understanding of the basic causes of absenteeism and labour turnover, could not be undertaken through lack of research workers with the necessary qualifications. A motivation study, confined to native workers, was, however, completed in the mining industry. Its limited objective was to determine attitudes towards employment on the mines in general, as distinct from industry, and more specifically, the reasons for preferring employment on one mine, rather than on another. The enquiry was conducted on four mines, representing different working and social conditions. Definite conclusions were drawn as to how employment on the mines can be made more attractive to native labourers drawn from various areas and tribal groups.

Physical Fitness Tests

Experimental work has been done, in collaboration with the Applied Physiology Laboratory of the Transvaal Chamber of Mines, on the construction of tests of physical fitness and staying power for labourers employed on heavy physical work. Apparatus on which a standard task can be set to be performed under standard conditions has been designed. Methods of recording pulse rate continuously whilst the subject is at work are under investigation.

Arbeidsomset

Daar is goeie vordering gemaak met die toepassing van nuwe statistiese metodes op die gegewens van arbeidsomset. Vir 'n sekere Nywerheid en gebaseer op 'n besondere waarnemingstydperk is daar waarskynlikheidstabelle opgestel vir behoud en vervanging van arbeiders. Hierdie tabelle kan gebruik word om te voorspel hoeveel nuwe arbeid gehuur sal moet word te eniger tyd in die toekoms en om die ekonomiese gevolge van 'n gegewe spoed van arbeidsomset te bepaal. Aangesien die materiaal wat ontleed is tot dusver tot een nywerheidskorporasie beperk was, is gegewens oor die blanke arbeidskrigte van 'n myn ook nou verkry en konsuleringsreëlings is so pas getref met 'n ander nywerheidsorganisasie wat 'n derde stel syfers van arbeidsomset sal verskaf om die algemene geldigheid van die metodes wat ontwikkel is, uit te toets.

Afwesigheid

Werk insake afwesigheid is grotendeels beperk tot die verbetering van die beheerkaart-tegniek vir die aanteken en ontleding van afwesigheid. Die toepassing van steekproefmetodes met betrekking tot verslagkaarte is ondersoek met die doel om hulle gebruik meer prakties te maak. Die ekonomiese gevolge van afwesigheid in terme van verlore tyd word ondersoek ten einde 'n bestuur in staat te stel om hierdie verlies in produksievermoë vooraf te bepaal en daarvoor voorsiening te maak.

Labour Turnover

Good progress has been made in the application of new statistical methods to labour turnover data. For a particular industry, and based on a particular observation period, probability tables of survival and replacement have been constructed. These tables can be used to forecast how much new labour will have to be hired at any time in the future, and to assess the economic consequences of a given labour turnover rate. Whereas the material analysed has so far been confined to one industrial corporation, data have now also been obtained on the European labour force on a mine, and consulting arrangements have just been concluded with another industrial organization, which will provide a third set of labour turnover figures to test the general validity of the methods that have been evolved.

Absenteeism

Work on absenteeism has been largely confined to the improvement of the control chart technique of recording and analysing absenteeism. The application of sampling methods to the record charts has been investigated, in order to make their use more practical. The economic consequences of absenteeism are being investigated in terms of time lost, to enable management to anticipate and to safeguard itself against this loss in productive efficiency.



'n Masjien vir die sortering van geponsde kaarte met gegewens i.v.m. psigologiese toetse.

A machine for the sorting of punched cards containing psychological test data.

Ongelukke

Gegewens omtrent padongelukke in 'n vervoerkorporasie wat 'n groot aantal passasiersbusse in 'n aantal verskillende sentra in gebruik het, is ingewin. Werk in verband met die ontwikkeling van 'n beheerkaart-tegniek om die doeltreffendheid van verhinderingsmaatreëls en verbeterings op die proef te stel, word gedoen. Indien hierdie nuwe metode suksesvol is, sal dit 'n algemene toepassing hê op pad- sowel as nywerheidsongelukke. In samewerking met die Nasionale Padveiligheidsorganisasie word die oorsake van motorfietsongelukke ondersoek. Sensusopnames van alle motorfietsongelukke wat gedurende een jaar in die Unie plaasgevind het, is ontleed. 'n Intensiewe studie van 'n aantal noodlottige ongelukke waarvoor inligting van lykskouingsverslae gebruik word, word nou gemaak. Om 'n idee te kry van die mate van blootstelling in vergelyking met ander padvoertuie is alle geregistreerde eienaars van motorfiets in Johannesburg versoek om besonderhede te verskaf van die mylafstand wat gedurende die jaar afgelê is en die doel waarvoor die motorfiets gebruik word. 'n Redelik goeie opgawe is verkry. Die ondersoek sal vroeg in 1955 voltooi word.

Studies oor die Aard en Meting van Persoonlikheid

Langtermyn-ondersoek na die wese van persoonlikheidsbepalings en die meting daarvan het waardevolle resultate opgelewer. Faktore wat van besondere belang is, is die tempo en veranderlikheid van gedrag, uithouvermoë en vatbaarheid vir emosionele ondervindinge. Suksesvolle aanpassing by werk in die vorm van beroeps-tevredenheid, doeltreffendheid, produktiwiteitspeil en goeie verhoudinge met medemense is gedeeltelik afhanklik van een of ander van hierdie faktore.

Die Teoretiese Sielkundedepartement het verder gevorder met hulle studie van die aanhoudende opteltoets volgens Pauli as 'n maatstaf vir uithouvermoë, aanpasbaarheid en stabiliteit. Die toets verg konsentrasie vir een uur op 'n eentonige taak, naamlik die optel van pare enkel syfers teen 'n maksimum spoed en akkuraatheid. Dit meet nie soseer wat 'n persoon kan doen nie as wat hy gewillig is om te doen en hoe hy dit doen. So bring dit aspekte van die persoonlikheid uit wat andersins nie deur die gewone bekwaamheidstoets gemeet word nie. 'n Intensiewe statistiese studie van die faktore wat die „werkskromme” bepaal en deur middel van die toets verkry word, is onderneem voordat begin is met die geldigheidsbepaling van die toets vir gebruik by projekte oor personeelkeuring. Hierdie ontleding het getoon dat hoewel aanhoudende optelling 'n skynbaar enkelvoudige taak is, dit in werklikheid 'n samegestelde vorm van gedrag verteenwoordig. Die volgende belangrike faktore is geïdentifiseer: (1) „Spoed” of „persoonlike tempo”; (2) „Uithouvermoë en energie”; (3) „Impulsiwiteit”; (4) „Stabiliteit”; (5) „Akkuraatheid en netheid”. Die meet van hierdie eienskappe is klaarblyklik van aansienlike praktiese waarde in beroepsielkunde. Die Pauli-toets, wat geheel-en-al objektief is en maklik is om te merk, hou groot moontlikhede

Accidents

Data have been collected on road accidents in a transport corporation running a large fleet of passenger buses in a number of different centres. Work is in progress on the development of a control chart technique to test the efficiency of preventive and remedial measures. If successful, this new device will be widely applicable both to road and to industrial accidents.

An investigation is also in progress, in collaboration with the National Road Safety Organization, into the causes of motor cycle accidents. Census returns on all motor cycle accidents occurring during one year in the Union have been analysed. An intensive study is now being made of a group of fatal accidents, for which information from inquest reports is being used. To obtain an idea of exposure rate, in comparison with other road vehicles, all registered motor cycle owners in Johannesburg have been circularized to provide details of mileage run during the year and the purpose for which motor cycles are used. A fairly good return has been obtained. The investigation will be completed early in 1955.

Studies on the Nature and Measurement of Personality

Long-term investigation of the nature of personality determinants and their measurement have produced some valuable results. Factors that are of particular interest are the tempo and variability of behaviour, capacity for sustained effort and susceptibility to emotional experience. Successful adjustment to work, in the form of job satisfaction, efficiency, productivity level, and good human relations, is partly dependent on one or other of these factors.

The Theoretical Psychology Department has proceeded further with its study of the Pauli continuous addition test as a measure of staying power, adaptability and steadiness. The test demands concentration for one hour on a monotonous task, namely the addition of pairs of one-digit figures, at maximum speed and accuracy. It does not so much measure what a person can do, but rather what he is willing to do and how he does it. Thus it brings out aspects of the personality that are not otherwise covered by the ordinary ability tests. An intensive statistical study of the determinants of the “curve of work” obtained from the test was undertaken, prior to validating it for use in personnel selection projects. This analysis showed that the apparently simple activity of continuous adding is in reality a complex form of behaviour. The following main factors were isolated: (1) “speed” or “personal tempo”; (2) “endurance and energy”; (3) “impulsiveness”; (4) “steadiness”; (4) accuracy and neatness”. The measurement of these attributes is clearly of considerable practical value for occupational psychology. The Pauli test, which is completely objective and simple to score, holds out much promise of becoming a practical and easy-to-use instrument for the measurement of the kind of staying power in which the employer is interested.

in om 'n praktiese en maklik bruikbare instrument te word vir die meet van die soort uithouvermoë waarin werkgewers belang stel.

'n Bevinding van aansienlike wetenskaplike belang is die verband tussen die telling van die „impulsiwiteits-“, en in mindere mate, die „akkuraatheids-“ en „stabiliteitsfaktore“ en die alpha-frekwensie in die elektroënsefalogram. Dit is reeds bewys dat alpha-ritme in verband staan met die tempo-element in persoonlikheid (tegnies bekend as primêre-sekundêre funksie) wat as aangebore beskou word. Indien hierdie bevinding bekragtig word deur verdere ondersoek, mag die Pauli-toets ook as 'n nuttige en praktiese maatstaf dien vir hierdie belangrike persoonlikheidseienskap.

'n Verbeterde ergograaf — of meetinstrument vir werkverrigting — is in die Instituut se werkswinkel gebou, om die eienskappe van die „werkskromme“ te bestudeer wanneer die inspanning eerder van 'n liggaamlike as van 'n verstandelike aard is, soos die geval is in die Pauli-toets.

Om die aard van verskille in die werkverrigting te bestudeer en om die stabiliteit van sommige van die verwantskappe wat tussen objektiewe maatstawwe van basiese en van moontlik konstitusionele elemente in persoonlikheidsamestelling te toets, is metings gedoen van 'n aantal fisiologiese en sielkundige funksies, insluitende die elektroënsefalogram- en Pauli-toetsprestasies, op drie volwassenes vir dertig agtereenvolgende werksdae. Die statistiese ontleding van die groot hoeveelheid gegewens wat deur middel van hierdie studie verkry is, is nog aan die gang.

Elektroënsefalografie

Behalwe sy deelname aan hierdie en ander persoonlikheidsnavorsingsprogramme, het die E.E.G. Departement 'n studie van die geregtelikegeneeskundige en sosiologiese implikasies van elektroënsefalografie onderneem. By hierdie studie was 24 persone betrokke wat van moord of poging tot moord aangekla of skuldig bevind is, maar wat kranksinnig verklaar is. Die meeste van hierdie persone het abnormale E.E.G.'s gehad wat onvolwassenheid of beskadiging van die sentrale senuwee-organisasie aandui. 'n Oneweredige getal eensydige fokale steurings in die slaaplob is ontdek. 'n Ondersoek van die betekenis van hierdie defek word nou onderneem by alle kliniese gevalle waar hierdie abnormaliteit ontdek is.

Psigometriese Studies

Die Psigometriese Afdeling se tyd was grootliks in beslag geneem deur die oplossing van probleme van meting- en toetskonstruksie wat voorgekom het in die loop van toegepaste werk in ander afdelings.

Stadige vordering is gemaak met die standaardisering van die Suid-Afrikaanse vorm van die Wechsler-toets in intelligensiemeting by volwassenes. Baie van die beurse wat aan studente toegeken is vir nagraadse studie van die resultate wat verkry is deur middel van die toets en waarvoor hulle tussen 150 en 200 persone moes toets, moes gekanselleer word aangesien daar min of geen werk verrig

A finding of considerable scientific interest is the connection between the scores on the “impulsiveness” and to a lesser extent the “accuracy” and “steadiness” factors and alpha frequency in the electroencephalogram. This has previously been shown to be related to the tempo element in personality (technically known as primary-secondary function) which is believed to be constitutional in origin. If this result is confirmed by further investigations, the Pauli test may also prove useful as a practical measure of this important personality trait.

An improved ergograph — or recorder of work output — has been constructed in the Institute Workshop, to study the characteristics of the curve of work when effort is physical rather than mental, as it is in the Pauli test.

To study the nature of variations in work performance, and to test the stability of some of the relationships that have been found between objective measures of basic and possibly constitutional elements in personality make-up, measurements were made in three adults for 30 consecutive work days of a number of physiological and psychological functions, including the electroencephalogram and Pauli test performance. The statistical analysis of the large amount of material obtained from this study is still in progress.

Electroencephalography

In addition to its participation in these and other personality research projects, the E.E.G. Department carried out a study of the forensic and sociological implications of electroencephalography. This involved a study of 24 persons charged with or convicted of murder or attempted murder, but declared insane. Most of these persons had abnormal E.E.G.'s, indicative of immaturity or impairment of central neural organization. As a disproportionate number of unilateral focal disturbances in the temporal lobe were found, an investigation of the significance of this defect is being undertaken in all clinical cases in which this abnormality was found.

Psychometric Studies

Most of the Psychometric Department's time was devoted to the solution of problems in test construction and measurement that arose in the course of applied work done by other departments.

Slow progress was made in the standardization of the South African version of the Wechsler test of adult intelligence. Of the bursaries that were granted to students for post-graduate study of the results obtained from the test, for which they were required to test from 150 to 200 persons, many had to be cancelled because little or no work was done. A number of full-time appointments has



Die elektroënsefalograaf wat gebruik word om die elektriese aktiwiteit van die brein te meet.

The electro-encephalograph which is used for measuring the electrical activity of the brain.

is. 'n Aantal voltydse aanstellings is nou gemaak en die toets word ook gebruik in 'n personeelnavorsingsprojek. Aansienlike hulp is verkry van die Departement van Arbeid wat toestemming gegee het vir die toepassing van toetse by die arbeidsburo's in Johannesburg en Pretoria. Die benodigde aantal toetse is 5,000 en uit alle bronne is sower slegs 776 resultate beskikbaar. Teen hierdie spoed sal dit lank duur voordat 'n begin gemaak kan word met standaardisering. Een van die probleme is om genoegsame volwassenes te vind uit die regte ouderdoms-, opvoedings-, sosio-ekonomiese, seks- en taalgroepe wat nodig is om die monster verteenwoordigend te maak van die blanke bevolking en wat gewillig is om die tyd op te offer om die toets te ondergaan.

Wiskundige Statistieke

Die werk van hierdie afdeling bestaan hoofsaaklik uit raadgewing aan ander afdelings. Nuwe en meer ekonomiese tabelle vir χ^2 is saamgestel. 'n Studie van „distribusievrye” statistieke, wat betreklik onbekend is, maar waarvoor belangrike aanwendinge reeds gevind is in verskillende vertakkinge van die Instituut se werk, is gemaak. Die tegniek van faktorontleding wat al hoe meer in psigometriese werk gebruik word, word bestudeer uit 'n wiskundige-statistiese oogpunt. In samewerking met die Psigometriese afdeling word aandag geskenk aan die moeilike probleem om 'n metode te vind waardeur kandidate wat onderwerp is aan 'n aantal toetse vir 'n aantal soorte van werk met verskillende vereistes, geklassifiseer

now been made, and the test is also being used in a personnel selection project. Much assistance was obtained from the Department of Labour, which granted permission to apply the tests at labour bureaux in Johannesburg and Pretoria. From all sources, only 776 completed tests are available, the total number required being 5000. At this rate, it will still take a long time before standardization can be started. One of the difficulties is to find sufficient adults, representative of the age, educational, socio-economic, sex and language categories that are necessary to make the sample representative of the European population, who are willing to spare the time necessary to complete the test.

Mathematical Statistics

Most of the work of this department consisted of consulting work on behalf of other departments. New and more economical tables for χ^2 were constructed. A study was made of “distribution free” statistics, which are comparatively little known, but for which important applications have already been found in various aspects of the Institute's work. The technique of factor analysis, of which increasing use is being made in psychometric work, is being studied from a mathematical statistical angle. In collaboration with the Psychometric Department, attention is also being given to the difficult problem of finding a method whereby candidates, tested on a number of tests, for a number of jobs with different



'n Skalogrambord vir die ontleding van gegewens van sielkundige toetse. Met die apparaat kan die gegewens wat met koeëllaers in gaatjies in los aluminiumstrookies uitgeteken word, op 'n paar verskillende maniere gerangskik word.

A scalogram board for the analysis of data from psychological tests. This piece of apparatus enables the data which is plotted with ball bearings in holes in loose aluminium strips to be arranged in several different ways.

kan word in gegewe verhoudings op so 'n wyse dat die beste gebruik gemaak kan word van die beskikbare mannekrag.

Statistiese werk in die Instituut is grootliks bespoedig deur die installering van meer deurslagkaartmasjinerie. Die uitrusting bestaan nou uit handdeurslagmasjiene, 'n outomatiese deurslagmasjien en kontroleerder, twee sorteerders, 'n interpoleerder en 'n tabuleermasjien. Nog 'n sorteerder en tabuleerder is bestel.

Inkomste

Hoewel die hoeveelheid en soort ondersteunde werk wat onderneem kon word gestrem was deur 'n tekort aan personeel, was die inkomste uit kontrakte en toetse nogtans bevredigend, naamlik, £17,040 vir die finansiële jaar geëindig 31/3/1954. Dit verteenwoordig 24·5% van die lopende uitgawe vir daardie jaar. Alle bestaande langtermyn-navorsingskontrakte is hernu en 'n aantal kleinere nuwe kontrakte is gesluit.

requirements, can be classified in given ratios, such that optimum use is made of the available manpower.

Statistical work in the Institute has been greatly accelerated by the installation of more punch card machinery. The establishment now consists of hand punches, an automatic punch and verifier, two sorters, an interpolator and a tabulating machine. One more sorter and tabulator are on order.

Revenue

Although shortage of staff limited the amount and type of sponsored work that could be undertaken, revenue from contracts and tests nevertheless remained satisfactory at £17,040 for the financial year ending March 31st, 1954. This represents 24·5% of the running expenses for that year. All existing long-term research contracts were renewed, and a number of smaller new contracts was concluded.

Sentrale Werkplaas

Amptenaar-in-beheer; MNR. J. VAN DER STAALJ.

Weens die uitbreiding van die W.N.N.R. as 'n geheel en die feit dat verskeie afdelings van die W.N.N.R. werk op kontrakgrondslag doen, was dit nodig om die personeel van die verskillende seksies van die werkplaas uit te brei. Die totale personeel van die werkplaas is nou 42 blankes en 11 Naturelle.

Toerusting en personeel van die siklotronwerkplaas wat tydelik in die sentrale werkplaas gehuisves was, is nou na die siklotrongebou op die nuwe perseel verskuif.

Die beheer van die magasyn is nou tot die werksaamhede van die werkplaas gevoeg en die magasyn se personeel, bestaande uit een aankoopsbeampte, twee klerke en twee naturelle, is van die hoofkwartier na die sentrale werkplaas oorgeplaas.

Die planne vir die nuwe werkplaas en magasyngebou is nou gereed vir die bestek-opmakers en daar sal teen die end van die jaar tenders daarvoor gevra word.

Die waarde van die werk wat gedurende die boekjaar 1953/54 deur die werkplase verrig is (administrasiekoste ingesluit) in die maak van kapitaaltoerusting, is beraam op £22,576 14s. 10d.

Central Workshops

Officer-in-charge: MR. J. VAN DER STAALJ

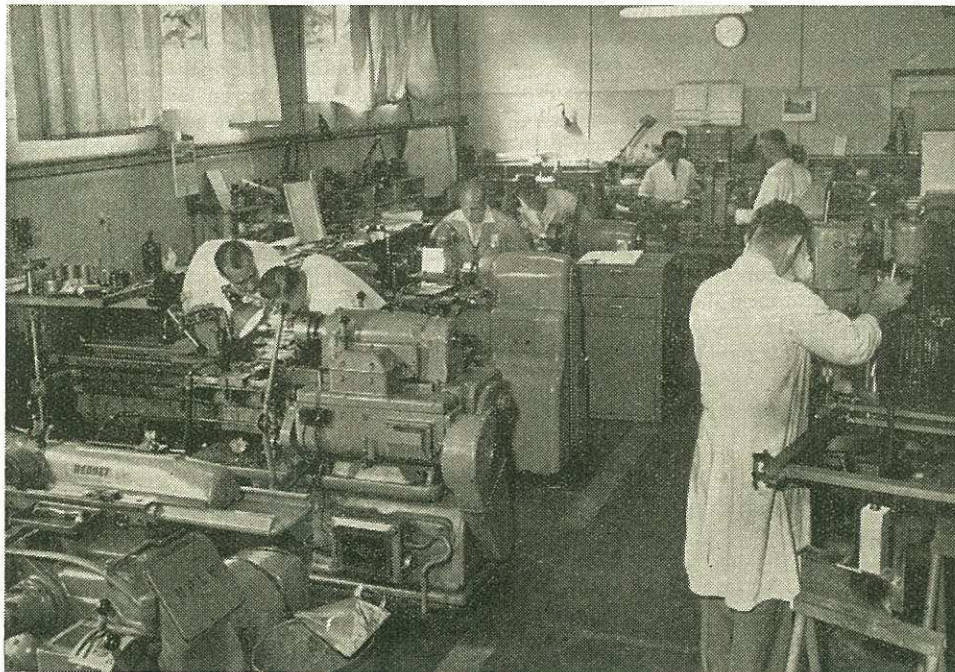
The expansion of the C.S.I.R. as a whole and the fact that several sections of the C.S.I.R. are carrying out contract jobs have made it necessary to increase the staff of the different sections of the Workshop. The total staff of the Workshop is now 42 Europeans and 11 Natives.

Equipment and staff of the Cyclotron Workshop which was temporarily housed in the Central Workshop have been moved into the Cyclotron building at the new site.

Storekeeping has been made a part of the Workshop's duties, and the store's staff consisting of one buying officer, two clerks and two Natives, has been transferred to the Central Workshop staff from Headquarters.

The plans for the new workshops and store building are now ready for the quantity surveyors and will be given out for tender at the end of this year.

The value of work done by the Workshops (including overheads) in manufacturing capital equipment during the financial year 1953/54 is estimated to be £22,576 14s. 10d.



Die Sentrale Werkplaas van die W.N.N.R.

A view of the C.S.I.R. Central Workshops.

Nywerheidsnavorsings- institute

In die volgende paragrafe word 'n kort oorsig gegee van die werk wat gedurende die jaar deur elk van die nywerheidsnavorsingsinstitute en die Navorsingseenheid vir Bitumeneuse Bindstof gedoen is. Die institute is as nie-winsgewende maatskappye geïnkorporeer en word deur hulle eie beheerrade bestuur. Hulle staan dus onafhanklik van die W.N.N.R. en publiseer hulle eie afsonderlike jaarverslae. Aangesien 'n aansienlike gedeelte van hulle geldelike steun egter van die Raad afkomstig is, word opsommings van hulle werksaamhede hier gegee. Die Navorsingseenheid vir Bitumeneuse Bindstof verskil van die ander in soverre dat dit nie onder die Maatskappye-Wet geïnkorporeer is nie maar direk deur die W.N.N.R. bestuur word. Sy funksies is egter soortgelyk aan dié van die ander institute en dit is vanselfsprekend dat dit onder hierdie afdeling ingesluit word.

LEERNYWERHEID-NAVORSINGSINSTITUUT

Direkteur: DR. S. G. SHUTTLEWORTH.

Die inkomste van die Instituut sal vir die huidige jaar sowat £50,000 beloop, waarvan £12,000 deur die Wetenskaplike en Nywerheidsnavorsingsraad bygedra sal word.

Fundamentele Navorsing

Die fundamentele navorsingsprogram wat die noodsaaklike agtergrond vir nuwe nywerheidsprosesse verskaf, is gedurende die afgelope jaar voortgesit en daar is gevorder met die studies van die struktuur en molekulêre gewig van en die uitwerking van chemiese behandeling op verskeie watteltanninfraksies. Die werk op struktuur van komplekse chroomione, die teorieë van looi met organiese verbindings en chroom, die fisiese eienskappe van die globulien-verwante proteïene van velle, en die nasionale voetvormeienskappe van verskeie Suid-Afrikaanse voetgroepe het voortgeduur.

Dit is interessant om te meld dat die Amerikaanse Chemiese Vereniging die Direkteur van die L.N.N.I. gevra het om die deel oor die meganisme van chroomlooiery te skryf in die „A.C.S.” se Monografie van vier volumes, *The Chemistry of Leather Manufacture*, wat in 1955 gepubliseer sal word.

Algemene Tegnieëse Vooruitgang

Opsommings hieroor kan in die Jaarverslag van die Instituut gevind word. Die werk dek huide en velle, wattel, looiery en skoeisel en dien verskeie belangrike Suid-Afrikaanse nywerhede wat saam jaarliks sowat £30,000,000 tot die nasionale rykdom van die land bydra.

In die geval van huide en velle is verdere vordering gemaak met die ontwikkeling van verbeterde metodes van bewaring, insluitende die klein- en grootskaalse be-

Industrial Research Institutes

In the following paragraphs a brief description is given of the work during the year of each of the industrial research institutes and the Bituminous Binder Research Unit. The institutes have been incorporated as non-profit companies and are managed by their own boards of control. They are thus independent of the C.S.I.R. and issue their own separate annual reports, but as a substantial proportion of their financial support is derived from the Council, summaries are given here. The Bituminous Binder Research Unit differs from the others in that it has not been incorporated under the Companies Act, but is administered directly by the C.S.I.R. Its functions, however, are similar to those of the other institutes and it is logical to include it in this section.

LEATHER INDUSTRIES RESEARCH INSTITUTE

Director: DR. S. G. SHUTTLEWORTH

During the current year the income of this Institute will amount to approximately £50,000, of which about £12,000 will be contributed by the Council for Scientific and Industrial Research.

Fundamental Research

The fundamental research programme, which provides the essential background to new industrial processes, has been continued during the past year and progress has been made in studies on the structures and molecular weights of various wattle tannin fractions and the effects of chemical treatments on these, the structures of chromium complex, the theories of vegetable and chrome tanning, the physical properties of the globular proteins of hides, and the national foot shape characteristics of various South African groups of feet.

It is interesting to record that the American Chemical Society has invited the Director of L.I.R.I. to write the section on the mechanism of chrome tanning in the four-volume A.C.S. monograph, *The Chemistry of Leather Manufacture* to be published in 1955.

General Technical Advances

Summaries of these can be found in the Annual Report of the Institute. The work covers hides and skins, wattle, tanning and footwear, serving several major South African industries which together contribute annually some £30,000,000 to the national wealth of the country.

In the case of hides and skins, further progress has been made in the development of improved methods

studering van verskeie insek-, fungus- en bakteriedodende middels.

Werk vir die wattel- en looinywerhede is voortgesit veral i.v.m. proefinstallasie- en buitemuurse groot-skaalse ontwikkeling van nuwe en verbeterde metodes. Baie Suid-Afrikaanse looiers het die Instituut se prosesse suksesvol by hul eie vereistes aangepas en daar is 'n toenemende samewerking tussen die praktiese man en die navorsingswerker, wat veel vir die toekoms beloop. Hier behoort spesiaal melding gemaak te word van die Instituut se „Osmotan” vinnige sooldeerproses wat suksesvol uitgetoets is in agt looierye. Die metode is toegespits op die kostevermindering van sooldeer, sodat dit beter kan meeding met sintetiese plaasvervangers.

Van die verskeie ontwikkelinge in die skoeiselnywerheid is die interessantste miskien die voltooiing van twee kunshars-preparate om in skoenneuse te gebruik, met moontlike besparings van minstens £100,000 per jaar. Die harse word reeds op 'n beperkte skaal deur 'n groot aantal fabriek gebruik. Daar is spesiale aandag gewy aan die vereistes van beroepskoeisel soos mynwerkers se stewels. Ondergrondse toetse is reeds vir 'n paar jaar aan die gang om hul duursaamheid in die strawwe toestand van mynwerk, te verbeter. Die toekomstige leerstewel sal ook uit die werk baat. Spesiale leeste en bybehore is vir Yskor se veiligheidskoene ontwerp en hierdie skoene word nou prakties uitgetoets. Soortgelyke werk i.v.m. verpleegsterskoene is aan die gang.

Gehaltebeheer

As gevolg van die laboratoriums en toetsfasiliteite wat aan die leer- en verwante nywerhede by hul Instituut beskikbaar gestel word, brei die algemene gehaltebeheer geleidelik uit. Daar was vanjaar 'n baie opvallende styging in die aantal navrae en die *pro rata* gehalte van die vrae wat aan die Instituut voorgelê word, is nou naastenby dieselfde as in Brittanje.

Produktiwiteit

'n Unieke ontwikkeling van die Instituut was die invoering van moderne produktiwiteitstechniek en wetenskaplike aansporingslone, gebaseer op tyd- en arbeidstudies, as direkte fabrieksdienste. 'n Produktiwiteitspan van twintig het tot dusver studies in sewe fabriek voltooi en is nou in tien ander besig. Die gegewens en ondervinding wat met die werk opgedoen word, sal waarskynlik baie waardevol wees in die produktiwiteitsnavorsingsprogram van die Instituut. Die werk word gesamentlik gesteun deur die werknemers en werkgewers deur middel van die Nasionale Nywerheidsraad.

Ekonomiese Bemakingsnavorsing

Die werk van dié afdeling het in die afgelope jaar baie lof ingeoos. Die voorsiening van die jongste maandelikse en jaarlikse statistieke het aan Suid-Afrikaanse skoeiselvervaardigers 'n diens gegee wat nie tevore beskikbaar was nie. Die interessantste aspek van die werk is miskien die ontdekking dat byna die helfte van die nuwe skoene wat gemaak word, deur die nie-blanke gekoop word en

of preservation, including the small and large scale study of various insecticides, fungicides and bactericides.

For the wattle and tanning industries, work has continued on pilot plant and extra-mural large-scale development of new and improved methods. Many South African tanners have been successful in adapting Institute processes to their requirements, and there is increasing collaboration between the practical man and the research worker which augurs well for the future. Special mention should be made of the Institute's Osmotan rapid sole leather process which has been tried out successfully in eight tanneries. This method is aimed at reducing the cost of sole leather, thereby making it more competitive with synthetic substitutes.

Among the various developments for the foot-wear industry, perhaps the most interesting is the perfection by the Institute of two synthetic resins for use as toepuffs in footwear, with potential savings of at least £100,000 per annum. These resins are already being used by a large number of factories on a limited scale. Special attention has been paid to occupational footwear requirements such as miners' boots, where underground trials have been in progress for some years in order to improve their durability under the extreme conditions encountered. Such work will also benefit the future army boot. Special lasts and fittings have been developed for Iscor safety boots and wear trials are in progress. Similar work is in progress for hospital nurses' shoes.

Quality Control

As the result of the laboratories and testing facilities available to the leather and related industries at their Institute, the extent of general quality control is steadily increasing. There has been a very marked rise in the number of enquiries this year and the *pro rata* quality of the questions submitted to the Institute is now approximately the same as in Britain.

Productivity

A unique development of this Institute has been the installation of modern productivity techniques and scientific wage incentives based on time and motion study as direct factory services. A productivity team of twenty has thus far completed seven factories and is now busy in ten others. The data and experience accumulated in this work is likely to prove of great value in the productivity research programme of the Institute. The work is sponsored jointly by employers and employees through the National Industrial Council.

Economics and Markets Research

The work of this section has earned wide praise during the past year. The provision of up-to-date monthly and annual statistics has given South African footwear manufacturers a service not hitherto available. Perhaps the most interesting aspect of this work is the discovery that nearly half the new footwear produced are purchased by the non-European, and exploratory

daar word nou ondersoek ingestel na die aard van die nie-blanke se begroting.

Publikasies

Gedurende die afgelope jaar het die Instituut 62 verhandelinge gepubliseer, waarvan 12 in oorsese tydskrifte was.

VISNYWERHEID-NAVORSINGSINSTITUUT

Direkteur: DR. G. M. DREOSTI

Gedurende die afgelope jaar is die personeel en gebied van die navorsingsprogram van die Visnywerheid-navorsingsinstituut verder uitgebrei. Die oorvol toestand van die huidige huisvesting het baie erg geword, maar daar kan geen verbetering verwag word nie voordat die nuwe laboratorium by Grootte-Schuur gebou word op die perseel wat deur die Universiteit van Kaapstad beskikbaar gestel is. Die planne hiervoor het nou betreklik ver gevorder en hopelik sal die bouwerk in die komende jaar 'n aanvang neem.

In die jaar waaroor die verslag loop het die Instituut se inkomste met sowat £2,000 tot £37,000 toegeneem. Die syfer sluit 'n spesiale toekenning van die Vissery-Ontwikkelingskorporasie van Suid-Afrika, Beperk, in, wat gewy moet word aan navorsing i.s. die bewaring en vervoer van vars vis na binnelandse markte, asook inkomste uit roetine-dienste (bv. chemiese ontledings, inspeksies, spesiale ondersoeke en tegniese advies) wat tot oor die £9,000 vir die jaar behoort.

Die meeste van die navorsingswerk wat onderneem is, was weer op 'n korttermyn-basis, weens die dringende en onmiddellike behoeftes van die vinnig-uitbreidende visnywerheid, maar dit het gedurende die afgelope jaar moontlik geword om meer tyd en plek aan langtermyn-vraagstukke toe te staan. In die kort oorsig word slegs die belangrikste ondersoeke wat gedurende die jaar begin of voltooi is, aangestip.

Vars Vis

Daar is voortgegaan met pogings om 'n bevredigende objektiewe toets vir varsheid te vind. Van die metodes wat onlangs in die literatuur gemeld is, het geeneen sulke konsekwente resultate gelewer of aanvangsbederf so gou aangetoon as die reuk nie. 'n Metode wat in die Visnywerheid-navorsingsinstituut ontwikkel is om die hoeveelheid uitdrukbare sap te meet, is egter baie belowend en word verder ondersoek. Verdere werk in verband met die grade van verkoeling in ys is onderneem en metodes om die proses te versnel is ontwikkel, met gevolglike verbetering van die gehalte. Ander ondersoeke sluit metodes in vir die verlenging van die opbergingsleeftyd van verkoelde vis deur verbeterde hantering van die vis aan boord, verbeterde bevriesing en die gebruik van bederfweringsmiddels. 'n Nuwe navorsingsprogram i.v.m. die vervoer van stokvis na binnelandse dele is aangepak.

Inmaak

Verdere aandag is gewy aan die vraagstuk van optimum-opbergings toestande vir vars sardyne wat ingemaak

work in non-European budget analyses is now in progress.

Publications

During the past year the Institute published 62 papers, of which 12 were in overseas journals.

FISHING INDUSTRY RESEARCH INSTITUTE

Director: DR. G. M. DREOSTI

During the past year the Fishing Industry Research Institute has undergone further expansion both with regard to staff and scope of the research programme. Congestion in the present accommodation has become acute, but no relief can be expected until the new laboratory is built at Grootte Schuur on the site made available by the University of Cape Town. Plans for this are now fairly well advanced and it is hoped to start building operations in the coming year.

The Institute's income increased by approximately £2,000 to £37,000 for the year under review. This figure includes a special grant from the Fisheries Development Corporation of South Africa Limited to be devoted to research into the preservation and transport of fresh fish intended for inland markets, and earnings from routine services (i.e., chemical analyses, inspections, special investigations and technical advice) amounting to over £9,000 for the year.

Much of the research undertaken was again on a short-term basis owing to the urgent and immediate needs of the rapidly expanding fishing industry, but it has become possible during the past year to allot a larger amount of time and space to long-term problems. This brief review touches only the main investigations begun or completed during the year.

Fresh Fish

Efforts to discover a satisfactory objective test for freshness continued. Of the methods recently reported in the literature, none gave results as consistent or indicated incipient spoilage as early as the sense of smell. However, a measure of the quantity of expressible juice, developed at the Fishing Industry Research Institute, is very promising and is being further investigated. Further work was done on rates of chilling in ice and means for accelerating the process were developed, with consequent improvement in quality. Other investigations included methods for prolonging the storage life of chilled fish by improved fish-handling on deck, improved icing and the use of preservatives. A new programme of research was initiated concerning the transport of hake to inland centres.

Canning

Further attention was given to the question of optimum storage conditions for fresh pilchards intended for

moet word. Vir maklike hantering en goeie bewaring is water met ys verkoel die beste opbergingsmiddel wat tot dusver ondersoek is en die beste metode is om vis en gebreekte ys gelyktydig in die water te sit. Die redes vir die groot afwyking in die soutinhoud van ingemaakte sardyne is ondersoek en uitvoerige laboratoriumtoetse oor die insouting van vis is uitgevoer. Drie belangrike faktore wat die finale soutinhoud van die ingemaakte produk beïnvloed, is die sterkte van die pekel, die duur van inpekeling en die verhouding van pekel tot vis. As 'n geskikte gesoute produk verlang word, moet 'n verandering in die waarde van enige van die drie faktore deur 'n ooreenstemmende wysiging in die ander twee gebalanseer word. Dit maak inpekeling 'n baie moeilike proses om suksesvol onder kommersiële toestande toe te pas. Daar is ook gevind dat 'n redelike suiwer sout gebruik moet word, daar die teenwoordigheid van onsuiverhede neig om die sout smaak van die produk te verhoog.

Kreef

Verdere proefnemings is gedoen i.v.m. die behandeling en opberging van kreef voor die inmaak. Een interessante bevinding was dat as die lewende vis vir 48 uur in lopende seewater verhonger word, die kleur, smaak en algemene gehalte van die ingemaakte produk aansienlik verbeter. Statistiese ontleding van kreefverpakkings van 8 onse netto-gewig, het aan die lig gebring dat die afwyking van die gemiddelde gewig groter is as in die geval van „Al Tall” vis. Verder is daar 'n merkbare wisseling met die seisoene. Die verhouding van „gedreineerde gewig” tot „netto-gewig” is in Julie/September hoër as in ander tye van die jaar.

Vismeel

Aandag is gewy aan die vraagstuk van sagte sardyne en die bewaring van die soort vis vir gebruik in vismeelfabriekes; aan die vorming en samestelling van bloederige water wat in visputte ophoop en die moontlikheid om die vloeistof tot ekonomiese nut aan te wend; en aan die verhouding tussen ouderdom en water-oplosbare proteïeninhoud in maasbankers wat heel opgeberg word. Deur die laasgenoemde ondersoek is vasgestel dat daar gedurende die opbergings tydperk 'n progressiewe toename in die hoeveelheid water-oplosbare proteïen is in verhouding tot totale eiwitte. Hierdie verhouding in vars vis kan verdubbel voordat bederf intree. Die bevinding is belangrik, want dit toon dat die hoeveelheid water-oplosbare proteïen wat in vismeel gevind is, nie noodwendig 'n maatstaf is vir die „volheid” van 'n meel nie, hoewel dit in sommige lande as sulks gebruik word. Navorsing op hierdie gebied is nog aan die gang.

Daar is voortgegaan met werk oor die herwinning van visafvalwater en die produksie van volmeel. Reëlins is getref vir die invoer van 'n dubbel-effek-konsentreertoestel en 'n drievoudeffek-toestel met snelkonsentrasie in die eindstadium. Die dubbel-effek-installasie is bevredigend gevind en dit is aangeneem. Die installasie van die drievoudeffek-toestel is gedurende die jaar voltooi nog

canning. For ease of handling and effective preservation, ice-chilled water is the best storage medium so far investigated, and the best method is to feed fish and crushed ice into the water simultaneously. The reasons for the wide variations observed in the salt content of canned pilchards were investigated and extensive laboratory tests on brining were undertaken. Three important factors affecting the final salt content of the canned product are brine strength, length of time in brine, and proportion of brine to fish. A change in the value of any one of these factors requires corresponding adjustment to the other two, if a suitably salted product is to be obtained. This makes brining a difficult method to apply successfully under commercial conditions. It has also been found that it is necessary to use a reasonably pure salt as the presence of impurities tends to increase the saltiness of the product as judged by taste.

Rock Lobster

Further experiments were carried out on the pre-canning treatment and storage of rock lobster. One interesting finding was that starvation of live fish for 48 hours in running sea water appreciably improved the colour, flavour and general quality of the canned product. Statistical analysis of the nett weights of 8 ozs. rock lobster packs revealed that the dispersion of weights about the mean is greater than in Al Tall fish packs. There is moreover a marked seasonal fluctuation, the ratio of “drained weight” to “nett weight” being higher in July/September than at other times of the year.

Fish Meal

Attention was given to the problem of soft pilchards and the preservation of such fish for use in fish meal plants; to the formation and composition of blood water accumulating in fish pits and the possibility of converting this liquid to economic use; and to the relation between age and water-soluble protein content in maasbankers stored in the round. The latter investigation has established that there is a progressive increase in the amount of water-soluble protein relative to total protein during storage, and the ratio in fresh fish may be more than doubled by the time decomposition sets in. This finding is important since it indicates that the amount of water-soluble protein found in fish meals is not necessarily a criterion of the “wholeness” or “fullness” of a meal, although used as such in some countries. Further research on this subject is in progress.

Work continued on the recovery of stickwater and the production of whole meals. Arrangements were completed for the importation of a double-effect concentration plant and a triple-effect plant (with a rapid concentration finishing step). The double-effect plant was found satisfactory and accepted. The installation of the triple-effect plant, prior to testing by the Fishing Industry Research Institute, was completed during the year.

voordat dit deur die Visnywerheidsnavorsingsinstituut getoets is.

Verdere werk het ondersoek van die vitamien-inhoud van visafvalwater in verskillende omstandighede van verwerking en opberging ingesluit, ensimatiese vloeibaarmaking van gekonsentreerde oplosbare visstowwe, die ontleding van vet in vismeel, relatiewe higroskopisiteit van vol- en gewone meel, monsternemingsplanne en -metodes, verpakking in sakke en maatstawwe om die neiging tot selfontbranding te meet.

Voedingswaardes en Sporelemente in Visprodukte

Met behulp van die Nasionale Fisiese en Nasionale Chemiese laboratoriums is spektrografiese en chemiese ontledings gemaak van sporelemente in kommersiële sout, vars en gekonsentreerde tamatiepap en verskeie onbewerkte en verwerkte visprodukte. Oor die algemeen was die hoeveelhede onwenslike sporelemente nie meer as wat gewoonlik in Suid-Afrika en oorsee as toelaatbaar beskou word nie. Daar is egter betreklik hoë hoeveelhede arseen in ingemaakte kreef en sardyne gevind. Daar mag op gelet word dat verslae in die literatuur 'n hoë arseeninhoud in rou kreef aantoon en dit lyk waarskynlik dat die stof in 'n organiese en dus onskadelike vorm voorkom. Verdere werk word in die verband gedoen.

Ontleding van die jodiuminhoud van Suid-Afrikaanse visse het aan die lig gebring dat sardyne, stokvis en kreef betreklik ryk is aan die stof.

Daar is gedurende die jaar begin met mikrobiologiese bepaling en spektrofotometriese ontleding van die vitamien-inhoud van vismeel en ander visprodukte, asook 'n langtermynondersoek na die biologiese waardes van vismeel. Aandag word gewy aan die uitwerking, al dan nie, wat verskillende metodes van verwerking moontlik op die voedingswaardes in die algemeen mag hê.

Waterontleding

Watervoorrade skep dikwels 'n probleem langs die droë weskus en daar word baie seewater in die inmaak-fabriek gebruik. Aandag is geskenk aan die vraagstukke van afvloeielsbesmetting en die suiwering van sout- en vars water. Daar is gevind dat die lewensvatbaarheid van kolivormige bakterieë in seewater in 'n sekere mate 'n funksie van die opbergingstemperatuur is, maar selfs as monsters goed verkoel is, was die resultate van die vermoedelijke toets na opberging vir 24 uur, onbetroubaar. Metodes is ontwerp vir die chloreer en suiwering van seewater en 'n eenvoudige apparaat vir die toets van chloor is gemaak en aan fabriek vir gebruik gegee.

Behalwe die ondersoekwerk, het die Instituut voortgegaan om roetine-ontledings en inspeksies vir ledefirmas uit te voer. Die sentrale laboratorium in Kaapstad en die substasie by Walvisbaai het gedurende die jaar tesame oor die 2,000 monsters ontleed. Dit het produkte soos vismeel en olies, kreefmeel, perskoek, visafvalwater, gekonsentreerde oplosbare visafvalstowwe, gedroogde en gesoute vis, sout en tamatiepastas bedoel vir gebruik in die nywerheid, water, ens., ingesluit. Bevrore kreefsterte

Further work included investigations into the vitamin content of stickwater under different conditions of processing and storage, enzymic liquefaction of condensed fish solubles, the analysis of fat in fish meals, relative hygroscopicities of whole and ordinary meals, sampling plans and methods, bagging and criteria for measuring the tendency to spontaneous combustion.

Nutritional Values and Trace Elements in Marine Products

With the assistance of the National Physical and National Chemical Laboratories, spectrographic and chemical analyses were made of trace elements in commercial salt, fresh and concentrated tomato pulps, and various raw and processed marine products. On the whole, undesirable trace elements did not exceed the amounts generally considered permissible in South Africa and overseas. However, relatively high values were obtained for arsenic in canned rock lobster and canned pilchards; it may be noted that reports in the literature indicate a high arsenic content in raw rock lobster, and it seems probable that this substance occurs in an organic and therefore harmless state. Further work is in progress.

Analysis of the iodine content of South African fishes revealed that pilchards, hake and rock lobster are relatively rich in this substance.

Microbiological assay and spectrophotometric analysis of the vitamin contents of fish meals and other marine products were begun during the year, and a long-term investigation into the biological values of fish meals was initiated. Attention is being given to the effect, if any, of different methods of processing on nutritional values generally.

Water Analyses

Water supplies are often problematic on the dry west coast, and much seawater is used in the canneries. Attention was given to questions of effluent contamination and the purification of both salt and fresh waters. It was found that the viability of coliforms in sea-water was to some degree a function of the temperature of storage, but even when samples were well chilled the results of the presumptive test were unreliable after 24 hours' storage. Methods for purifying and chlorinating sea-water were devised, and a simple chlorine-testing outfit was made and supplied for use in factories.

In addition to investigational work, the Institute continued to provide routine analytical and inspection services on behalf of member firms. Between the central laboratory at Cape Town and the sub-station at Walvis Bay, over 2,000 samples were analysed during the year. These included such products as fish meals and oils, rock lobster meals, presscake, stick-water, condensed fish solubles, dried and salted fish, salt and tomato pastes intended for use in the Industry, water, etc. Inspection of frozen rock lobster tails and canned products intended

en ingemaakte produkte vir uitvoer is ook ondersoek. Die eersgenoemde het bestaan uit 21 besendings van die Unie, 7 besendings van Suidwes-Afrika en 4 van Tristan da Cunha. Vir alle ondersoeke en ontledings word apart betaal deur die firmas wat van die diens gebruik maak.

SUIKERMEULE-NAVORSINGSINSTITUUT

Direkteur: DR. K. DOUWES DEKKER.

Die studie van verskeie metodes van sapsuiwering soos dit op Natalse sappe aangewend word, is en sal altyd 'n belangrike item van die navorsingsprogram van die S.M.N.I. wees. In 1953 is 'n nuwe suiweringsproses, wat deur D. N. Ghosh beskryf is, in 'n reeks laboratoriumproewe uitgetoets. In die proses word gemengde sap geëlektroliseer met die gebruik van aluminium- of ysterelektrodes. Gedurende die proses styg die pH en 'n neerslag word gevorm. Tot dusver kan daar geen mening uitgespreek word oor die industriële toepassing van die proses nie, maar daar is vasgestel dat dit 'n suiwer sap van baie hoë gehalte lewer. Die CaO-inhoud van die ligkleurige gesuiwerde sap was laag (80-100 mg/l), byna al die silika is verwyder en die gesuiwerde sap was vry van stysel.

Daar is ook gevind dat as 'n stroom vir een of twee minute deur die sap gestuur word, dit die spoed van neerslaan van die presipitaat wat in die voorsuiweringsproses met suur gevorm word, verbeter.

Die voorkoms en rol van silika in suikerrietsap, was die onderwerp vir 'n spesiale studie. Silika kom in ru suikerrietsap in 'n oplosbare anorganiese vorm voor, maar ook as 'n onoplosbare suspensie. Daar is gevind dat die gewone sulfo-suiweringsproses, soos dit in Natal toegepas word, ondoeltreffend is om oplosbare silika te verwyder. Die onoplosbare silika is teenwoordig as 'n bestanddeel van deeltjies plantweefsel wat van kolloïdale grootte mag wees en word maklik verwyder in die suiweringsproses.

Daar is ook baie aandag geskenk aan die voorkoms van stysel in suikerrietsap en suiker. Natalse sappe bevat oënskynlik meer stysel as sap van die riet wat in tropiese lande groei. Dit het geblyk dat selfs geraffineerde suikers stysel bevat, met uitsondeing van die produk van een raffinadery, waar die oplossings ontkleur word met plantkoolstof.

Daar is 'n opname gemaak van die eienskappe van die suikers wat deur die verskillende meule gelewer word. Die monsters wat elke week deur al die fabriek ingestuur is, is volgens die voorlopige spesifikasies van die S.A.B.S. ontleed. Dit is wenslik geag om sommige van die ontledingsmetodes te wysig. Die resultate van die opname is volledig bespreek in 'n *Mededeling van die S.M.N.I.* en in 'n verslag wat aan die Natalse Suikermeulevereniging voorgelê is.

Daar is 'n studie gemaak van die beskikbare metodes vir die bepaling van die persentasie vesel in suikerrietmonsters.

for export was also carried out, the former covering 21 shipments from the Union, 7 shipments from South West Africa, and 4 from Tristan da Cunha. All inspection and analytical services are paid for separately by the firms making use of them.

SUGAR MILLING RESEARCH INSTITUTE

Director: DR. K. DOUWES DEKKER.

The study of various methods of juice clarification as applied to Natal juices is, and will always be, an important item of the research programme of the S.M.R.I. In 1953 a new process of clarification which had been described by D. N. Ghosh was tested in a series of laboratory trials. By this method mixed juice is electrolysed using aluminium or iron electrodes. During the process the pH rises and a precipitate is formed. So far no opinion can be given about the industrial applicability of the process, but it was established that it produces a clarified juice of superior quality. The CaO content of the light coloured clarified juice was low (80-100 mg/l), nearly all the silica was removed, and the clarified juice was free from starch.

It was also found that passing a current through juice during one to two minutes improved the rate of settling of the precipitate formed in the acid-preclarification process.

A subject of special study was the occurrence and role of silica in cane juice. Silica occurs in raw cane juice in a soluble inorganic form, and also as an insoluble suspension.

The normal sulpho-defecation process, as practised in Natal, was found to be inefficient in removing soluble silica. The insoluble silica is present as a constituent of fragments of plant tissue which may be of colloidal dimensions. The insoluble silica is easily removed in clarification.

Much attention was also paid to the occurrence of starch in cane juice and in sugars. Natal juices apparently contain more starch than juice from cane grown in tropical countries. Even refined sugars appeared to contain starch, with the exception of the product from one refinery where the liquors are decolourised with vegetable carbon.

A survey was made of the properties of the sugars produced by the various mills. The samples sent in each week by all the mills were tested in accordance with the methods of the tentative S.A.B.S. specifications. It was found desirable to modify some of these analytical methods. The results of this survey were fully discussed in a *Communication from the S.M.R.I.* and in a report submitted to the Natal Sugar Millers' Association.

A study was made of the methods available for the determination of the percentage of fibre in samples of cane.

Interessante resultate is verkry in 'n ondersoek waarin die suiwerheid van die sap van die top en die stronk naby die breekpunt, bepaal is.

By sommige van die meule is 'n aantal stoomketel-toetse uitgevoer. Die resultate het duidelik getoon hoe meer doeltreffendheid verkry kon word.

'n Voorlopige ondersoek is uitgevoer waarin die toepaslikheid van die bry-inenting van die C-suikermagma getoets is.

Sekere produkte is ontleed i.v.m. sekere moeilikhede wat by 'n aantal fabriekie ondervind is. Toevoerwater en stoomketelwater moet as sulks genoem word.

Die personeel van die S.M.N.I. het 58 besoeke by fabriekie afgelê om spesiale onderwerpe te bespreek en 'n beter insig in die Natalse verwerkingsprosesse te kry. Die resultate van die besprekings is opgesom in „Interne Verslae” wanneer slegs vir interne gebruik bedoel, of „Tegniese Verslae”, waarvan afskrifte aan die betrokke fabriekie gestuur is. Op versoek van fabriekie is daar ook „Tegniese Verslae” opgestel oor 'n aantal onderwerpe waarvoor hulle die S.M.N.I. se mening wou inwin.

In die reeks, *Mededelings van die S.M.N.I.* is ses artikels oor verskillende onderwerpe gepubliseer. Die personeel van die Instituut het vier verhandelinge voorgedra by die jaarvergadering van die S.A. Vereniging van Suikertegnoloë en twee by die Barbados-kongres van die Internasionale Vereniging van Suikerriettegnoloë.

Die Direkteur van die S.M.N.I. het die hoofstuk „The Agents used in Sugar Manufacture” geskryf vir die nuwe handboek „Principles of Sugar Technology” wat uitgegee is deur dr. Pieter Honig.

Drie verhandelinge wat deur die personeel van die Instituut geskryf is, het in die Suid-Afrikaanse Suikerjoernaal verskyn en een in die Internasionale Suikerjoernaal.

Lede van die personeel van die S.M.N.I. het op verskeie tegniese komitees van die suikerindustrie gedien.

VERFNYWERHEID-NAVORSINGSINSTITUUT

Direkteur: MNR. G. M. HAMILTON.

Dit is aangenaam om te merk dat bydraende lede al hoe meer gebruik maak van die Instituut. Die meeste van die behoeftes is *ad hoc* van aard, maar daar word gevoel dat die beskikbare dienste beter bekend raak en beter gebruik word. Om te verhoed dat die navorsings- en ontwikkelingswerk daaronder ly, het dit nodig geword om nuwe personeel te werf vir dié deel van die werk.

Die eerste jaar van werk i.v.m. die waardebeplanning van Suid-Afrikaanse materiale en van die ondersoek van verf in heersende toestande in die land is nou voltooi. Binnekort sal voorlopige verslae oor die werkverrigting van die verf uitgereik word en sulke verslae sal nou 'n jaarlikse reeks vorm. Uit die resultate wat tot dusver verkry is, is dit duidelik, altans sover dit verfwerk in Durban betref, dat die klimaat baie streng is en die eenvoudiger soorte afwerkverwe nie goeie resultate

Interessante resultate is verkry in 'n ondersoek waarin die suiwerheid van die sap van die top en die stronk naby die breekpunt, bepaal is.

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Die Direkteur van die S.M.N.I. het die hoofstuk „The Agents used in Sugar Manufacture” geskryf vir die nuwe handboek „Principles of Sugar Technology”, edited by Dr. Pieter Honig, was written by the Director of the S.M.R.I.

Three papers written by the staff of the Institute were published in the *South African Sugar Journal* and one in the *International Sugar Journal*.

Members of the staff of the S.M.R.I. served on various technical Committees of the sugar industry.

PAINT INDUSTRIES' RESEARCH INSTITUTE

Director: MR. G. M. HAMILTON

It is gratifying to note that increasing use is being made of the Institute by subscribing members. Most of the requirements are of an *ad hoc* nature, but it is felt that the services available are becoming better known and used. So that the research and development work does not suffer, it has become necessary to recruit new staff to cope with this side of the Institute's activities.

The work of evaluation of South African materials, and of examination of paints under conditions obtaining in this country, has now completed its first year. Interim reports on performance are shortly to be issued, and such reports will form an annual series. It is clear from the results to date that, at least so far as paint in Durban is concerned, the climate is exceptionally severe, and the simpler kinds of finishes do not give good results. Every opportunity is taken to point out to the consumer that

lewer nie. Daar word van elke geleentheid gebruik gemaak om dit aan die verbruiker tuis te bring dat die moderne soort sintetiese verf miskien duurder is maar aansienlike besparings sal meebring.

Die moontlikheid van verwerking in die kusgebiede is so groot, dat strukturele ingenieurs sover moontlik omswaai na die gebruik van sement as boumateriaal. Daar is egter nog baie gevalle waar metaal noodsaaklik gebruik moet word en die V.N.N.I. het verwerkingsstremende grondverflae ondersoek, veral met die oog op beskerming teen soutsprei. Daar is reeds tot besliste gevolgtrekkings gekom, maar die werk is nog nie voltooi nie, aangesien 'n verdere aantal materiale nog getoets moet word.

Die gebied van die Instituut brei geleidelik uit en ons wil graag ons innige waardering uitspreek teenoor die Raad en die Universiteit van Natal vir simpatieke en gewillige bystand en fasiliteite wat aan ons beskikbaar gestel is.

SUID-AFRIKAANSE WOLTEKSTIEL-NAVORSINGSINSTITUUT

Direkteur: MNR. R. C. PALMER.

Die Instituut word finansiële gesteun deur die Wolraad, die Bokhaar-adviesraad, industriële ondersteuners en die W.N.N.R., wat £ vir £ bydra op bydraes wat vir vyf jaar gewaarborg is. Die werk van die Instituut is daarop toegespits om koste te verminder en om gehalte te verbeter in die woltekstielnywerhede. Die werk kan in drie hoofgroepe verdeel word :

- (a) Toetswerk vir die nywerheid.
- (b) Kort ondersoek vir die nywerheid.
- (c) Navorsingswerk.

Onder (a) het die Instituut gedurende die jaar sowat tagtig toetse uitgevoer. Dit is meestal klein sakies soos die veseldeursnee van kambande en gare en toetse vir oorblywende vet op kambande. Die Instituut lê hom daarop toe om sulke toetse gou uit te voer en stuur dikwels die resultate per telegram of telefoon na die firma, want die resultate van sulke toetse is gewoonlik slegs vir die fabrieksbestuur van nut as hulle binne 'n dag of twee ontvang word. Die Instituut het baie foute ondersoek. Dit is dikwels sake wat beide koper en verkoper raak, bv. as 'n besending wol in die een of ander vorm bv. kambol, beskuldig of foutief by ontvangs is en hulle wil weet wie vir die skade verantwoordelik was. Partymaal is daar 'n fout in draad of materiaal wat 'n fabriek vir sy eie interne doeleindes ondersoek wil hê. Dit is bevredigend om te sien dat die nywerheid al hoe meer gebruik maak van die Instituut vir die doel. Deur dié werk vir die lede te doen, en veral deur dit vinnig te doen, kan die Instituut met reg daarop aanspraak maak dat hy 'n waardevolle diens aan die nywerheid lever, wat dikwels op geen ander manier verkry kan word nie.

the use of the perhaps more costly modern type of synthetic paint may be attended with considerable economies.

So great is the probability of corrosion in the coastal belt, that structural engineers are turning over as far as possible to cement as a building material. There remain, however, many cases where metal must of necessity be employed, and P.I.R.I. have been examining corrosion inhibitive primers, particularly from the point of view of protection from salt spray. Definite conclusions have been reached, but the work is not complete as yet, since a number of further materials have still to be tested.

The scope of the Institute is steadily widening, and the Board of Control would like to record its sincere appreciation both to the Council and to the University of Natal for sympathetic and ready assistance and facilities they have made available.

SOUTH AFRICAN WOOL TEXTILE RESEARCH INSTITUTE

Director: MR. R. C. PALMER.

The Institute receives its financial support from the Wool Board, the Mohair Advisory Board, industrial subscribers and the C.S.I.R., who give a £-for-£ contribution on subscriptions that are guaranteed for five years. The work of the Institute is directed towards decreasing costs and improving quality in the wool textile industries. This work falls into three main categories—

- (a) Small tests for industry.
- (b) Short investigations for industry.
- (c) Research work.

Under (a) the Institute has during the year carried out some eighty tests. These are mostly small matters such as the fibre diameter of tops and yarns, tests for residual grease content of tops. The Institute makes a point of doing such tests promptly and often communicates the results to the firm by telegram or telephone, because the results of such tests are usually only of use to the factory management if they are given within a day or two. The Institute has had many faults to investigate. These are often matters affecting buyer and seller, as when a delivery of wool in some form, e.g., tops, arrives damaged or faulty and the two parties want to know who was responsible for the damage. Sometimes the fault is one in yarn or cloth that a factory wants investigated for its own internal purposes. It is pleasing to note that the industry is using the Institute more and more in this way. By doing these jobs for the members, particularly by doing them quickly, the Institute can fairly claim to be providing a valuable service to industry which it can often get in no other way.

Ondersoeke onder (b) is groter werke wat op versoek van die nywerheid onderneem word. Die Instituut kon reeds hierdeur verskeie fabriekke met hul spesiale probleme help. Partymaal lei die ondersoek van 'n bepaalde probleem van 'n fabriek verder as die blote oplossing daarvan tot 'n navorsingstudie wat op sigself van belang is.

Navorsing (c) is die vernaamste funksie van die Instituut. Die belangrikste prestasie van die Instituut tot dusver was op die gebied van sajeterdunning en spin. Oorsee word tans baie werk gedoen i.v.m. die duur stadium in die vervaardiging van garing, wat bekend staan as „verdunning”. Die Instituut het 'n suksesvolle teorie oor een aspek van verdunning opgestel, naamlik die oorsprong van medium- en langtermynonreëlmatighede in kamdrade. Hierdie studie is uit 'n suiwer akademiese oogpunt onderneem, maar dit het twee belangrike toepassings in die fabriek tot gevolg gehad. Deur die teorie te gebruik, kan die Instituut 'n masjien, wat sy deel van die verdunningsproses nie goed uitvoer nie, opspoor. Dit kan gedoen word deur net die draad te ondersoek en die hele proses duur nie twee dae nie. Om die belangrikheid van die ontwikkeling vir die nywerheid te sien, moet 'n mens besef dat daar so veel as sewe ingewikkelde masjiene kan deelneem aan die verdunningsproses, enigeen waarvan verantwoordelik kan wees vir 'n slegte of verkeerde draad en dat dit 'n lang tyd sal duur om elkeen van hulle apart te ondersoek. Die Instituut was reeds baie suksesvol in die toepassing van die nuwe diagnostiese metode.

'n Tweede toepassing van die teorie is om die minimum aantal operasies wat nodig sal wees om 'n gegewe kambol uit te trek en te spin, te voorspel. Dit is belangrik omdat dit die spinner help om nie 'n duur fout te begaan in die beplanning van sy proses nie. Tot dusver het die Instituut se hulpmiddels nie toegelaat om hierdie toepassing van die teorie nader te ondersoek nie.

'n Ander studie in verdunning is toegespits op die ondersoek van die volledige veselrangskikking in 'n kamband. 'n Masjien wat die kamband millimeter vir millimeter, kan ontleed, is in die Instituut ontwerp, ontwikkel en gebou. Die masjien kan ook gebruik word om roetine-monsters van die kamband vir metings te neem en dit staan bekend as 'n kambandmonster-nemer. Sommige interessante resultate oor die samestelling van 'n kamband, wat fundamenteel is vir die teorie van die verdunnings- en spinprosesse, kom nou aan die lig. Ander werk wat by die Instituut i.v.m. verdunning en spin gedoen word, staan in verband met die „bondelteorie” van korttermyn-draadonreëlmatighede.

Om die werk i.v.m. sajeterdunning en spinprosesse voort te sit, het die Instituut sy eie masjiene nodig en het so pas besluit om 'n kleinskaalse verdunnings- en spinmasjiene te koop, wat bekend staan as die „Tegniese Kollege-masjiene”. Dit sal sowat £8,000 kos.

Investigations under (b) are larger jobs undertaken at the request of industry. The Institute has been able to help several mills with their special problems by such work. Sometimes a problem raised by a factory leads beyond the solution of the particular problem to a research study of interest in its own right.

Research (c), is the main function of the Institute. The most notable achievement of the Institute has been in the field of worsted drawing and spinning. A good deal of work is currently being done overseas on the costly stage of manufacture of yarns known as “drawing”. The Institute has developed a successful theory of one aspect of drawing, namely the origin of medium- and long-term irregularities in worsted yarn. This study was undertaken purely from an academic point of view, but has turned out to have two important applications in the factory. By using the theory the Institute is able to detect a machine in drawing that is not working properly. It can do this by an examination of nothing but the yarn, and the whole process takes less than two days. To see the industrial importance of this development, it is necessary to realise that there may be as many as seven complicated machines in drawing, any of which may be responsible for a faulty or inferior yarn and that to examine them each separately would take a long time. The Institute has already had considerable success in the application of the new diagnostic method.

A second application of the theory lies in being able to forecast the minimum number of drawing operations required to draw and spin a given wool top. The point is important in that it enables a spinner to avoid making a costly mistake in arranging his process. The Institute's facilities have not allowed this application to be pursued so far.

Another study in worsted drawing is directed to investigating the detailed fibre arrangement in a top. A machine for dissecting the top millimetre by millimetre has been designed, developed and a prototype constructed at the Institute. The machine can also be used for taking routine samples of top for measurement and is known as a Top Sampler. Some interesting results are emerging on the structure of a top, which is fundamental to the theory of worsted drawing and spinning. Other work on hand at the Institute connected with worsted drawing and spinning concerns the “bundle theory” of short-term yarn irregularity.

To continue the work on worsted drawing and spinning the Institute needs machinery of its own and has just decided to buy a small scale drawing and spinning set known as a “Technical College Set”. This will cost about £8,000.

The Institute has bought a specially made pilot scale washing set, which will act as a link between the laboratory experiments and the large scale. The Institute's work on wool washing is mainly directed towards reducing the cost of washing and improving the quality of

Die Instituut het 'n spesiaal vervaardigde kleinskaalse wasmasjien gekoop, wat as 'n skakel sal dien tussen die laboratorium-eksperimente en die grootskaalse werk. Die Instituut se werk i.v.m. die was van wol is hoofsaaklik daarop toegespits om die koste van was te verminder en om die gehalte van die gewaste wol te verbeter. Daar word gepoog om eenvoudige laboratorium-toetsmetodes te ontwerp, wat die wolwasser in staat stel om vooraf te kan sê wat die beste wasproses is vir 'n gegewe ru-wol. Dit lyk asof dit uit die werk aan die lig kom dat verskillende soorte wol nie effens verskillend nie, maar radikaal verskillend behandel moet word.

NAVORSINGSEENHEID VIR BITUMINEUSE BINDSTOF

Direkteur: DR. P. J. RIGDEN.

Na drie jaar is die eerste ontwikkelingsstadium van die Eenheid voltooi en dit het toe lank genoeg bestaan om 'n betreklik noukeurige berekening van sy jaarlikse werkskoste moontlik te maak. As gevolg van 'n uitvoerige hersiening van die Eenheid se geldelike posisie en navorsingsprogram het die Loodskomitee besluit om al die Eenheid se ondersteuners te vra om hul jaarlikse bydraes te verhoog en hulle van 1 April 1954, vir nog vyf jaar te waarborg. Die reaksie op die versoek was baie bemoedigend en daar was gevolglik 'n toename van 50 persent in die beskikbare fondse, wat nou byna £13,000 per jaar bedra vir jaarlikse lopende uitgawes. Die Natalse Provinsiale Administrasie word nou op die Eenheid se Loodskomitee verteenwoordig en die Standard-Vacuum Refining Co. in Durban het ook 'n belangrike ondersteuner geword met 'n verteenwoordiger op die Loodskomitee.

Die verhoogde inkomste het 'n paar toevoegings tot die Eenheid se personeel moontlik gemaak en nog 'n ge-graduateerde en twee assistente is aangestel, met die doel dat daar meer werk op die chemiese gebied verrig kan word. Een van die senior lede van die personeel is na die Padnavorsingslaboratorium in Brittanje gestuur vir 'n jaar se studie en ook om meer ondervinding op te doen in die nuutste metodes van padnavorsing. Terwyl hy in Europa is, sal hy 'n aantal ander padnavorsingsinstitute besoek.

Foto-oksidasie van Bindstowwe

Die rol van foto-oksidasie in die verwerking van bindstowwe op die pad, is een van die baie faktore wat die duursaamheid van bindstof kan beïnvloed. Daar is nog betreklik min bekend oor die onderwerp en die Eenheid het onlangs 'n voorlopige laboratoriumondersoek voltooi in 'n poging om sommige van die belangriker vrae te kan beantwoord. Met die gebruik van dun lae bindstof wat met ultravioletlig bestraal is, kan daar getoon word dat die foto-oksidasiereaksie aan die begin vinnig is, maar gou stadiger word en waarskynlik nie die teer of skalieolie-bitumen dieper as 60 mikron aantas nie. Die reaksie veroorsaak 'n dun ondeurdringbare laag op

the washed wool. An attempt is being made to find simple laboratory methods of testing that will enable the wool washer to tell beforehand what is the best washing procedure to use on a given raw wool. It seems to be emerging from this work that different wools need, not slightly, but radically different treatment.

BITUMINOUS BINDER RESEARCH UNIT

Director: DR. P. J. RIGDEN.

By the end of 1953 this Unit had, after three years, completed its initial stage of development and had been in existence long enough for a reasonably close assessment of the annual cost of its work to be made. As a result of a detailed review of the Unit's financial position and research programme, the Steering Committee decided to ask all the Unit's supporters to increase their annual contributions and to guarantee them for a further five-year period from the 1st April, 1954. The response to this request has been most encouraging and, as a result, there has been an increase of about 50 per cent in the funds available for annual running expenses, which now amount to nearly £13,000 per annum. The Natal Provincial Administration is now represented on the Unit's Steering Committee, and the Standard-Vacuum Refining Co. in Durban has also become a major contributor with a seat on the Steering Committee.

The increased income has permitted some additions to the Unit's staff, and a further graduate and two assistants have been appointed to enable an increased effort on the chemical side to be made. One of the senior members of the staff has been sent to the Road Research Laboratory in Britain to study for one year, and to gain further experience in the latest methods of road research. While in Europe he will visit a number of other road research institutes.

Photo-oxidation of Binders

One of the many aspects of the binder durability problem is that of the role of photo-oxidation in the weathering of binders on the road. Comparatively little is known on the subject and the Unit recently completed a preliminary laboratory investigation in an attempt to answer some of the more important questions. Using thin films of binder irradiated with ultra-violet light, it was shown that the photo-oxidation reaction, though initially rapid, slows down quickly and does not appear to affect either tar or shale-oil bitumen below a depth of 60 microns. As a result of this reaction, a thin impermeable skin is produced on the surface and, while it

die oppervlakte en terwyl dit heel bly, hou dit oksidasie en die verlies van olie uit die bindstof teë. Die voorlopige gevolgtrekking uit die werk is dat die soort oppervlaktereaksie nie op sigself baie skadelik is nie.

Skalieolie-bitumen

Dit lyk asof die duursaamheid van skalieolie-bitumen afhang van oksidasie, maar pogings om die vatbaarheid vir oksidasie, te verminder deur die bitumen vooraf te behandel of deur die gebruik van anti-oksideermiddels, was tot dusver nie baie suksesvol nie. Die werk duur egter voort. Terselfdertyd word 'n meer fundamentele benadering toegepas deur 'n poging te maak om die aard van die oksidasieproses te verstaan. In dié verband word fraksionering van die bitumen in verskillende groepe verbindings nou uitgevoer. Dit word hoofsaaklik deur chromatografiese metodes gedoen.

Fisiese Aspekte van Duursaamheid

Tesame met die chemiese ondersoek van bindstowwe is daar begin met nuwe ondersoeke om die fisiese meganisme van die mislukking van bindstowwe onder verkeer te probeer vasstel. As gevolg van verwerking word bindstowwe progressief harder en word uiteindelik „bros”, veral in die winter as die temperatuur van die padoppervlakte baie laag is. In die omstandighede word die klippe onder die verkeer uit die pad geslinger en die padoppervlakte versleg. Aangesien die vernietigende kragte van bewegende verkeer slegs vir 'n deeltjie van 'n sekond inwerk, is dit redelik om aan te neem dat die gedrag van 'n bindstof afhang van sy elastiese en viskeuse eienskappe. 'n Metode is in die laboratorium ontwikkel om Young se Modulus en die meegaande inwendige viskositeit te meet. Dit kan toegepas word op bitumineuse bindstowwe wat hard en bros, of sag en plasties is. Metings kan maklik op 'n klein hoeveelheid materiaal oor 'n wye gebied van temperatuur en frekwensie gedoen word.

Groot skaalse Padtoetse op Spesiale Tere

In die vorige jaarverslag is verwys na werk i.v.m. die vlugtigheidsienskappe van Yskortere. As gevolg van die belowende resultate van die laboratoriumtoetse, is tien soorte spesiale teer waarin verskillende soorte swaarolie gebruik is, by die Yskorwerke berei. Die tere is vroeg in 1954 op die Tarlton-Ventersdorppad gelê vir 'n beheerde proefneming van oppervlaktebedekking, tesame met teer verkry volgens gewone prosesse en ingevoerde bitumene vir vergelykingsdoeleindes. Die proef is vier myl lank en bestaan uit 72 verskillende afdelings.

Die Werkverrigting van Bindstofsproeiers

Die bindstofsproeier is miskien die belangrikste apparaat wat vir die maak van oppervlaktebedekking van paaie gebruik word. Die sukses van oppervlaktebedekking hang in 'n groot mate daarvan af of 'n eenvormige laag bindstof met 'n voorgeskrewe dikte op die pad aangewend word. Gedurende die groot skaalse toetse op paaie is die prestasie van 'n aantal van die masjiene in besonderhede bestudeer en 'n ietwat onbevredigende toestand van sake het aan die lig gekom. Dit blyk dat baie

remains intact, retards oxidation and loss of oil from the binder. The preliminary conclusion from this work is that surface reactions of this type are not, of themselves, very harmful.

Shale-oil Bitumen

The durability problem in shale-oil bitumen appears to be one of oxidation, and attempts to reduce oxidation susceptibility either by pre-treatment of the bitumen or by the use of anti-oxidants have not, so far, been very successful, but further work continues. At the same time a more fundamental approach is being made in an attempt to establish the mechanism of oxidation. In this connection fractionation of the bitumen into different groups of compounds is now in hand, mainly by chromatographic methods.

Physical Aspects of Durability

Parallel with the chemical work on binders some new investigations have been started to try to establish the physical mechanism of binder failure under traffic. As a result of weathering, binders become progressively harder and finally reach a “brittle” condition which is particularly marked in the winter when road surface temperatures are low. Under these conditions stone is lost under traffic and the road surface deteriorates. Since the destructive forces of moving traffic are imposed in a small fraction of a second it seems reasonable to assume that the elastic as well as viscous properties of a binder determine its behaviour. A method of measuring Young's Modulus and the associated internal viscosity has been developed in the laboratory and is applicable to bituminous binders in either a hard and brittle condition or when soft and plastic. Measurements can be easily made on a small quantity of material over a range of temperature and frequency.

Full-scale Road Tests on Special Tars

Reference was made in the last annual report to work on the volatility characteristics of Iscor tars. The promising results found on laboratory tests led to the preparation of ten special tars at the Iscor works in which different types of heavy oil were used. These tars were laid in a controlled surface dressing experiment on the Tarlton-Ventersdorp road early in 1954, together with normal-production tars and imported bitumens for comparison. The experiment is four miles long and comprises 72 different sections.

The Performance of Binder Distributors

The binder distributor is perhaps the most important item of plant used for the surfacing of roads. The success of surface dressing operations depends to a large extent upon the application to the road of a uniform film of binder of specified thickness. In the course of full-scale work on roads, the performance of a number of these machines has been studied in detail, and a somewhat unsatisfactory state of affairs has been revealed. Many distributors appear to be unreliable and show con-

sproeiers onbetroubaar is en aansienlike afwykings vertoon in die oorlangse en kruiselingse verspreidingspatrone. In baie gevalle is die sproeiing van die bindstof ook nie konstant nie.

Daar is dus besluit om op 'n geskikte depot fasiliteite op te rig om die sproeiers volledig te toets. Vereers sal die doel veral navorsing en ondersoek wees, maar later roetinetoetse. In medewerking met die Transvaalse Provinsiale Administrasie is 'n geskikte toetsapparaat ontwerp en opgebou en dit is nou gereed vir installasie en gebruik in die depot.

siderable variations in the longitudinal and transverse distribution patterns, while in many cases the output from the spray-bar is far from constant.

It was therefore decided to set up facilities at some convenient depot for the complete testing of distributors, initially for the purpose of research and investigation, and later for the purpose of routine testing. In collaboration with the Transvaal Provincial Administration, a suitable depot testing apparatus has been designed and constructed and is now ready for installation and use.

Mediese Navorsing

Ere-Adviseur: PROF. S. F. OOSTHUIZEN.

Komitees

Die Raad betuig sy dank teenoor die lede van die Mediese en Tandheelkundige Navorsingskomitee en lede van die tien onderkomitees vir mediese navorsing vir hul voortdurende belangstelling en vir hul leiding in die navorsingsprogramme van die mediese navorsingseenhede. Die Raad wil veral vir dr. T. B. Davie, Voorsitter van die Mediese en Tandheelkundige Navorsingskomitee en Prof. S. F. Oosthuizen, sy Ere-Sekretaris vir Mediese en Tandheelkundige Navorsing bedank vir hul getroue hulp verleen ten spyte van hul baie ander veeleisende pligte.

Professor G. A. Elliott en dr. J. H. S. Gear het aan die end van 1953 uitgetree as lede van die Mediese en Tandheelkundige Navorsingskomitee en volgens die konstitusie van die komitee is hulle vir één jaar nie weer verkiesbaar nie. Hul plekke is gevul deur dr. J. C. Thomas, Hoofpatoloog, Natalse Provinsiale Administrasie en dr. B. J. P. Becker, S.A. Instituut vir Mediese Navorsing. Prof. J. C. Middleton Shaw se bedanking uit die komitee is met spyt deur die Raad aanvaar. Prof. F. Forman, Departement van Medisyne, Universiteit van Kaapstad en prof. H. W. Snyman, Departement van Medisyne, Universiteit van Pretoria het ingestem om as plaasvervangende lede op die komitee te dien.

Nuwe Eenheid

'n Hartnavorsingseenheid in die Departement van Medisyne aan die Universiteit van Pretoria, wat vir 'n geruime tyd aktief besig was met navorsing na hartongesteldhede, is erken as 'n mediese navorsingseenheid van die W.N.N.R. Prof. H. W. Snyman is aangestel as direkteur van die eenheid, wat onder beheer van die onderkomitee vir kardio-pulmonale navorsing sal staan.

Ondersteunde Navorsing

Die Nasionale Raad van die S.A. Rooikruisvereniging het aangebied om £2,500 wat hulle as 'n erfenis ontvang het, te gebruik vir 'n studie onder beskerming van die W.N.N.R. van die biochemie van harsing-rugmurgvloeistof in tuberkuleuse meningitis, met besondere verwysing na die bloed/CSF Bromiedverhouding as 'n vroeë diagnostiese toets. Die navorsingswerk sal 'n aanvang neem sodra 'n laboratoriumassistent aangestel is.

Die Transvaalse Provinsiale Administrasie sal die Raad vir drie jaar 'n jaarlikse toekenning van £2,000 gee om die oorsake van sterftes onder narkose te ondersoek. Aansoeke van gekwalifiseerde geneeshere vir 'n beurs van £1,200 per jaar is gevra, en hopelik sal 'n beurshouer binnekort aangestel word.

Die waterbioloog wat met 'n spesiale skenking van £1,500 van die Transvaalse Provinsiale Administrasie aangestel is, het gedurende die jaar begin werk. Nadat hy opleiding in die laboratorium en in die veld ontvang het, het hy Nelspruit tot sy hoofkwartier gemaak, waar

Medical Research

Hon. Adviser: PROF. S. F. OOSTHUIZEN.

Committees

The Council expresses its gratitude to the members of the Medical and Dental Research Committee and members of the ten medical research sub-committees for their continued interest and for their guidance on the research programmes of the medical research units. In particular the Council thanks Dr. T. B. Davie, Chairman of the Medical and Dental Research Committee and Prof. S. F. Oosthuizen, its Honorary Secretary for Medical and Dental Research, for their unflinching help given in spite of their many other onerous duties.

Professor G. A. Elliott and Dr. J. H. S. Gear relinquished membership of the Medical and Dental Research Committee at the end of 1953, and in accordance with the Committee's constitution were not eligible for re-election for one year. Their places were taken by Dr. J. C. Thomas, Chief Pathologist, Natal Provincial Administration and Dr. B. J. P. Becker, S.A. Institute for Medical Research. The resignation of Prof. J. C. Middleton Shaw from the Committee was accepted with regret by the Council. Prof. F. Forman, Department of Medicine, University of Cape Town and Prof. H. W. Snyman, Department of Medicine, University of Pretoria, agreed to act as alternate members of the Committee.

New Unit

A Heart Research Unit in the Department of Medicine, University of Pretoria, which had for some time been very actively engaged in research into heart disorders, was given recognition as a C.S.I.R. medical research unit. Prof. H. W. Snyman was appointed as director of the unit, which will be guided by the Cardio-Pulmonary Research Sub-Committee.

Sponsored Research

The National Council of the S.A. Red Cross Society has offered to use £2,500, which it received as a bequest, for the study under the C.S.I.R.'s auspices of the biochemistry of cerebral spinal fluid in tuberculous meningitis, with particular reference to the blood/CSF Bromide ratio as an early diagnostic test. The research work will begin as soon as a laboratory assistant is appointed.

The Transvaal Provincial Administration is to provide the Council with an annual grant of £2,000 for three years to investigate the causes of deaths under anaesthesia. Applications have been invited from qualified medical doctors for a bursary of £1,200 a year, and it is hoped to appoint a bursar shortly.

The water biologist appointed with a special grant of £1,500 by the Transvaal Provincial Administration began work during the year. After receiving training in the laboratory and in the field, he made his headquarters at Nelspruit, where he will in future concentrate on the ecology, bionomics and physiology of the snail hosts,

hy hom in die toekoms sal toelê op die ekologie, biologie en fisiologie van die slak se gashere, in medewerking met die weekdierkundige wat deur die Unie-Departement van Gesondheid aangestel is.

Fundamentele Chemiese Navorsing in Verhouding tot die Mediese Wetenskap

In die Nasionale Chemiese Navorsingslaboratorium is 'n klein afdeling ingerig om skeikundige probleme wat deur die Raad se mediese navorsingseenhede teenekom word, te hanteer.

Jaarlikse Vergadering van Direkteure van Mediese Navorsingseenhede

Die spesiale komitee wat die Raad verlede jaar aangestel het vir die hersiening van die mediese navorsingseenhede wat deur die Raad gesteun word, het aanbeveel dat die direkteure van die eenhede een maal per jaar bymekaar moet kom om wetenskaplike afsondering teen te werk. 'n Geslaagde vergadering wat deur al die direkteure van Eenhede bygewoon is, het in Augustus 1954 plaasgevind.

Kommissie van Onderzoek na Mediese Navorsing

Gedurende die jaar het die President 'n voorstel van die Unie-Departement van Gesondheid dat die W.N.N.R. alle mediese navorsing wat binne die Departement gedoen word, moet oorneem, met die Sekretaris van Gesondheid bespreek. Hulle het aanbeveel dat die Regering 'n Kommissie aanstel om die saak te ondersoek, aangesien ander Staatsdepartemente ook mediese navorsing doen.

Die Raad neem met genoeg kennis dat Sy Eksellensie, die Goewerneur-Generaal in Augustus 1954 'n Kommissie van Onderzoek aangestel het met die volgende opdragte :

1. Om die volgende sake te ondersoek en daarvoor verslag te doen—
 - (a) die moontlikheid van beter koördinerende van mediese navorsing in die Unie, moontlik onder een liggaam ;
 - (b) die moontlikheid om sodanige koördinasie te weeg te bring onder, of as 'n deel van 'n bestaande statutêre liggaam ;
 - (c) die noodsaaklikheid, of andersins, van die stigting van 'n nuwe onafhanklike liggaam om mediese navorsing te koördineer.
2. As dit nodig gevind word om 'n koördinerende liggaam in die lewe te roep, of as deel van 'n bestaande statutêre liggaam of as 'n nuwe onafhanklike liggaam, om aanbevelings te doen oor—
 - (i) aan wie so 'n koördinerende liggaam verantwoordelik moet wees ;
 - (ii) die konstitusie van so 'n liggaam ;
 - (iii) die magte en pligte van so 'n liggaam ;
 - (iv) die wyse waarop so 'n liggaam en sy aktiwiteite gefinansieer moet word.
3. As die stigting van 'n koördinerende liggaam nie raadsaam geag word nie, om aanbevelings te doen i.v.m. die wyse waarop mediese navorsing ge-koördineer moet word.

in collaboration with the malacologist appointed by the Union Health Department.

Fundamental Chemical Research in Relation to Medical Science

A small section has been established in the National Chemical Research Laboratory to deal with chemical problems encountered by the Council's medical research units.

Annual Meeting of Directors of Medical Research Units

The special committee which the Council appointed last year to review the medical research units which it supports recommended that the directors of the units should meet once a year to combat scientific isolation. A successful meeting attended by all the directors of units was held in August, 1954.

Commission of Enquiry into Medical Research

During the year the President of the Council discussed with the Secretary for Health a proposal submitted by the Union Health Department that the C.S.I.R. should take over all medical research being done within the Department. They recommended that the Government should appoint a Commission to go into the question, since medical research was being done by other Government departments too.

The Council notes with approval that His Excellency the Governor-General in August, 1954, appointed a Commission of Enquiry with the following terms of reference :

1. To investigate and report upon —
 - (a) the possibility of better co-ordination of medical research in the Union, possibly under one body ;
 - (b) the possibility of bringing about such co-ordination under, or as part of, an existing statutory body ;
 - (c) the necessity or otherwise of the establishment of a new independent body to co-ordinate medical research ;
2. If it is found necessary to establish a co-ordinating body, either as part of an existing statutory body or as a new independent body, to make recommendations regarding —
 - (i) to whom such a co-ordinating body would be responsible ;
 - (ii) the constitution of such a body ;
 - (iii) the powers and duties of such a body ;
 - (iv) the manner in which such a body and its activities should be financed.
3. If the establishment of a co-ordinating body is not considered advisable, to make recommendations regarding the manner in which medical research should be co-ordinated; and

4. Om aanbevelings te doen oor enige ander sake wat in verband staan met bogenoemde opdragte.

Skakel

Die Raad se mediese ere-skakelbeamptes in die Verenigde Koninkryk en die Verenigde State het nog 'n jaar van waardevolle diens aan die W.N.N.R. gelewer deur dit op die hoogte te hou van onlangse ontwikkelinge in oorsese mediese navorsing. Die Raad is hulle baie dank verskuldig vir die diens. Die Raad het ook 'n beter skakeling met mediese navorsingswerkers in ander Afrikaanse gebiede probeer verseker.

Gedurende die jaar het die voorsitter van die M.T.N.R., dr. T. B. Davie, die Verenigde State en Kanada besoek en prof. S. F. Oosthuizen, die Raad se ere-sekretaris vir Mediese Navorsing het die Verenigde Koninkryk en Europa besoek. Hul verslae was besonder waardevol vir die M.T.N.K.

Fondse

Gedurende die finansiële jaar 1954/55, is sowat £77,500 toegeken vir mediese en tandheelkundige navorsing. Sowat £16,000 is toegewys aan individuele mediese en tandheelkundige navorsingswerkers aan Universiteite, £7,500 aan die Suid-Afrikaanse Instituut vir Mediese Navorsing en sowat £51,000 aan mediese navorsingseenhede. 'n Geringe bedrag is bestee aan reis en onderhoudskoste deur die adviseurs van die Raad en lede van mediese advieskomitees.

Skenkings

Die Raad erken met dank skenkings ter waarde van £217 2s. 0d. van verskeie persone vir teringnavorsing aan die Teringnavorsingseenheid, Durban.

Mediese Navorsingseenhede

Verslae deur die direkteure van die mediese navorsingseenhede verskyn in die volgende afdelings. Die bystand van Regerings- en Provinsiale owerhede, die Suid-Afrikaanse Instituut vir Mediese Navorsing en van individue wat tot die werk bygedra word, word met dank erken.

AMEBIASE-NAVORSINGSEENHEID

Hoof van die Eenheid: DR. R. ELSDON-DEW.

Huisvesting

Weens die koms van die Mediese Skool in Durban en die gesamentlike aanstellings van die Natalse Provinsiale Administrasie en die Universiteit van Natal, moes reëlings in die laboratorium getref word om groter ruimte beskikbaar te stel vir die Afdeling Parasitologie en dus ook vir die Amebiase-navorsingseenheid.

Die saal wat in die Koning Edward VIII-hospitaal afgesonder is vir die Afdeling vir Geneeskundige Proewe is nog in gebruik en die skakeling met die Natalse Provinsiale Laboratoriumdiens en die hospitale van die Natalse Provinsiale Administrasie is volgehou.

4. To make recommendations regarding any other matters relating to the above terms of reference.

Liaison

The Council's honorary medical liaison officers in the United Kingdom and the United States have given the C.S.I.R. another year of valuable service in keeping it informed of recent developments in medical research overseas. The Council is greatly indebted to them for this service. The Council has tried also to ensure better liaison with medical research workers in other African territories.

During the year the Chairman of the M.D.R.C., Dr. T. B. Davie, visited the United States and Canada and Prof. Oosthuizen, the Council's Honorary Secretary for Medical Research visited the United Kingdom and Europe. Their reports were most valuable to the M.D.R.C.

Funds

About £77,500 was allocated for medical and dental research during the financial year 1954/55, some £16,000 being allocated to individual medical and dental research workers at Universities, £7,500 to the South African Institute for Medical Research and about £51,000 to medical research units. A small sum was spent on travelling and subsistence by the Council's advisers and members of medical advisory committees.

Donations

The Council acknowledges with thanks donations from various persons amounting to £217 2s. 0d. for tuberculosis research in the Tuberculosis Research Unit in Durban.

Medical Research Units

Reports by the directors of the medical research units are given in the succeeding sections. The assistance of Governmental and Provincial authorities, the South African Institute of Medical Research and individuals who have co-operated in this work, is gratefully acknowledged.

AMOEBIASIS RESEARCH UNIT

Head of the Unit: DR. R. ELSDON-DEW

Accommodation

The advent of the Medical School in Durban and the establishment of the joint appointments of the Natal Provincial Administration and the University of Natal have resulted in certain rearrangements of the laboratory to make a slight increase of space available to the Parasitology Section and thus to the Amoebiasis Research Unit.

The ward set aside in the King Edward VIII Hospital for the Therapeutic Trials Section is still in use and the liaison with the Natal Provincial Laboratory Service and the hospitals of the Natal Provincial Administration is being maintained.

Geneeskundige Proewe

Dieselfde beleid is weer in dié jaar gevolg. Die hoofdoel was naamlik om die doeltreffendheid van individuele middels te toets, meer bepaald met die doel om die geneeskundige behandeling te verstaan as om 'n wondermiddel vir genesing van alle gevalle te ontdek. Proefnemings oor die metodes van behandeling het ons reeds 'n praktiese begrip van die siekte gegee soos dit in Afrika voorkom. Daar bestaan weinig twyfel dat die belangrikheid van die bakteriese flora in die akute fase van die siekte deur die geneeskundige proewe vasgestel is.

Gedurende die jaar is daar geen groot vordering gemaak met die geneeskundige behandeling nie, behalwe dat daar vasgestel is dat baie kleiner dosisse van die antibiotiese middels verbasend doeltreffend is. Wat die koste van die terapie betref is dit uiters belangrik, want as die groot dosisse antibiotiese middels gebruik moes word, sou behandeling byna onmoontlik gewees het.

Opnames

Die Eenheid se vorige verslag oor die uitwerking van beter behuising op die ingewandfauna is gretig ontvang en soortgelyke opnames i.v.m. behuising onder industriële toestande word nou onderneem. Die samewerking van laaslike nyweraars is 'n groot hulp.

Laboratoriumondersoeke

Proefnemings met die kultuur van die amebes is voortgesit. 'n Nuwe benadering soos voorgestel deur Geiman van Boston word nou gebruik en dit lyk asof dit 'n voldoende bron van antigeen sal verskaf. Verdere proefnemings om die graad van reduksie vas te stel, word uitgevoer in verband met die gebruik van ensiemstelsels, wat volgens vorige bevindings noodsaaklik is vir die amebes. Dit is nog baie gou om 'n mening uit te spreek oor die doeltreffendheid van die benadering, maar dit mag moontlik wees om vir die amebe 'n ensiemstelsel te verskaf wat dit gouer sal laat groei.

Die ondersoek van tegniese metodes is voortgesit en 'n verhandeling wat tans gereedgemaak word, handel oor die uitkenning van die amebe deur verftegniek. Ondersoeke duur ook voort om die ensiemstelsels rondom die amebe vas te stel deur bemiddeling van mikrochemiese metodiek.

Die Departement van Fisika van die Universiteit het meegedeel dat hulle belang stel in die biofisiese probleme waarmee die Eenheid te kampe het en daar bestaan 'n hoop dat 'n lid van hulle personeel sal kan bystand verleen. Tot tyd en wyl iemand genoeg tyd aan die probleme aan bestee, kan daar egter nie veel verdere vordering verwag word nie.

Algemeen

Daar is geen verandering in ons beoordeling van die siekte soos dit in die vorige Jaarverslag uiteengesit is nie. Op 'n onlangse vergadering van die Amebiase-navorsingskomitee is die kwessie van dieet in die siekte te berde gebring en die moontlike uitwerking van die belasting op mineraalwaters is genoem. Gedurende die tydperk toe die belasting bestaan het, was daar ongetwyfeld 'n

Therapeutic Trials

The same policy has been pursued throughout this year; that is, the main aim has been to test the efficacy of individual drugs more from the point of view of understanding the therapy than from the point of view of establishing a "cure-all" method of treatment. Experiments into methods of therapy have already given a working concept of the disease as it occurs in Africa and there can be little doubt that the therapeutic trials have established the importance of the bacterial flora in the acute phase of the disease.

There have been no great advances in therapy during the year, except that it has been established that very much smaller doses of the antibiotics are surprisingly effective. This is most important from the point of view of the cost of therapy which, if the large doses of antibiotics were to be used, became almost prohibitive.

Surveys

The Unit's previous report on the effect of better housing on the intestinal fauna has been received with enthusiasm and, following along these lines, surveys are in hand with reference to housing under industrial conditions. The co-operation of local industrialists has been of great assistance in this work.

Laboratory Investigations

The experiments on culture of the amoeba continued. A new approach along the lines suggested by Geiman of Boston is being put in hand and it seems that this may provide an adequate source of antigen. Further experiments to establish the state of reduction are being carried out in the use of enzyme systems which have previously been found essential to the amoeba. It is still early to talk of the effectiveness of this approach, but it may be possible to provide an enzyme system for the amoeba which will enable it to grow at greater speed than at present.

Investigations into technical methods have continued and a paper in course of preparation at the moment deals with the question of the identification of the amoebae by staining processes. Investigations are also being continued on microchemical methods to determine the enzyme systems surrounding the amoeba.

The Department of Physics of the University has indicated its interest in the biophysical problems confronting the Unit and there is some hope that one of the staff of the Physics Department may be able to assist, but until someone is able to spend sufficient time on these problems very little further progress can be expected.

General

There has been no change in our concept of the disease as reported in the last Annual Report. The question of diet in the disease was brought out in a recent meeting of the Amoebiasis Research Committee and the possible effect of the taxation on mineral waters was mentioned. During the period, whilst this tax was imposed there was undoubtedly a fall in the incidence of

afname in die voorkoms van amebiase, maar 'n mens kan nog geen gegronde gevolgtrekking hieruit maak nie. Dit sal interessant wees om te sien of daar 'n verskerpte uitbreking was sedert die belasting opgehef is. Gevolgtrekkings sal egter baie versigtig gemaak moet word weens die periodieke voorkoms van die siekte en ook weens die uitwerking van ander maatreëls wat die eenheid by plaaslike owerhede aanbeveel het.

Erkennings

Die Raad wil graag sy dank betuig teenoor die volgende liggame wat die Eenheid bygestaan het: Die Natalse Provinsiale Administrasie vir onbeperkte samewerking op elke gebied, die Personeelkomitee van die Koning Edward VIII-hospitaal wie se samewerking die werk moontlik gemaak het, die Stadsbestuur van Durban vir medewerking op baie gebiede, die lede van die Amebiase-navorsingskomitee, en die medisynemaatskappy wat mildelik medisyne voorsien het en wat op ander gebiede hulp aangebied het.

NATUURHISTORIESE BILHARZIA-EENHEID

Hoof van Eenheid: DR. B. DE MEILLON.

(Suid-Afrikaanse Instituut vir Mediese Navorsing)

Patologie van Bilharzia in Proefdiere

Lantermyn-besmettings

Daar is voortgegaan met die waarneming van twee aape wat met bilharzia besmet is. Die een is weer in November 1953 besmet en die ander is as kontrole gehou. Die resultate wat tot op datum verkry is, d.w.s. sewe maande nadat die een aap weer besmet is en agtien maande na die oorspronklike besmetting, kan as volg opgesom word:

- (i) Ondersoeke van lewerweefsel verkry deur biopsie het aan die lig gebring dat die kontrole-aap wat vir 18 maande besmet is weinig verdere histologiese veranderinge toon. Die chemiese veranderinge in die bloed, soos waargeneem deur Bersohn en Lurie op 26 weke („S. Afr. med. J.” 27, 950, 1953) neig egter om tot die normale terug te keer. Die omkeerbaarheid van die veranderinge, hoofsaaklik proteïenverhoudings, is van belang.
- (ii) In die proefaap wat oorspronklik agtien maande gelede en weer sewe maande gelede besmet is, is geen belangwekkende verdere veranderinge in die lewerpatologie tot dusver waargeneem nie. Die chemiese veranderinge in die bloed bly egter abnormaal.

Ter opsomming kan dus gesê word dat dit lyk asof die vroeë histologiese veranderinge in die lewer vir minstens agtien maande na besmetting voortduur, maar dat die chemiese veranderinge in die bloed neig om tot die normale terug te keer. Herbesmetting met 'n homologe stam veroorsaak geen merkbare histologiese veranderinge in die lewer nie, maar dit laat die chemie van die bloed abnormaal bly.

amoebiasis, but one cannot draw a valid conclusion from this and it will be interesting to see whether there has been a recrudescence since the taxation has been removed. This will require very careful assessment because of the seasonal incidence of the disease and also the impact of other measures advised to local authorities by this Unit.

Acknowledgements

The Council wishes to place on record its thanks to the following bodies which have assisted the Unit: The Natal Provincial Administration for their unstinting co-operation in every direction, the Staff Committee of King Edward VIII Hospital whose co-operation has made the work possible, the Corporation of the City of Durban for co-operation in many directions, the Members of the Amoebiasis Research Committee, and the drug companies who have been so generous in the supply of drugs and in their offers of other assistance.

BILHARZIA NATURAL HISTORY UNIT

Head of the Unit: DR. B. DE MEILLON

South African Institute for Medical Research

Pathology of Bilharziasis in Experimental Animals

Long term infections:

Observations on two bilharzial infected monkeys have continued. One was infected in November, 1953, and the other was kept as control. The results to date, ten, seven months after reinfection and eighteen months after the original infection may be summarized as follows:

- (i) The control monkey infected for 18 months shows very little further histological change as revealed by examination of liver material obtained by biopsy. The blood chemical changes reported by Bersohn and Lurie at 26 weeks (S. Afr. med. J. 27, 950, 1953) are, however, tending to revert to normal. The reversibility of these changes, largely protein ratios, is a matter of some importance.
- (ii) In the experimental monkey originally infected 18 months ago and reinfected seven months ago no significant further changes in liver pathology have been noted to date. The blood chemical changes, however, remain abnormal.

To sum up it appears that, following infection, the early histological changes in the liver persist for at least eighteen months, but that the blood chemical changes tend to revert to normality. Reinfection with an homologous strain produces no marked histological changes in the liver, but causes blood chemistry to remain abnormal.

Pathological changes in an apparently cured monkey:

A monkey infected with local *mansoni* was treated with Atebrin in the first place. Although the drug caused only dead eggs to be passed at first it soon re-

Patologiese veranderinge in 'n aap wat oënskynlik genees is.

'n Aap wat met plaaslike *mansoni* besmet was, is eers met atebrien behandel. Hoewel die middel in die begin meegebring het dat slegs dooie eiers afgeskei is, het dit gou weer hervat. Vyf maande later is die dier met antimoon-tri-(dodesie-merkaptied) wat deur die Abbott-laboratoriums verskaf is, behandel en vyf dae later het die ontlasting negatief geword vir eiers en daar is nou reeds vir ses maande geen lewensvatbare eiers afgeskei nie. 'n Onlangse ondersoek van die dier het weer getoon dat patologiese veranderinge in die lewer feitlik dieselfde bly, maar dat die chemie van die bloed tot die normale terugkeer het.

Bilharzia in 'n aap met 'n tekort aan proteïen en in een wat met die Egiptiese stam van mansoni besmet is

Afgesien van die feit dat die chemiese veranderinge in die bloed baie gouer as verwag is, plaasgevind het, het die twee ape geen slegte steurings getoon nie. Dit is miskien van belang om daarop te let dat die kenmerke van bilharzia nie vererger is in die aap met 'n tekort aan proteïen nie.

Bloedverlies in Ingewandbilharzia

Die ondersoek is gedoen in medewerking met dr. Walker van die Eenheid vir Menslike Biochemie. Hy het gevind dat die bloedverlies in *mansoni*-bilharzia net so onbeduidend was soos in urinale bilharzia.

Swemmersjeuk

Die Eenheid het gevind dat „swemmersjeuk” beslis in die Unie voorkom.

Ten spyte van alle pogings was dit nie moontlik om die lewensgeskiedenis van die serkarië waarmee twee eksperimentele gevalle van „swemmersjeuk” veroorsaak is, uit te werk nie. Eende en muise is sonder sukses daaraan blootgestel. Daar is egter vasgestel dat die draer aan die spesies *Bulinus*, waarskynlik *tropicus* behoort. Dié slak kom oor 'n wyderspreide gebied in die Unie voor.

'n Verhandeling oor „swemmersjeuk” is ingedien vir publikasie.

Serologiese Diagnose van Serkarië

Een van die moeilikhede waarmee veldwerkers te kampe het, is die diagnose van die serkarië wat deur slakke wat wild gevang is, afgewerp word. Dit is nou bekend dat die morfologiese verskille wat eers beskou is as 'n maatstaf vir die identifikasie van die nou verwante slakwurm in mens en dier onbetroubaar is.

Daar is reeds begin met werk op die gebied en die resultate wat tot dusver verkry is, lyk belowend. Die toets wat ontwikkel is berus op die agglutinasie van serkarië met homologe immuun serums. Dit spreek vanself dat as die serkarië bekend is, die toets gebruik kan word om teenliggame en dus besmetting aan te toon. Die aspek word ondersoek en dit is moontlik dat die toets meer sensitief kan wees as die BCF-toets.

lapsed. Five months later the animal was treated with antimony tri- (dodecylmercaptide) supplied by Abbott Laboratories and five days later the stool became negative for ova and no viable ova have now been passed for about six months. A recent examination of this animal again shows that pathological changes in the liver remain very much the same but that blood chemistry has returned to normal.

Bilharziasis in a protein deficient monkey and in one infected with the Egyptian strain of mansoni:

Apart from the fact, that blood chemical changes occurred very much earlier than expected, these two monkeys have shown no untoward disturbances. It is perhaps significant to note that in the protein deficient monkey bilharzial stigmata were not enhanced.

Blood Loss in Intestinal Bilharziasis

The Unit has collaborated with Dr. Walker of the Human Biochemistry Unit in this investigation. Briefly he has found the blood loss in *mansoni* bilharziasis to be as insignificant as in the case of urinary bilharziasis.

Swimmer's Itch

The Unit has definitely found “swimmer's itch” to occur in the Union.

In spite of all efforts it has not been possible to work out the life history of the cercariae with which two experimental cases of “swimmer's itch” were produced. Ducks and mice have been exposed to them without result. It has been established, however, that the vector is a species of *Bulinus* probably *tropicus*. This snail has a very wide distribution in the Union.

A paper dealing with “swimmer's itch” has been submitted for publication.

Serological Diagnosis of Cercariae

One of the problems facing field workers is the diagnosis of the cercariae shed by wild caught snails. The morphological differences formerly thought to serve as criteria for identifying the closely related human and animal flukes are now known to be unreliable.

Some work on the subject has been started and the results so far appear to be promising. The test evolved depends on the agglutination of cercariae with homologous immune sera. Naturally if the cercariae are known the test may be used for demonstrating antibody and hence infection. This aspect is being investigated as it is possible that the test may be more sensitive than the BCF.

Bilharzia en sy Verwantskap met Blaaskanker en Lewersirroze

In die studie werk die Eenheid saam met dr. Higginson van die S.A.I.M.N.

Omdat herhaalde ondersoeke van urine en ontlasting nie altyd die teenwoordigheid van bilharzia toon nie, is dit raadsaam om die blaas, lewer en nersderm in alkali te verteer om die teenwoordigheid of afwesigheid van die siekte vas te stel. Die metode word in opeenvolgende lykskouings by die Baragwanath-hospitaal uitgevoer om die algemene voorkoms onder die hospitaal-pasiënte vas te stel. Die bevindinge word gekorreleer met die voorkoms van lewersirroze en blaaskanker.

Daar is nog nie tot finale gevolgtrekkings gekom nie, maar op die oomblik lyk dit asof :

1. Daar geen korrelasie tussen bilharzia, kanker en lewersirroze is nie ;
2. daar 'n korrelasie mag wees tussen bilharzia en blaaskanker.

Stamme van Skistosome

Vir geruime tyd stel die Eenheid belang daarin om te bewys dat Suid-Afrikaanse stamme van *mansoni* en *haematobium* verskil van dié van Egipte. In 'n vroeëre jaarverslag (1950/51) is melding gemaak van die mislukte poging om Egiptiese oordraers met ons *mansoni* en *haematobium* te besmet. Sedertdien het die Eenheid bewys dat *Australorbis glabratus*, wat oorspronklik uit Suid-Amerika kom en wat deur Dr. Standen van Burroughs, Wellcome, Londen verkry is, vatbaar is vir Egiptiese *mansoni*, maar nie vir die Suid-Afrikaanse stam nie.

Deurlopende Waarneming van die BCF-toets in Kinders wat met Hematobium Besmet is

Waarnemings is gemaak op 19 blanke skoolkinders in die Ferndale-gebied. Die kinders het almal eers positiewe BCF-reaksie getoon ; daarna is hulle behandel en is sedertdien met tussenpose van sowat ses maande ondersoek. Die huidige toestand word in Tabel I hieronder opgesom :

TABEL I.

	BCF- Positief	Urine- Positief
Voor behandeling	19/19	19/19
6 maande na behandeling . .	16/17	0/17
14 maande na behandeling . .	12/16	0/16
20 maande na behandeling . .	11/15	0/15

Dit is duidelik dat BCF tot op minstens 20 maande na suksesvolle behandeling in die meeste gevalle nie as 'n toets vir genesing gebruik kan word nie.

Daar word voortgegaan met waarnemings van die kinders, maar dit word al moeiliker om hulle op te spoor

Slakke in Laboratoriumkultuur

Australorbis glabratus, 'n Suid-Amerikaanse slak en 'n goeie draer van verskeie stamme van *mansoni* is tot die Eenheid se voorraad van kulture toegevoeg.

Die belangrikste kulture van slakke nou in die Eenheid se versameling is :

Bilharziasis and its Relationship to Bladder Cancer and Hepatic Cirrhosis

The Unit is collaborating with Dr. Higginson of the S.A.I.M.R. in this study.

As frequent urine and faeces examination sometimes fails to indicate the presence of bilharziasis it is advisable to digest the bladder, liver and rectum in alkali in order to establish the presence or absence of the disease. This technique is being carried out on consecutive necropsies at Baragwanath hospital in order to establish the incidence in the general hospital population. These findings are being correlated with the incidence of hepatic cirrhosis and the frequency of cancer of the bladder.

Final conclusions have not been arrived at, but at the moment it appears that :—

- (1) There is no correlation between bilharziasis, cancer and cirrhosis of the liver.
- (2) There may be a correlation between bilharziasis and cancer of the bladder.

Schistosome Strains

The Unit has for some time been interested in showing that South African strains of *mansoni* and *haematobium* differ from those of Egypt. In a previous annual report (1950/51) the failure to infect Egyptian vectors with our *mansoni* and *haematobium* was mentioned. Since then the Unit has shown that *Australorbis glabratus*, originally from South America, and obtained through Dr. Standen of Burroughs Wellcome, London, are susceptible to Egyptian *mansoni* but not to the South African strain.

Continuous Observations on the BCF in Children Infected with Haematobium

Observations have been made on 19 European school children in the Ferndale area. These children all had positive BCF to start with, they then received treatment and have since been examined at intervals of approximately 6 months. The position at the present moment is summarised in Table I below :—

TABEL I.

	BCF Positive	Urine Positive
Before treatment	19/19	19/19
6 months after treatment	16/17	0/17
14 months after treatment	12/16	0/16
20 months after treatment	11/15	0/15

It will be seen that the BCF up to at least 20 months after successful treatment cannot be used as a test for cure in the majority of cases.

Observations on these children are being continued but it is becoming more and more difficult to keep track of them.

Snails in Laboratory Culture

Australorbis glabratus a South American snail and a good vector of some strains of *mansoni* has been added to the Unit's culture stocks.

The main cultures of snails now in the Unit's collection are :

Physopsis sp. Verskeie plaaslike bronne. Vatbaar vir plaaslike *haematobium* en *bovis*.

Physopsis sp. Oeganda. Nie vatbaar vir plaaslike *haematobium* nie.

Planorbis sp. Tzaneen. Nie-vatbaar vir plaaslike *mansoni*. Die slak wat die maklikste in laboratorium-kultuur gehou kan word.

Australorbis glabratus. Oorspronklik van S. Amerika. Besmetbaar met Egiptiese en nie-besmetbaar met plaaslike *mansoni*.

Bulinus sp. Verskeie plaaslike bronne. Nie-vatbaar vir plaaslike *haematobium*. Draer van „swimmersjeuk”. Die Egiptiese bilharzia-owerhede sal die Egiptiese stam van *haematobium* stuur om uit te vind of dit die plaaslike spesies van *bulinus* sal besmet.

Lymnaea natalensis. Verskeie plaaslike bronne.

Erkennings

Die Eenheid geniet nog steeds die steun van die Direkteur en personeel van die Suid-Afrikaanse Instituut vir Mediese Navorsing, die Pes-navorsingslaboratorium, Johannesburg, die Unie-Gesondheidsdepartement en dr. Ortlepp, Onderstepoort.

KARDIO-PULMONALE NAVORSINGSEENHEID

Hoof van die Eenheid: PROF. G. A. ELLIOTT.

(Universiteit van die Witwatersrand)

Die benadering van vraagstukke wat vir die Eenheid van belang is, volg nog dieselfde patroon as in vorige jare.

Ballistokardiografie

Die vasstelling van verskeie aspekte van die hart-funksie met die ballistokardiograaf, duur voort. Normale standaarde vir die hoogfrekwensie (Starr-tipe) ballistokardiogram is vir 100 mans en 100 vroue vasgestel. Die standaarde sluit grense van normaliteit vir hartsterkte in, respiratoriese wisselingsindeks en die afsonderlike bestanddele van die ballistokardiografiese komplekse.

Daar is 'n vergelyking getref tussen die bevindinge vir normale pasiënte en pasiënte met kroonslaagarmoeilikheid en die resultate is vergelyk met ander toetse vir kroonslaagargebreke soos die inspanningselektrokardiogram.

Individuele buigings van die ballistokardiogram toon 'n aktiwiteit van die hartvoorkamer en dit is nuttig gevind in die keuring van pasiënte vir mitraalklep-valvotomie. Verder is die dinamiese verskynsels van die voorkamers soos dit in die ballistokardiogram weerspieël word, gebruik om vas te stel wanneer die linker- en regterkamers faal.

Elektrokardiografie

Belangstelling in die elektrokardiografiese veranderinge wat geassosieer word met voorkamereienskappe, het voortgeduur. 'n Ontleding van die „P”-golf van die elektrokardiogram het getoon dat dit moontlik is om vergroting van die linker- en regtervoorkamers—afsonderlik of gesamentlik—noukeuriger vas te stel as wat voorheen moontlik was.

Physopsis sp. Several local sources. Susceptible to local *haematobium* and *bovis*.

Physopsis sp. Uganda. Non susceptible to local *haematobium*.

Planorbis sp. Tzaneen. Non susceptible to local *mansoni*. The easiest snail to keep in laboratory culture.

Australorbis glabratus. Originally S. America. Infectable with Egyptian and non-infectable with local *mansoni*.

Bulinus sp. Several local sources. Non susceptible to local *haematobium*. Vector of “swimmer's itch.”

The Egyptian Bilharzia authorities are sending the Egyptian strain of *haematobium* to see if it will infect the local species of *bulinus*.

Lymnaea natalensis. Several local sources.

Acknowledgements

The Unit continues to enjoy the support of the Director and Staff of the South African Institute for Medical Research, Plague Research Laboratory, Johannesburg, the Union Health Department and Dr. Ortlepp, Onderstepoort.

CARDIO-PULMONARY RESEARCH UNIT

Head of Unit: PROF. G. A. ELLIOTT

(University of Witwatersrand)

The approach to the problems of interest to the Unit continues along the same lines as in previous years.

Ballistocardiography

Work continues on the use of the ballistocardiogram in the assessment of various aspects of the function of the heart. Normal standards for the high frequency (Starr type) ballistocardiogram have been established on 100 males and 100 females. These include limits of normality for cardiac “strength”, respiratory variation index and the individual components of the ballistocardiographic complexes.

A comparison has been made between these findings in normal subjects and patients with coronary artery disease and the results have been compared with other tests for coronary insufficiency such as the effort electrocardiogram.

Individual deflections of the ballistocardiogram have been shown to reflect auricular activity and this has been found useful in the selection of patients for mitral valvotomy. In addition the dynamics of the auricles as reflected in the ballistocardiogram has been used to judge failure of the left and right ventricles.

Electrocardiography

Interest in the electrocardiographic changes associated with auricular events has been maintained. An analysis of the “P” wave of the electrocardiogram has shown that it is possible to assess left and right auricular enlargement singly or in combination more accurately than was previously possible.

Die gebruik van die elektrokardiografiese afleidings verkry van die agterste deel van die liggaam, wat oorspronklik gebruik is vir die diagnose van agterwand-miocardiale infarksie, is as 'n eenvoudige metode vir 'n vektorontleding gebruik, veral om die hoek wat tussen die QRS-gebied en die T-golfgebied gevorm word, te meet.

Mitraalklepchirurgie

Op dié praktiese gebied word die werk intensief voortgesit. Ten spyte van die baie werk wat tot dusver gepubliseer is, bly die keuring van gevalle vir mitraalklepchirurgie 'n moeilike en dringende vraagstuk. Werk wat in 1952 in die Eenheid begin is, word in drie hoofrigtings voortgesit. Eerstens word chirurgiese bevindinge voortdurend vergelyk met uitvoerige kliniese, elektrokardiografiese en radiologiese gegewens en dit het gelei tot die opstel van twee verhandelinge oor die keuring van gevalle (sien publikasies). Tweedens het ballistokardiografiese studies voor die operasie, wat met chirurgiese bevindinge vergelyk is, getoon dat mitraalstenose en terugvloeiing neig om veranderde en diagnoseerbare ballistokardiografiese patrone te toon. Dertens is 'n voortdurende en uitvoerige studie aan die gang van die gevalle wat reeds geopereer is. Hopelik sal daar op die manier in die toekoms 'n beter keuring van gevalle moontlik wees.

Drukverhoging

Die werk op die gebied was hoofsaaklik die uittoets van die sogenoemde anti-drukverhogingsmiddels in gevalle van essensiële drukverhoging. 'n Reeks gevalle waarvoor strenge beheer uitgeoefen word, is ondersoek. Die resultate van die studies van skildkliertreksel, Apresolien en Hidergien is reeds gepubliseer en die uitwerking van die Rauwolfia-alkaloïd, Reserpine, nader voltooiing.

Serotonien

Oorsee word daar 'n aansienlike mate van belangstelling in die biologiese stof getoon. Daar word besef dat 'n begrip van sy uitwerking op die liggaamsproesse noodsaaklik is om die funksie van bloedsomloop en longe te verstaan. Daar word nou gepoog om die konsentrasie serotonien in die bloed te meet. Teenwerkers van serotonien is beskikbaar en die moontlikheid van hul gebruik in kliniese medisyne sal afhang daarvan of daar meer lig gewerp kan word op die uitwerking van serotonien in siektetoestande.

Suurstofbindingskrag van Sekesel-hemoglobien.

Die resultate van studies van die suurstofdissosiasiekurve van hemoglobien wat van gevalle met sekeselbloedarmoede verkry is, waarmee in 1953 begin is, word nog steeds ingesamel. Daar is gevoel dat dit wenslik is om die waarnemings op 'n groter reeks gevalle te doen voordat die resultate gepubliseer word. Al die beskikbare gevalle in die Transvaal is bestudeer. Hopelik sal gevalle uit ander gebiede bestudeer kan word en ontwikkeling in die rigting word nou oorweeg.

The use of the electrocardiographic leads from the back of the body initially introduced for the diagnosis of posterior myocardial infarction has been utilised as a simple measure for a vector analysis, particularly for a measure of the angle formed between the QRS area and T wave area.

Mitral Valve Surgery

Work continues intensively in this practical field. The selection of cases for mitral valve surgery remains a most difficult and pressing problem in spite of the amount of work that has been published to date. Work commenced in the Unit in 1952 is being continued along three principal lines. Firstly, surgical findings are continually being compared with detailed clinical, electrocardiographic and radiological data and this has resulted in the preparation of two papers on the selection of cases (see publications). Secondly, pre-operative ballistocardiographic studies when compared with surgical findings have disclosed that mitral stenosis and regurgitation tend to produce differing and diagnosable ballistocardiographic patterns. Thirdly, a continual and detailed post-operative study is in progress of those cases which have been subjected to surgery. It is hoped that in this way a better selection of cases will be possible in the future.

Hypertension

The work in this field has been mainly the trial of the so-called anti-hypertensive drugs in cases of essential hypertension. Strictly controlled series of cases are being investigated. The results of studies on thyroid extract, Apresoline and Hydergine have already been published, and a trial of the effects of the Rauwolfia alkaloid, Reserpine, is nearing completion.

Serotonin

Considerable interest in this biological substance is being shown overseas. The effects on body processes are being recognised as fundamental in the understanding of circulatory and pulmonary function. Work is now being carried out here, attempting to measure the concentration of serotonin in the blood. Antagonists to serotonin are available and the possibility of their use in clinical medicine will depend upon the elucidation of the effects of serotonin in disease states.

Oxygen-binding Power of Sickle Cell Haemoglobin

The results of studies commenced in 1953 on the oxygen dissociative curve of haemoglobin obtained from subjects with sickle cell anaemia continue to be accumulated. It has been felt desirable before actual publication to repeat the observations on a larger series of subjects. Studies have been done on all the available cases in the Transvaal. It is hoped that cases from other areas may be possible to study, and development along these lines is now contemplated.

Polisitemie

Daar is onlangs oorsee getoon dat die toestand van die bloed abnormale longfunksie veroorsaak. Die resultate is hier bevestig. Die omvang en aard van die steuring word tans ondersoek.

Normale Waardes vir Longfunksietoetse by 'n Hoogte van 6,000 voet

Daar is 'n jaar gelede met die studie van normale waardes begin en dit is byna voltooi. Afgesien van hul innerlike waarde, vorm die resultate 'n noodsaaklike voorbereiding vir die bepaling van die graad van abnormaliteit. Hulle sal 'n goeie statistiese grondslag vorm vir die vertolking van resultate en sal vir ander wat by dié hoogte werk bv. die Silikoseburo vir Mynwerkers, baie waardevol wees.

Emfiseem

Dit word al duideliker dat die toestand van kroniese hipertrofiese emfiseem nie 'n afsonderlike toestand is nie maar uit 'n heterogene groep verwante ongesteldhede bestaan. Een van die belangrikste take van die eenheid is 'n poging om die groep af te breek en om sommige van sy verbindings deur middel van korrelasie van kliniese en fisiologiese gegewens uit te ken.

NAVORSINGSEENHEID VIR KLINIESE VOEDING

Hoof van die Eenheid; PROF. J. F. BROCK.
(Universiteit van Kaapstad)

Die program van die Eenheid bly nog soos dit in die vorige jaarverslag omskryf is: „Die benutting op enige moontlike manier van die unieke natuurlike proefneming wat in die Kaapse Skiereiland bestaan vir 'n rasse-vergelyking van die siekte- en sterftesyfers, veral tussen die Kaapse Kleurlinge en die blanke bevolking van die Kaapse Skiereiland.” Daar word aangeneem dat voedingsverskille van die allergrootste belang is en hulle vorm dan ook die hoofonderwerpe van die studie, hoewel hulle steeds in hul regte perspektief gesien word, teenoor ander genetiese en omgewingsfaktore. Namate die geleentheid hom voordoen word die primêre vergelyking van die Kaapse Kleurlinge en die blankes uitgebrei om vergelykings met Bantoe-, Boesman- en ander groepe in te sluit.

Toekening van die Williams-Watermanfonds van die V.S.A.

Die fonds het aangebied om die werk van die Direkteur van die Eenheid in verband met kliniese proewe oor kwashiorkor geldelik te steun. Ter bevordering van die program het die Eenheid kliniese proewe gedoen i.v.m. die genesing van kwashiorkor met sintetiese formules en was in staat om die volledige vog-, stikstof-, natrium- en kaliumbalans gedurende die hersteltydperk te bestudeer. Daar is reëlings getref met prof. J. Davel van die Pretoria-hospitaal en dr. A. B. Taylor van die McCord-hospitaal in Durban om die proewe uit te brei en te bespoedig deur verdere toetse op formules uit te voer wat gedurende voorlopige toetse in Kaapstad bevredigend

Polycythaemia

This condition of the blood has recently been shown overseas to produce abnormal lung function. These results have been confirmed here. The extent and nature of the disturbance is at present being investigated.

Normal Values for Lung Function Tests at 6,000 feet

The study of normals commenced a year ago is nearing completion. The results apart from the intrinsic value form an essential preliminary to the assessment of degree of abnormality. They will provide a sound statistical foundation for the interpretation of results and will be of great value to others, such as the Miners' Silicosis Bureau, working at this altitude.

Emphysema

It becomes increasingly obvious that the condition of chronic hypertrophic emphysema is no single condition, but a heterogeneous group of related disorders. One of the major tasks before the unit is an attempt to break down this group and define some of its compounds by means of the correlation of clinical and physiological data.

CLINICAL NUTRITION RESEARCH UNIT

Head of Unit; PROF. J. F. BROCK.
(University of Cape Town)

The programme of the Unit continues to be as defined in the last annual report "The exploitation by whatever means possible of the unique natural experiment existing in the Cape Peninsula for inter-racial comparison of morbidity and mortality particularly as between the Cape Coloured people and the Europeans of the Cape Peninsula". It is believed that differences in nutrition are of very great importance and these constitute the major subjects of study, although they continue to be held in their proper perspective against other environmental and genetic factors. As opportunity occurs the primary comparison of Cape Coloured and European people is extended to include comparison with Bantu, Bushmen and other groups.

Grant from the Williams-Waterman Foundation of the U.S.A.

This foundation offered to support financially the work of the Director of the Unit in connection with clinical trials in kwashiorkor. In furtherance of this programme the Unit has been carrying out clinical trials in the cure of kwashiorkor with synthetic formulae and has been able to study the complete fluid, nitrogen, sodium and potassium balance during the period of recovery. Arrangements have been made through Professor J. Davel at the Pretoria Hospital and Dr. A. B. Taylor at the McCord Hospital, Durban, to expand and accelerate the trials by doing further tests on formulae which have been found by preliminary testing

e blyk het. Die algemene doel van die proewe is om vas te stel of die geneesvermoë van gedroogde afgeroomde melk hoofsaaklik afhang van die aminosuur-inhoud of van die inhoud van bekende vitamien of van onbekende voedingstowwe. Die Geneeskundige Instituut van Merck in Rahway, New Jersey, het bystand verleen deur teen 'n aansienlike koste die sintetiese formules, insluitende mengsels van sintetiese aminosure te voorsien.

Nutrisie-edeem

'n Koöperatiewe studie oor die oorsake van edeem te wyte aan voedingsteuring is in Kaapstad voortgesit, veral met betrekking tot vog- en elektrolietbalans en die nierfaktor. Die Eenheid vir Hartsiektes en die Bloedvatondersoekdiens by die Groote Schuur-hospitaal het saamgewerk. Dit is reeds duidelik dat nutrisie-edeem 'n baie ingewikkelde etiologie kan hê en die abnormaliteite wat opgespoor en omskryf kan word sluit in verskillende gevalle 'n paar van of al die volgende faktore in :

- (a) ten minste twee soorte hartongesteldhede te wyte aan voedingsteuring ;
- (b) 'n lewerfaktor ;
- (c) veranderende verskuiwings van vog-, elektroliete en stikstof in die vaste en vloeibare afdelings van die liggaam ;
- (d) 'n moontlike nierfaktor.

Aminosuurmetabolisme by Verkeerde Proteïenvoeding

Deur chromatografiese en chemiese metodes word 'n studie gemaak van die verdeling van aminosure in die serum en urine van volwassenes en kinders by verkeerde proteïenvoeding.

Aterosklerose, Serumlipiede en Dieet

In oorleg met dr. Ancel Keys van die Universiteit van Minnesota is 'n studie beplan en pas begin onder verskillende rasse. Die dieetopname wat deur professor E. Baston gemaak is, het aan die lig gebring dat daar baie duidelike verskille is in die vetkaloerieverhouding in die kosopname van die hoofrassegroepe in die Kaapse Skiereiland.

Maatskaplike Agtergrond van Ondervoeding

Daar word 'n studie van die probleem gemaak, met spesiale klem op dieetpatrone en alkoholverbruik in Kaapse Kleurlinge en onder stedelike en rondtrekkende Bantoes.

TANDHEELKUNDIGE NAVORSINGSEENHEID

Hoof van die Eenheid: PROFESSOR J. T. IRVING.

(Universiteit van die Witwatersrand)

Die Eenheid is op 1 Februarie 1954 in die lewe geroep en sedertdien het die Hoof van die Eenheid die grootste gedeelte van sy tyd bestee aan die bestelling van toerusting en die organiseer van die Eenheid. 'n Senior tegnikus is aangestel en het op 1 Julie diens aanvaar en 'n Navorsingsbeampte (Biochemikus) op 1 Augustus.

Die navorsingswerk sal dieselfde patroon volg as die werk wat voorheen deur professor Irving gedoen is, maar dit sal aansienlik uitgebrei word. Die hoofdoeleindes is

at Cape Town to be satisfactory. The general purpose of these trials is to determine whether the curative capacity of dried skimmed milk is dependent mainly upon its amino acid content, or its content of known vitamins or unknown nutrients. The Merck Therapeutic Institute of Rahway, New Jersey, has assisted by providing at considerable cost the synthetic formulae including mixtures of synthetic amino acid.

Nutritional Oedema

A co-operative study has continued into the causes of nutritional oedema in adults in Cape Town, with special reference to fluid and electrolyte balance and the renal factor. The Cardiac Unit and the Vascular Investigation Service at the Groote Schuur Hospital have collaborated. It is clear already that the nutritional oedemas are very complex in their aetiology and that abnormalities can be detected and defined which include in different cases some or all of the following factors:

- (a) at least two varieties of nutritional heart disorder;
- (b) a hepatic factor;
- (c) varying shifts in fluid, electrolytes and nitrogen in the solid and fluid compartments of the body;
- (d) a possible renal factor.

Amino Acid Metabolism in Protein Malnutrition:

A study of the partition of amino acids in the serum and urine of adult and infant cases with protein malnutrition is being carried out by chromatographic and chemical methods.

Atherosclerosis, Serum Lipoids and Diet:

An inter-racial study has been planned in collaboration with Dr. Ancel Keys of the University of Minnesota and is just starting. The dietary survey made by Professor E. Baston has shown very distinct differences in the fat calorie ratio of the dietary intake of the principal racial groups in the Cape Peninsula.

Social Background of Malnutrition:

A study is being made of certain aspects of this problem with special reference to dietary patterns and alcohol consumption in Cape Coloured subjects and among urbanized and migrant Bantu people.

DENTAL RESEARCH UNIT

Head of Unit; PROFESSOR J. T. IRVING.

(University of Witwatersrand)

The Unit was established on 1st February, 1954, and since then the Head of the Unit has spent most of his time in ordering equipment and organising the Unit. A senior technician was appointed and assumed duty on 1st July, and a Research Officer (Biochemist) on 1st August.

The research aims of the Unit follow a pattern similar to, but considerably expanded beyond, the work of Professor Irving in the past. The chief objectives are to

om die veranderinge in tande onder verskillende dieet-, endokriene- en ander toestande te bestudeer en te vergelyk met veranderinge wat in die res van die liggaam plaasvind. Tot dusver was die studie hoofsaaklik histologies, maar die voorneme is om die chemiese, histochemiese en ensiemveranderinge wat mag voorkom, ook te bestudeer. Daar word ook gehoop om in samewerking met ander liggame 'n span te stuur om die bestandheid van Naturelle se tande teen beenverrotting te bestudeer.

NAVORSINGSEENHEID VIR GESINSGESONDHEID

Hoof van die Eenheid: DR. S. L. KARK.

(Instituut vir Gesins- en Gemeenskapsgesondheid, Durban)

Die omvang van die werk en besonderhede van verskeie studies wat deur die Eenheid onderneem word, is in die vorige verslag uiteengesit. Die studies is voortgesit en die verslag sal dus beperk wees tot 'n oorsig van die vordering wat in sekere rigtings gemaak is.

Groei

Die groeistudies van verskeie groepe loop van die tydperk vóór geboorte deur die vroeë kinderdae en puberteitsjare tot volwassenheid. Resultate van ondersoek is tot dusver gepubliseer oor :

- (a) Vergelykende rassestudies van gewig by geboorte en 'n ontleding van sommige van die bepalende faktore, bv. gewig van die moeder, geboortetang.
- (b) Gewig van Bantoebabas gedurende die eerste 10 dae in die lewe.
- (c) 'n Vergelykende studie van die groei van voor-skoolse kinders van verskillende maatskaplike stande en rasse.
- (d) Puberteit in Indiërdogters.
- (e) Die groei en voedingstoestand van stedelike Bantoedogters.

Met die materiaal wat nou ontleed word en die werk wat nog aan die gang is, behoort die Eenheid binnekort in staat te wees om „standaarde” vir die groei van verskeie groepe in ons land op te stel. Weens die gebrek aan sulke basiese kennis was dit nog nie moontlik om die aard van die verskille wat voorkom meer volledig te bestudeer nie.

Oorlewing

Die relatiewe skaarsheid van inligting oor oorlewing op verskillende ouderdomme in verskillende kultuurgroepe het die Eenheid aangemoedig om die gemeenskappe wat deur die Instituut vir Gesinsgesondheid bedien word, te bestudeer.

Die aanvangstudies staan in verband met oorlewing van babetjies en vir die doel is 'n ondersoek ingestel van die verhouding tussen doodgeboortes, sterftes by geboorte en sterftes na geboorte in vyf gemeenskappe. Die vyf gemeenskappe sluit in drie Zoeloe-groepe (platte-landse Naturelleservaat, stedelike agterbuurt en stedelike behuisingskema) en twee Indiërgroepe (stedelike agterbuurt en stedelike behuisingskema).

study the tooth changes in various dietary, endocrine and other conditions, in parallel with changes occurring in the rest of the body. Up to now the study has been chiefly histological, but it is intended to study the chemical, histochemical and enzymic changes which may occur as well. It is also hoped, in conjunction with other bodies, to send a team to study the resistance of Native teeth to caries.

FAMILY HEALTH RESEARCH UNIT

Head of Unit: DR. S. L. KARK.

Institute of Family and Community Health, Durban.

The scope of work and particulars of various studies being undertaken by the Unit have been indicated in previous annual reports. These studies were continued and this report will therefore be confined to a review of some aspects of the progress made.

Growth

The growth studies of various groups extend from ante-natal life, through early childhood and adolescence to adulthood. Some results of these investigations have so far been published :—

- (a) Comparative racial studies of birth weight and an analysis of some of the determining factors, e.g., age of mother, birth rank.
- (b) Weight of Bantu babies during the first 10 days of life.
- (c) A comparative study of the growth of pre-school children of different social classes and races.
- (d) Puberty in Indian girls.
- (e) The growth and nutritional state of urban Bantu girls.

With the material now being analysed and the work still under way the Unit should in the near future be in a position to prepare “standards” of growth applicable to various groups in our country. The absence of such basic knowledge has not allowed for more specific studies of the nature of the differences found to occur.

Survival:

The relative paucity of information on survival at various ages in different culture groups has encouraged the Unit to study the communities served by the Institute of Family and Community Health.

The initial studies being undertaken are concerned with survival in infancy and for this purpose an investigation of the stillbirth, neo-natal and post-natal mortality rates in five communities has been carried out. The five communities, include three Zulu (rural Native reserve, urban slum and urban housing project) and two Indian (urban slum and urban housing scheme) communities.

The results indicate :—

- (a) A steadily decreasing mortality rate of infants in

Die resultate dui op die volgende :

- (a) 'n Geleidelike afname in die sterftesyfer van suigelingen in die gemeenskappe wat deur die Instituut bedien word, met die gevolg dat dié gemeenskappe laer sterftesyfers het as wat aangegee word vir ander vergelykbare gemeenskappe.
- (b) Betekenisvolle verskille in die oorlewing van Zoeloe- en Indiërbabetjies waarvoor welbekende invloede soos armoede, toestande in die agterbuurte en voedingspeil nie verantwoordelik kan wees nie. Die treffendste verskil is die onverwagte lae sterftesyfer by die pasgebore Indiërbabas wat bestudeer is.

Om meer lig te werp op sommige van die faktore, is 'n aanvang gemaak met meer intensiewe gesinstudies.

Gesinstudies

In 1951 is begin met 'n studie van die voeding van moeders en die groei van babas. Dit het getoon dat die nutrisietoestand van Zoeloe- sowel as Indiërmoeders baie swak is. In die geval van die Indiërvrou vereis dit spesiale vermelding met die oog op die relatiewe lae sterftesyfers van babas voor en tydens geboorte.

In die lig van bogenoemde bevindinge het dit al hoe belangriker geword vir die Eenheid om die kulturele faktore wat verantwoordelik mag wees vir die verskil in neigings in die gemeenskappe wat bestudeer word, nader te ondersoek. Dit het nodig geword om die uitwerking van die Instituut se gesins- en gesondheids-onderrig op die gemeenskappe te bepaal asook die kultuurverskille van die gemeenskappe. In die afwesigheid van 'n basiese sosiologiese studie van Indiërgemeenskappe in ons land, was die Eenheid gelukkig om die dienste van 'n ervare sosiale antropoloog op sy personeel te verkry. Die dame bestudeer nou die Indiërgemeenskappe van Durban met spesiale verwysing na gesinsbetrekkings, die grootmaak van kinders en hul begrip van siektes in verhouding tot die beoefening van rituale. Die eerste verhandeling, wat nou byna gereed is vir publikasie, handel oor Hindoe-beskouings van siekte.

'n Ondersoek van sommige van die maandelike betekenisvolle faktore wat borsvoeding in 'n blanke gemeenskap bepaal, is die jaar onderneem. Die resultate word nou ontleed vir publikasie.

Gemeenskapstudie

'n Studie van ondervoeding en heraanpassing van die gemeenskap in die Pholela-Naturelleservaat word nou gereedgemaak om as 'n monografie gepubliseer te word. Hopelik sal die verskillende studies wat nou in ander gemeenskappe uitgevoer word met verloop van tyd ook verwerk kan word vir publikasie in dié vorm.

the communities served by the Institute, with the result that these communities have lower mortality rates than have been reported in comparable communities.

- (b) Significant differences in the survival of Zulu and Indian infants which cannot be explained in terms of well-established influences such as poverty, slum conditions and nutritional state. The most striking difference is that due to the unexpectedly low neo-natal mortality rate of the Indian infants studied.

Further more intensive family studies are required to elucidate some of the factors involved, and these have commenced.

Family Studies

A study of maternal nutrition and infant growth, commenced in 1951, has shown that the nutritional state of both Zulu and Indian mothers is very poor. The state of under-nutrition and malnutrition of the Indian women requires particular mention in view of the relatively low still-birth and neo-natal mortality rates found.

In the light of the findings referred to above, it has become increasingly important for the Unit to further its studies in the cultural factors which might be responsible for the varying trends noted in the communities being investigated. The influence of the Institute's family practice and health education on the way of life of these communities requires evaluation, as do the culture differences between these communities. In the absence of any basic sociological study of Indian communities of this country, the Unit was fortunate in obtaining the services of an experienced social anthropologist on its staff. She has been studying Indian communities of Durban, with particular reference to family relationships, child rearing, and their concepts of disease in relation to ritual practices. The first paper for publication, which is now nearing completion, is concerned with Hindu concepts of disease.

An investigation of some of the possible significant factors involved in determining breast feeding in a European community has been undertaken this year. The results are now in process of analysis for publication.

Community Study

A study of malnutrition and adjustment of the Pholela Native Reserve community has now been assembled for presentation as a monograph. It is hoped that in the course of time the various studies now being undertaken in other communities will be collated in similar form for publication.

NAVORSINGSEENHEID VIR MENSLIKE BIO-CHEMIE

Hoof van die Eenheid; DR. A. R. P. WALKER
(Suid-Afrikaanse Instituut vir Mediese Navorsing.)

Ondersoeke na die Kalsiummetabolisme van die Suid-Afrikaanse Bantoe

Sedert die ontstaan van die Eenheid, is die kalsiummetabolisme van Bantoes intensief bestudeer, hoofsaaklik omdat hulle so 'n betreklik lae inname van die element het. Vorige ondersoek het ingesluit, waarnemings oor die kalsiumbalans, serum-kalsiumpeile, samestelling van moedersmelk en van been, geneigdheid tot beenbreuk en die aandeel van kalsium in die aanwas in lengte en die uiteindelijke lengte by volwassenheid. In die afgelope jaar is veral werk gedoen i.v.m. die rol wat die peil van kalsiuminname speel in die etiologie van ragitis.

Die Voorkoms van Ragitis in Stedelike, Omstedelike en Plattelandse gebiede

Die ondersoek word gedoen in medewerking met dr. H. C. Falcke, senior kinderarts by die Coronation-hospitaal, Johannesburg. Klinieke in verskillende gebiede is besoek en waarnemings wat tot dusver op babetjies en jong kinders gemaak is, dui daarop dat ernstige gevalle van ragitis baie minder in plattelandse en buite-stedelike gebiede voorkom as onder die digte bevolkings in stedelike gebiede. Uit Indië word dieselfde toestand gemeld. Dit lyk nie asof verskille in die kosopname (veral wat betref kalsiuminname) die oorsaak is van die verskille in die voorkoms van ragitis nie. Eerder wil dit voorkom asof onvoldoende blootstelling aan die beskikbare straling die primêre oorsaak van die gebreksiekte is. Ondersoek duur voort.

Die Aandeel van Kalsiuminname in die Etiologie van Ragitis

'n Kritiese ondersoek van die beskikbare inligting toon dat, in teenstelling met die algemene mening, daar geen bepaalde bewys is dat 'n lae kalsiuminname Engelse siekte (ragitis) veroorsaak of selfs bevorder nie. Dit lyk dus nie te regverdig nie om 'n hoë kalsiuminname vir jong kinders voor te skryf om hulle o.a. te beskerm teen ragitis of om dit minder ernstig te maak as dit mag voorkom.

Ondersoeke na Ystermetabolisme van die Suid-Afrikaanse Bantoe

Die ystermetabolisme van Bantoes is intensief bestudeer omdat hulle dikwels so 'n buitengewone hoë inname van die element het. Die volgende twee studies het gedurende die huidige jaar aandag geniet:

- (a) *Yster in serum en die vermoë van siderotiese en nie-siderotiese Bantoes om yster te bind*

Die ondersoek word uitgevoer op volwasse Bantoes met of sonder 'n abnormale ysterafsetting. Die mate van ysterafsetting word vasgestel deur die histologiese ondersoek van lewerbiopsie-materiaal in gevalle waar die operasie vir diagnostiese doeleindes onderneem moet word. Dit is duidelik dat daar min kans vir sulke

HUMAN BIOCHEMISTRY RESEARCH UNIT

Head of Unit; DR. A. R. P. WALKER.
(South African Institute for Medical Research)

Investigations on the Calcium Metabolism of the South African Bantu

Since the inception of the Unit, the calcium metabolism of the Bantu has been studied intensively mainly on account of their relatively low intake of the element. Previous aspects investigated have included calcium balance observations, serum calcium levels, composition of breast milk and of bone, proneness to fractures, and rôle of calcium in the attainment of height and ultimate height at maturity. Work carried out in the year under review bears on the part played by level of calcium intake in the aetiology of rickets.

The Incidence of Rickets in Urban, Peri-urban and Rural Areas

This study is being carried out in collaboration with Dr. H. C. Falcke, Senior Paediatrician at Coronation Hospital, Johannesburg. Clinics in different regions have been visited, and observations made thus far on infants and young children suggest that severe rickets occurs far less frequently in rural and peri-urban areas compared with the crowded populations in urban centres. A parallel situation is reported to occur in India. Differences in the diet consumed (especially in regard to calcium intake) by subjects appear unlikely to be responsible for the differences noted in rickets incidence. It would seem that insufficient exposure to the available radiation is the primary cause of this deficiency disease. Investigation continues.

The Rôle of Calcium Intake in the Aetiology of Rickets

A critical examination of the available evidence indicates that, contrary to popular belief, there is no specific evidence that a low calcium intake promotes, still less causes, rickets. It would seem unwarrantable, therefore, to recommend high calcium intakes for young children to protect, inter alia, against rickets or to minimise its severity should it develop.

Investigations on the Iron Metabolism of the South African Bantu

The iron metabolism of the Bantu has been studied intensively on account of their often extremely high intake of the element. The two studies which have received attention during the present year are as follows:

- (a) *Serum iron and iron binding capacity in siderotic and non siderotic Bantu.*

This investigation is being carried out on Bantu adults with and without abnormal iron deposition, as determined by histological examination of liver biopsy material, on occasions when the operation is undertaken for diagnostic purposes. Obviously, opportunities for

studies is. Uit die resultate wat tot dusver verkry is, kan geen gevolgtrekkings gemaak word nie.

(b) *Hemoglobienkonsentrasie en voedingstoestand in Suid-Afrikaanse Bantoes wat gewoon is aan 'n baie hoë ysterinname.*

Verskeie ondersoeke op die Bantoe het getoon dat, ten spyte van 'n onvoldoende dieet en dikwels ernstige ondervoeding en besmetting met parasiete, die gemiddelde hemoglobienwaardes van verskillende groepe mans en vroue (nadat hoogte in ag geneem is) binne of slegs effens onder die normale grense vir blankes is. Dikwels, maar nie sonder uitsondering nie, is die gemiddelde waardes in groepe wat medies geskik is hoër as die in ooreenkomstige groepe blankes. Verder toon waarnemings dat die gebruikelike hoë ysterinname van die mense soos 'n „rem” werk op die onderdrukking van waardes wat geassosieer is met slegte voedings- en parasitiese toestande. Wat hulle betref moet daar dus nie vertrou word op die hemoglobienwaardes vir die beoordeling van die voedingstoestand nie.

Dieet, Cholesterolkonsentrasie in Serum en Aterosklerose

Ter aanvulling van die eksperimentele studies wat voorheen vermeld is, is gepoog om vas te stel of dieetkundige faktore ander as vet-, cholesterol- en kalorie-inname, gekorreleer kan word in bevolkingsgroepe, met die voorkoms en erns van aterosklerose. Daar is gevind dat die peil van ru-veselinname, moontlik ook dié van vetinname, met beskikbare inligting oor die voorkoms van die siekte in verband gebring kan word. Die mening is geopper dat etiologiese ondersoeke nie soseer toegespits moet word op die kenmerke van vet- of hoë veselinname as sulks wat die dieet van die bevolkingsgroepe waar 'n lae voorkoms van ernstige aterosklerose bestaan kenmerk nie, maar eerder op die algemene patroon van die dieet waarin die twee eienaardighede so dikwels saam voorkom. Daar moet verder op gelet word dat dit lyk of dieselfde dieet 'n mate van beskerming verleen teen 'n aantal siektes wat gesamenlik die oorsaak is van hoë siekte- en sterftesyfers onder die westerse bevolkings, naamlik blindedermonsteking, stuipe, stene in die galblaas en urinale sisteem, peptiese sere en suikersiekte.

Metabolismestudies aan die Baragwanath-hospitaal vir Nie-blankes

Soos voorheen gemeld, word daar in medewerking met dr. E. Kahn, senior kinderarts van die bogenoemde hospitaal, balanswaarnemings met die gebruik van 'n metabolismebed op jong kinders wat aan ernstige ondervoeding ly, uitgevoer. Die navorsings is vir 'n paar maande weens gebrek aan personeel onderbreek, maar is nou hervat.

Die Aandeel van Parasitiese Besmetting in die Verergering van Ondervoeding by Bantoes

Haakwurmbesmetting (Ancylostomiasis)

Dié ondersoek waarby radio-aktiewe yster gebruik word, is in medewerking met dr. H. J. Heinz (S.A.I.M.N.) en dr. H. G. Stafford (W.N.N.R.) uitgevoer. Die vernamste bevindinge, gebaseer op 'n studie van drie

study are infrequent. Results obtained thus far do not allow conclusions to be drawn.

(b) *Haemoglobin concentration and nutritional state in South African Bantu habituated to a very high iron intake.*

Several investigations on the Bantu have shown that in spite of an inadequate diet, sometimes gross malnutrition, and frequent parasitisation, mean haemoglobin values of different groups of men and women (after correction for altitude), lie either within or only slightly below normal limits for white people. Mean values in medically fit groups, compared with corresponding white groups, have been found to be frequently though not invariably elevated. Observations show, moreover, that the habitually high iron intake of these people acts as a “brake” on the depression of values that is associated with adverse dietetic and parasitic conditions. Among these people, therefore, no reliance should be placed on haemoglobin values in the appraisal of nutrition status.

Diet, Serum Cholesterol Concentration, and Atherosclerosis

In addition to the experimental studies previously reported, an endeavour has been made to determine whether dietary factors other than fat, cholesterol, and calorie intakes, in population groups, may be correlated with incidence and severity of atherosclerosis. It has been found that level of crude fibre intake correlates with available evidence on the incidence of the disease, possibly as well as level of fat intake. The suggestion has been put forward that aetiological investigation should be directed not so much to the features of low fat intake or of high fibre intake *per se* which characterize the diets of population groups showing a low incidence of severe atherosclerosis, but rather to the general pattern of diet in which these two features so often go hand in hand. It must be noted, furthermore, that that same pattern of diet appears to confer a measure of protection against a number of diseases which together exact a high toll of mortality and morbidity among Western peoples, namely, appendicitis, eclampsia, stone in the gall bladder and urinary system, peptic ulcer, and diabetes.

Metabolic Studies in Baragwanath non-European Hospital

As mentioned previously, balance observations using a metabolic bed are being carried out on young children suffering from severe malnutrition, in collaboration with Dr. E. Kahn, Senior Paediatrician of the above hospital. Research work, which was interrupted for several months from lack of staff, has now been resumed.

The Rôle of Parasitic Infestation in Aggravating Malnutrition in the Bantu

Hookworm infestation (Ancylostomiasis)

This investigation, using radio-iron, was carried out in collaboration with Dr. H. J. Heinz (S.A.I.M.R.) and Dr. G. H. Stafford (C.S.I.R.). The main findings based

gevalle en een kontrolegeval, was soos volg :

Die bloedverlies in ontlasting het gewissel van 10-20 ml. per dag d.w.s. sowat $\frac{1}{2}$ -1 pint per maand. Die wurmbesmetting was 60-400 wurms. Bloedverlies per wurm per dag was gemiddeld 0.03-0.20 ml. Daar was geen duidelike korrelasie tussen wurmbelasting en die mate van bloedverlies nie. As so 'n bloedverlies gereeld plaasvind, kan dit lei tot hipochromiese bloedarmoede, tensy die ysterinname geduring hoog bly.

Ingewandsbilharzia (S. Mansoni)

'n Ondersoek i.v.m. die hemoglobienpeil en bloedverlies in ontlasting in volwasse Bantoes wat aan ingewandsbilharzia ly, is in medewerking met die Natuurhistoriese Bilharzia-eenheid uitgevoer. Waarnemings het aan die lig gebring dat die bloedverlies wat plaasvind ongereeld en ook baie min is en dit nie bloedarmoede kan veroorsaak of reeds-bestaande bloedarmoede aanmerklik vererger nie.

Die intensiteit van parasitiese besmetting en voedings-toestand

Waarnemings oor die voorkoms en intensiteit van parasitiese besmetting van die ingewande van medies-gekwikte Bantoe-mynwerkers dui daarop dat hulle nie so erg deur voeding gekniehalter word soos gemeen is nie. Die werk duur voort.

Studies van die Voeding van Bantoebabas en Jong Kinders *Studies oor die samestelling van die melk van Bantoe-moeders*

Daar is gevind dat die gemiddelde konsentrasie niasien in die melk van Bantoe-moeders minder as die helfte van die van blanke moeders is. Dit lyk egter of die feit klinies van baie min betekenis is. Daar is gevind dat die konsentrasie en omvang van triptofaan ('n voorloper van niasien wat daarom ook bestudeer is) dieselfde is as by die melk van blanke moeders. Daar word nou gegee-wens oor 'n ander aminosuur, metionien, ingesamel, hoofsaaklik omdat daar beweer word dat die gemiddelde waarde in die melk van Wes-Afrikaanse moeders laag is. Die syfers wat tot dusver verkry is, stem ooreen met die vir blanke moeders in Johannesburg. Die werk duur voort.

Samestelling van bottelvoeding wat aan Bantoebabas en jong kinders gegee word

Daar die speentydperk en daarna die mees kritiese periode met betrekking tot voeding in die lewe van die Bantoe-kind is, is die inhoud van bottels wat aan Bantoe-babas gegee word, ondersoek, deur monsters hiervan te verkry by hospitaalafdelings vir buite-pasiënte. Ook van kossoorte wat deur Bantoe-moeders vir hul kinders berei is, is monsters by hul huise geneem. Onder die kos-mengsels wat ondersoek is, was allerhande graanpappe, met of sonder 'n bietjie melk, gepatenteerde gedroogde melk-graankosse, gedroogde melkvoedsels en verskil-lende mengsels. Die opvallende bevinding was dat al die kossoorte *te veel verdun* word by die bereiding. As sulke kosse die enigste voedingsbron is (wat glo baie dikwels die geval is), moet die verbruikers byna uitgehonger wees.

on a study of three subjects and one control subject, were as follows :

Blood loss in stools ranged from 10-20 ml. per diem, i.e., approximately $\frac{1}{2}$ -1 pint per month. The worm loads were 60-400 worms. Blood loss per worm per diem averaged 0.03-0.20 ml. There was no obvious correlation between worm load and extent of blood loss. Such a blood loss, if regular, can lead to hypochromic anaemia, unless the iron intake be habitually high.

Intestinal bilharzia (S. mansoni)

An investigation bearing on haemoglobin level and blood loss in stools in adult Bantu suffering, inter alia, from intestinal bilharzia, has been completed, in collaboration with the Bilharzia Natural History Unit. Observations have shown that such blood loss as occurs is both irregular and very small; it could not cause an anaemia, nor significantly exaggerate an existing anaemia.

Intensity of parasitisation and nutrition state

Observations on the incidence and intensity of intestinal parasitisation of medically fit Bantu mine-workers suggest that the nutritional handicap imposed may well be less than is believed to be the case. Work continues.

Studies in the Nutrition of Bantu Infants and Young Children

Studies on the composition of Bantu breast milk

It has been found that the mean concentration of niacin in Bantu breast milk is less than half of the mean value for European mothers' milks, although this fact appears to have little clinical significance. The mean concentration and the range of tryptophane (a precursor of niacin, and thus studied on that account) has been found to be the same as for European mothers' milks. Data on another amino acid, methionine, are now being amassed, mainly because of the low mean value claimed to be present in the milks of West African mothers. Values obtained thus far are similar to those found for European mothers living in Johannesburg. Work continues.

Composition of bottle feeds given to Bantu babies and young children

Because the weaning period and thereafter is the most critical period in the nutritional life of the Bantu child, studies have been made of the contents of bottles being fed to Bantu babies, samples being collected at hospital out-patients departments, and of foodstuffs prepared by Bantu mothers for their children and sampled at their homes. Food mixtures examined included cereal "paps" made up with or without a modicum of milk, proprietary cereal-dried milk foods, dried milk foods, and miscellaneous mixtures. The salient finding has been that in all cases mixtures are prepared too dilute. When such foodstuffs form the exclusive source of nourishment (which is believed to be often the case), consumers must be half starved. Whatever be the

Wat die redes vir die oorverdunning van die kosse ook al mag wees, of dit onkunde of besparing of albei is, die bevinding is ontmoedigend. Eerstens omdat die meeste stedelike Bantomoeders kan lees en skryf en beter behoort te weet, en tweedens al sou daar ook in die toekoms die uitstekendste kosse verskaf word om melk te vervang, sal hul doeltreffendheid verminder en hul voedingswaarde onder verdenking bly tensy hulle in die regte sterkte gebruik word.

Die seldsaamheid van skeurbuik onder Bantoebabas en jong kinders

Kinderskeurbuik word baie selde in jong Bantoe-kinders waargeneem. Dit is verbasend, omdat die Eenheid gevind het dat bottelvoeding wat aan gespeende kinders gegee word byna heeltemal sonder vitamien C is.

Om die probleem te ondersoek, werk die Eenheid saam met dr. H. C. Falcke van die Coronation-hospitaal, Johannesburg. Die waarnemings sluit in 'n volledige kliniese ondersoek, radiologie van lang bene en die peil van vitamien C-konsentrasie in die bloedbestanddele. Die gevalle wat ondersoek word sluit in ondervoede kinders, kinders wat verkeerd gevoed is, klinies-gesonde kinders en blanke kontroles.

Ernstige Afwykinge in die Mate van Eritrosietafsetting in Medies-geskikte Volwasse Bantoes

In die ondersoek na bloedverlies in medies-geskikte Bantoe-mynerkers wat met ingewandsbilharzia en ander parasiete besmet is, is o.a. die graad van eritrosietafsetting bepaal. Daar is gemerk dat buitengewone abnormale waardes, wat in blankes 'n ernstige of dodelike siektetoestand sou aangedui het, algemeen was. 'n Interessante bevinding wat deur huidige resultate aange-ton word, is dat, hoe ongewoon die waardes ook al mag wees, hulle normaal word nadat die persone vir 'n paar maande op die uitstekende dieet wat in die myn-kampe verskaf word, geleef het. 'n Omvattende onder-soek in samewerking met ander navorsers word nou aan die gang gesit op 'n reeks individue voor en na indiens-neming op die myne, met betrekking tot hul kliniese toestand, hematologie, serologie, parasitologie en bloed-biochemie (insluitende lewerfunksie-toetse).

VOEDINGSNAVORSINGSEENHEID

Hoof van die Eenheid: PROF. J. GILLMAN
(Universiteit van die Witwatersrand)

Eksperimentele Voeding:

In die vorige jaarverslag is verwys na die ingewikkelde onderlinge verhouding tussen vette, koolhidrate, proteïene, soute en vitamine as faktore om groei te bevorder of verskille te beklemtoon waar mielies die basiese kos vorm. Met die oog op die noodsaaklikheid om die groei-prestasie van die rot met die struktuur van die inwendige organe te korreleer, is die publikasie van die gegewens vertraag totdat die histologiese studies wat nou aan die gang is, voltooi is. Dit is 'n uitgebreide onderneming vir die uitvoering waarvan 'n paar duisend snitte van verskeie weefsels en organe gemaak moes word. Daar word verwag dat die volledige verslag in 1955 beskikbaar sal wees.

reasons for preparing foods in too dilute a manner, ignorance or economy or both, the finding is depressing, firstly, since most urban Bantu mothers are literate and would be expected to know better, and, secondly, because no matter what excellent milk substitute foods be made available in the future, their effectiveness will be reduced and their nutritional value remain suspect until they are fed at the right concentration.

The rarity of scurvy among Bantu infants and young children

Infantile scurvy is extremely rarely observed in Bantu young children. This is surprising, partly because the Unit has found that bottle feeds given to weaned children are almost devoid of vitamin C. To investigate the problem, the Unit is collaborating with Dr. H. C. Falcke of Coronation Hospital, Johannesburg. Observations being made, include complete clinical examination, radiology of long bones, and level of vitamin C concentration in the blood components. Subjects being studied include undernourished and malnourished children, clinically healthy subjects, and European controls.

Gross Abnormalities of Erythrocyte Sedimentation Rate in Medically Fit Bantu Adults

In the investigation on the blood loss in medically fit Bantu mine-workers infested with intestinal bilharzia and other parasites, among other determinations carried out, were erythrocyte sedimentation rates. It was noted that grossly abnormal values were common, values which in white subjects would indicate grave or fatal pathology. An interesting finding indicated by present results is that, whatever be the significance of these unusual values, they become normal after subjects have been consuming for some months the excellent diet provided in the mine compounds. A comprehensive collaborative investigation is being initiated on a series of individuals before and after serving on the mines, with respect to clinical state, haematology, serology, parasitology, and blood biochemistry (including liver function tests).

NUTRITION RESEARCH UNIT

Head of the Unit: PROF. J. GILLMAN
(University of the Witwatersrand)

Experimental Nutrition

In the last annual report attention was drawn to the complex inter-relationship between fats, carbohydrates, proteins, salts and vitamins in promoting growth and differentiation in a maize setting. In view of the necessity of correlating the growth performance of the rat with the structure of the internal organs, the publication of the data has been delayed until the histological studies now in progress are completed. This is an extensive undertaking and has necessitated the preparation of several thousand sections of various tissues and organs. It is anticipated that the full report will be available during 1955.

AKTH om die vermoë van die nier om 'n bepaalde hoeveelheid water uit te skei, te herstel.

Koolhidraatmetabolisme

Ondersoeke oor die metabolisme van koolhidrate in normale bobbejane en bobbejane waarvan die harsingaansangsel verwyder is, word voortgesit. Tot dusver is vyf bobbejane noukeurig dopgehou onder verskeie vorms van endokrienbehandeling gedurende die afgelepe twee jaar. Volgens die inligting wat tot dusver ingewin is, is dit duidelik dat in die normale bobbejaan en die waarvan die harsingaansangsel verwyder is, nóg kortisone nóg AKTH in die gebruikte dosisse, die bloedsuikergebrek wat deur insulien veroorsaak is, kan verhinder, soos beweer word die geval by honde te wees. Die eerste verhandeling sal teen die einde van die jaar gepubliseer word.

Die Buislose Kliere en die Maandstondsiklus,

Die Slymklier

Die beskadiging deur operasie van die slymklier en moontlik van die stengel in 'n jong, volwasse vroulike bobbejaan, het die volgende fisiologiese sturings veroorsaak :

- (a) algehele ophouding van die maandstondsiklus ;
- (b) 'n skerp afname in die proteïengebonde jodium sonder enige kliniese bewys van skildkliergebrek ;
- (c) 'n tydelike steuring in die vermoë om 'n toetslading water uit te skei, wat egter na elf maande verdwyn het toe die bobbejaan in staat was om 'n toetslading teen dieselfde koers as 'n gekastreerde bobbejaan uit te skei ;
- (d) onbelemmerde koolhidraatmetabolisme soos vasgestel deur binnearese glukose- en insulien-toleransietoetse ;
- (e) 'n gestadige toename in gewig (van 30 tot 40 lb.) in een jaar, sonder enige merkbare tekens van vetsug.

Die ophouding van die maandstondsiklus en die lae proteïengebonde jodium dui op 'n ernstige onderdrukking van die gonadotrofiëse- en tirotrofiëse werking van die slymklier. Die instandhouding van normale koolhidraatmetabolisme en die normale koers van uitskeiding van 'n waterlading, dui op 'n onbelemmerde werking van die bynier. Die geleidelike toename in gewig toon dat die slymklier se somatotrofiëse funksie voortgaan. Dit is van belang om te let op die aanhoudende toename in gewig ten spyte van die lae plasmagebonde jodium en op die verband tussen die onderdrukking van die maandstondsiklus en 'n onderdrukte skildklierwerking.

Menslike Voeding

In 'n boek oor ondervoeding by die mens wys die hoof van die Eenheid op die diepgaande wysiging in die pigmentmetabolisme van die hare en die vel wat in ondervoede kinders en volwassenes voorkom. Die rede vir die verstoring van hierdie metabolisme is nie duidelik nie. Om die probleem aan te pak, is daar besluit om die chemie van die melaniënkoreltjie te ondersoek. Daar is gevind dat die melaniënkoreltjie 'n baie komplekse samestelling

Carbohydrate Metabolism

Investigations into the metabolism of carbohydrates in normal and hypophysectomized baboons are still in progress. Up to the present five baboons have been carefully followed under various forms of endocrine treatment during the last two years. The information to date discloses that at least in the hypophysectomized and normal baboon neither cortisone nor ACTH in the doses used is able to block insulin-produced hypoglycaemia as is claimed occurs in dogs. The first study will be published towards the end of this year.

The Endocrine Glands and the Menstrual Cycle, The Pituitary

Operative damage to the pituitary gland and possibly to the stalk in a young, adult female baboon has resulted in the following physiological derangements :—

- (a) complete suppression of the menstrual cycle,
- (b) a sharp fall in the protein-bound iodine without any clinical manifestation of hypothyroidism,
- (c) a temporary interference with the capacity to excrete a test load of water which was restored within a period of eleven months when the baboon was able to excrete a test load at the same rate as a castrate baboon,
- (d) unimpaired carbohydrate metabolism as assessed by intravenous glucose and insulin tolerance tests,
- (e) a steady increase in weight (a total of 10 lb. in a year) without any obvious signs of obesity.

The suppression of the menstrual cycle and the low protein bound iodine suggest severe depression of the gonadotrophic and thyrotrophic activity of the pituitary. The maintenance of normal carbohydrate metabolism and normal rate of excretion of a water load are indicative of unimpaired adrenal function. The steady gain in body weight suggests the persistence of the somatotrophic function of the pituitary. The continued increase in body weight in the face of a low plasma-bound iodine and the coupling of a suppressed menstrual cycle with depressed thyroid function are noteworthy.

Human Nutrition

In a book on human malnutrition, the Head of the Unit drew attention to the profound modification in pigment metabolism of the hair and skin occurring in malnourished infants and adults. The basis for this metabolic disorder remains obscure. As a first attack on the problem it was decided to investigate the chemistry of the melanin granule. It has been found that the melanin granule has a highly complex structure consisting of

Die program van samewerking met Dr. Loustalot van Basel en Dr. Saxen van Helsinki (wat in die vorige verslag, 1952-53 gemeld is) met die doel om vas te stel in watter mate die dieet- en genetiese faktore die lewensgang van knaagdier wysig, nader voltooiing en die resultate sal teen die end van 1954 beskikbaar wees.

Verder dui langtermyn-proefnemings met drie groepe van 100-150 rotte, wat op verskillende diëte geplaas is, daarop dat die verskyning van gewasse aansienlik deur dieet beïnvloed kan word, en dat dit selfs 'n aktiewe rol kan speel by die ontstaan van verskeie soorte gewasse.

Verlede jaar is aangedui hoe belangrik vitamien A is in die beheer van die ongeskondenheid van die lewer en ander organe. Daar is verduidelik dat vitamien A op die een of ander manier die morfologie van die galbuise reguleer en dat 'n afwesigheid van vitamien A lei tot oormatige groei van die galbuise, wat baie vererger kan word deur estrogeen, veral in manlike diere. Later is aangetoon dat komplekse faktore die galbuise beheer en dat cholsuur, cholesterol, die skildklier, die teelkliere, vitamien A en ander voedsel-faktore daarby 'n rol speel.

Aansienlike vordering is gemaak met die afsondering van 'n vitamien A-agtige stof in dierevet. In die afgelope ses maande is tien verskillende preparate biologies ondersoek en die afsondering en suiwering van die werksame faktor in beesvet nader voltooiing. Die ondersoek is aansienlik vergemaklik deur verbeteringe in beide chemiese en biochemiese essaiemetodes.

Ekspesimentele Kankerverwekking

Die Eenheid het nou 'n dieet ontwerp wat die groei en aantel van rotte moontlik maak maar progressiewe hiperplasie, anaplasie en metaplasie van die galbuisselle in die lewer veroorsaak, soortgelyk aan die wat in rotte wat met bottergeel gevoer is, waargeneem is. Die reaksies is soortgelyk aan die wat in cholangio-sellulêre karsinome voorkom. As Salmon en Copeland se ondersoek in ag geneem word naas hierdie werk, bestaan daar weinig twyfel dat minstens een vorm van primêre lewerkanker te wyte is aan dieet.

Die Makromolekulêre Simptomegroep

Rotte

Twee studies is voltooi en op die pers. Die ontwikkeling van ooggebreke in die kleintjies van moeders wat met tripanblou behandel is, is in 11 uit 51 embryo's beskryf. Op grondslag van die tripanblou-proefnemings is drie stappe in die ontwikkeling van die oog omskryf, naamlik :

- (a) Afbeelding van die getied van die oog;
- (b) vorming van die oogkoppie en lens, en
- (c) differensiasie van die retina en bykomende lae van die oog.

Daar is getoon dat 'n inspuiting van tripanblou na die verskyning van die oogkoppie geen invloed op latere ontwikkeling het nie. Ooggebreke kon slegs teweeggebring word as die kleurstof ingespuut is voor die morfologiese ontwikkeling van die oogkoppie. Die gevolgtrekking is dus gemaak dat tripanblou biochemies inwerk ge-

The collaborative programme with Dr. Loustalot of Basle and Dr. Saxen of Helsinki (mentioned in the last report, 1952-1953) to ascertain the extent to which the dietary and genetic factors modify the life track of the rodent is nearing completion and the results will be available at the end of 1954.

In addition, long range experiments with three groups of 100-150 rats fed different diets suggest that it is possible to influence profoundly the emergence of tumours by diet. It would seem that diet has more than a permissive role in the genesis of various kinds of tumours.

Last year the importance of vitamin A in regulating the integrity of the liver and other organs was indicated. It was demonstrated that vitamin A in some way regulated the morphology of the bile ducts, an absence of vitamin A leading to bile duct hyperplasia, which could be greatly intensified by oestrogen especially in male animals. Subsequently it was demonstrated that the factors regulating the bile ducts are complex, and that cholic acid, cholesterol, the thyroid gland, the gonads, vitamin A and other food factors are implicated.

Considerable progress has been made in the isolation of a vitamin A-like substance in animal fat. During the last six months, ten different preparations have been assayed biologically and the isolation and purification of the potent factor in beef dripping is approaching completion. The investigation has been considerably facilitated by improvements in both chemical and bio-assay techniques.

Experimental Carcinogenesis

The Unit has now devised a diet which, while allowing the rats to grow and reproduce, causes progressive hyperplasia, anaplasia and metaplasia of the intrahepatic duct cells, similar to that observed in rats fed butter yellow. These reactions are similar to those occurring in cholangio-cellular carcinomata. Indeed, considering Salmon and Copeland's investigations in conjunction with this work, there seems little doubt now that at least one form of primary liver cancer is causally related to diet.

The Macromolecular Syndrome

Rats

Two studies have been completed and are in press. The morphogenesis of eye defects, induced in the offspring of mothers treated with trypan blue was described in 11 of 51 embryos. On the basis of the trypan blue experiments, three stages in the development of the eye were defined, namely :—

- (a) delineation of the eye field,
- (b) formation of the optic cup and lens, and
- (c) differentiation of the retina and accessory coats of the eye.

It was shown that once the eye cup had differentiated, an injection of trypan blue given thereafter did not interfere with later developmental events. Eye defects could only be produced if the dye were injected before the emergence of the eye cup morphologically. It was concluded that trypan blue acted at the biochemical level

durende fase (a) en (b) maar sy uitwerking eers merkbaar word gedurende fase (c). Dit is ook die geval met soortgelyke gebreke wat geneties in knaagdiere en reptiele vasgestel is.

Die moontlikheid dat 'n slegte ontwikkeling van die ooglens-slagaar of 'n tydelike suurstofgebrek verantwoordelik kan wees vir die gebrekkige vorming van die oog, is oorweeg. Met die oog op die wydverspreide afwykings in die brein, die sensus en die geraamte van die kleintjies van die wyfie-rotte wat met tripanblou behandel is, egter, is dit waarskynlik dat ander faktore as dié wat die bloedvatstelsel aantast, verantwoordelik gehou moet word vir die afwykings. Een van die faktore kan 'n steuring in die reaksievermoë van die tussenweefsel laag wees met verreikende gevolge op die ontwikkelingsprosesse in verskeie afdelings van die embrio.

Afwykinge van die binne-oor in rotembrio's van moeders wat elke twee weke met tripanblou ingespuut is, is beskryf. Eerstens was daar 'n algemene belemmering van die ontwikkeling van die oor en tweedens 'n onderdrukking van die binnelimsakkie, 'n algemene eienskap van al drie die abnormale ore wat beskryf is. In twee van die ore wat die ergste misvorm was, het slegs één halfkringvormige kanaal ontwikkel, en was die slakhuis klein en nie opperol nie en die sakkie sleg afgebaken. In die oor wat nie so erg aangetas was nie, was al drie halfmaanvormige kanale teenwoordig en afgesien van die feit dat hulle kleiner was, het hulle nie 'n groot afwyking van die normale getoon nie.

Bobbejane

Vier gevalle van primêre amiloïdose, 'n siekte wat baie selde by die mens voorkom, is in geslagtelik-volwasse wyfie-bobbejane waargeneem. 'n Volledige verslag oor die gevalle is nou op die pers.

Vroeg in 1954 is twee gevalle van gewrigsontsteking in bobbejane waargeneem en een geval van uitgebreide retikulosarkoom. Die etiologie van dié bindweefsel-siektes in die bobbejaan word gekoppel aan 'n steuring in die metabolisme van die plasmaproteïene. Dit word om drie redes beweer :

- (a) die siekte kom net by die vroulike geslag voor ;
- (b) gedurende die maandstondsiklus van die normale volwasse wyfie-bobbejaan vind groot bewegings van plasmaproteïene, veral van die globuliese plaas (Cohen, 1954) ; en
- (c) die toestand van die diere wat aan amiloïdose ly word tydelik vererger gedurende die fase van krimpings van die damgeswel, wanneer daar 'n vinnige toename in die plasmaproteïene is.

In gewone omstandighede is die bobbejaan in staat om doeltreffend ontslae te raak van die oormaat van proteïene wat saamgaan met die inkrimping van die geslagtelike geswel. Skynbaar verskaf die onvermoë om van die oormaat van proteïene wat in die sirkulasie kom gedurende die fase van krimpings ontslae te raak, in sommige omstandighede die vereiste toestande vir die ontwikkeling van amiloïdose, of minder dikwels, van ernstige prik-

during stage (a) and stage (b), but the observable effects appeared only during stage (c) as seems to be the case in similar defects determined genetically in rodents and reptiles.

Consideration was given to the view that an imperfect development in the hyaloid artery or a temporary anoxia might be responsible for the defective formation of the eye. But, in view of the widespread anomalies affecting the brain, the nervous system and skeleton induced in the off-spring of these trypan blue-treated female rats, it was suggested that factors other than those affecting the vascular system were implicated in the production of the anomalies. Among those factors could be included a disturbance in the reactivity of the mesoderm with widespread repercussions on developmental processes in various regions of the embryo.

Anomalies of the internal ear have been described in rat embryos obtained from mothers subjected to fortnightly injections of trypan blue. The malformations expressed themselves first, in a general stunting of the ear and secondly, in the suppression of the endolymphatic sac, a feature common to all three abnormal ears described. In two of the most severely deformed ears, only one semi-circular canal had developed, and, in these specimens too, the cochlea was small and uncoiled and the sacculus poorly demarcated. In the less severely affected ear, all three semi-circular canals were present and, apart from their smaller size, did not deviate markedly from the normal.

Baboons

Four cases of primary amyloidosis, a rare disease in man, were reported in sexually mature female baboons. A full report of these cases is now in press.

Early in 1954, arthritis was observed in two baboons and a single case of extensive reticulosarcoma. The etiology of these connective tissue diseases in the baboon is suggestively linked with a disturbance in the metabolism of the plasma proteins. This is asserted for three reasons :

- (a) the diseases are confined to females,
- (b) large movements of plasma proteins, especially of the globulins, occur during the menstrual cycle of the normal adult female baboon (Cohen, 1954), and
- (c) the conditions of the animals suffering from amyloidosis is aggravated temporarily during the phase of deturgescence of the perineal swelling, at a time when there is a rapid increase in the plasma proteins.

In ordinary circumstances, the baboon is able to dispose efficiently of the excess protein associated with the involution of the enlarged sex swelling. Apparently, failure to dispose of the excess proteins flooding the circulation during the phase of deturgescence in some circumstances can provide the necessary conditions for the development of amyloidosis, or less commonly of profound irritation of the reticuloendothelial system. These observations in baboons add further confirmation of our

keling van die retikulo-endoteelstelsel. Die waarnemings in bobbejane dien tot verdere bevestiging van ons menings gebaseer op die eksperimente met tripanblou in rotte, naamlik dat die wye reeks bindweefselsiektes, insluitende Hodgkin se siekte en retikulosarkoom, op een of ander manier die gevolg is van 'n steuring in die metabolisme van die plasmaproteïene.

Die plasmaproteïene van 'n bobbejaan wat aan primêre amiloïdose ly, is deur mnr. S. Shall, B.Sc. (Hons.) ondersoek en 'n voorlopige verslag is gepubliseer. Die serum en plasma van die bobbejaan is elektroforeties ondersoek en die volgende inligting is ingewin: Al drie elektroforetiese patrone toon die verskyning van 'n abnormale bestanddeel met 'n beweeglikheid wat groter is as die van albumien („X” bestanddeel), asook 'n onduidelike onderskeiding van die vier globuliene. Die laasgenoemde verskynsel dui op 'n relatiewe toename van proteïene wat elektroforetiese beweeglikheid het wat tussen die van elk van die vier globuliene val. Daar word voortgegaan met ondersoek om vas te stel of die abnormale gedrag van die plasmaproteïene wat beskryf is, eie is aan primêre amiloïdose.

Eksperimentele Fisiologie en Metabolisme van die Bobbejaan

Proteïenmetabolisme

Dr. S. Cohen het sy M.D.-tesis oor Plasmaproteïene in die bobbejaan voltooi. Hopelik sal die monografie binnekort gepubliseer word.

Jodium- en Lipiedmetabolisme

Studies oor jodium- en lipiedmetabolisme in die bobbejaan is voortgesit met spesiale klem in hierdie jaar op die veranderinge wat met ouderdom plaasvind. In teenstelling met waarnemings in die mens, lyk dit of die serumlipiede in die bobbejaan progressief afneem met stygende ouderdom. As die grense van skommeling in die lipiedinhoud van die serum in die individuele bobbejaan oor 'n beperkte tydperk gemeet word, is dit baie minder as vir 'n groep as geheel.

Watermetabolisme

Studies oor watermetabolisme in die bobbejaan, waarmee in 1952-53 begin is, bring nog steeds nuwe feite i.v.m. die beweging van water aan die lig. Dit is nou duidelik dat die hoeveelheid water wat deur die bobbejaan ingeneem word nie die hoeveelheid water bepaal wat gedurende die eerste fase van die maandstondsiklus behou word nie. So is daar aangetoon dat 2 tot 3 Kg. vloeistof wat gedurende die eerste fase van die siklus behou is, verkry kon word deur 'n totaal van 33 of 17 liters in te neem. Sulke waarnemings dui daarop dat 'n ingewikkelde meganisme die ontwikkeling van eedeem weens ondervoeding of moontlik in hartkwaal of nier-siekte, beheer. Eedeem is nie noodwendig die gevolg van 'n veranderde elektroliet-metabolisme nie.

Ondersoek wat gedoen is met bobbejane waarvan die harsingaanhangsel verwyder is, bevestig die kliniese waarnemings dat kortisone meer doeltreffend is as

views established from experiments with trypan blue in rats namely, that the wide range of connective tissue diseases, including Hodgkin's disease and reticulosarcoma, are in some way dependent upon a disorder in the metabolism of the plasma proteins.

The plasma proteins of a baboon suffering from primary amyloidosis were investigated by Mr. S. Shall, B.Sc. (Hons.), and a preliminary report published. The serum and plasma of the baboon were examined electrophoretically and the following information obtained: all three electro-phoretic patterns show the appearance of an abnormal component with a mobility greater than albumin (“X” component) as well as indistinct differentiation of the four globulins. This latter phenomenon suggests a relative increase of proteins having electrophoretic mobilities intermediate between those of each of the four globulins. Investigations are proceeding to determine whether or not the described abnormal behaviour of the plasma proteins is specific to primary amyloidosis.

Experimental Physiology and Metabolism of the Baboon Protein Metabolism;

Dr. S. Cohen has completed his M.D. thesis on Plasma Proteins in the baboon. It is hoped that this monographic work will be published in the near future.

Iodine and Lipid Metabolism;

Studies of iodine and lipid metabolism in the baboon have been continued with special emphasis this year on the changes associated with age. Contrary to observations in man, the serum lipids in the baboon seem to fall progressively with increasing age. Moreover, the range of variation in the lipid content of the serum in the individual baboon, if measured over a restricted period, is much less than for a group as a whole.

Water Metabolism

Studies of water metabolism in the baboon initiated during 1952-1953 continue to disclose new facts concerning the movement of water. It is now apparent that the amount of water consumed by the baboon does not determine the amount of water retained during the first part of the menstrual cycle. Thus it was demonstrated that 2 to 3 Kg. of fluid retained during the first part of the cycle could be achieved by consuming a total of 33 litres or 17 litres. Such observations suggest that a complicated mechanism governs the development of oedema either in malnutrition or possibly also in cardiac disease and nephrosis. Oedema is not necessarily a result of an altered electrolyte metabolism.

Investigations carried out on hypophysectomised baboons confirm clinical observations that cortisone is more effective than is ACTH in restoring the ability of the kidney to excrete efficiently a fixed load of water.

het, bestaande uit 30% melanien, 30% diffendeerbare proteïen, 30% nie-diffendeerbare proteïen, 2% lipied en minder as 'n 0.5% nukleïensuur. Die totale koolhidraat-inhoud is sowat 10% en dit is duidelik dat die chemie van die melanienkorreltjie baie verskil van die van die mitokondrië. Spektroskopiese ondersoek van die pigment wat afgesonder is van die melanienkorreltjie dui aan dat dit vergelykbaar is met die pigment wat ensiematies en chemies van tirosien berei is. Die inligting bevestig die hipotese dat die pigmentbestanddeel van melanien afkomstig is uit tirosien of uit 'n voorloper van tirosien.

'n Mooi versameling van kinders se ribbebene verkry van die Medies-geregtelike Staatslaboratoriums, word ondersoek. Hopelik sal die verskillende beenletsels wat in die Bantoebevolking voorkom blootgelê kan word deur korrelatiewe studies van die histologie en die X-straalvoorkoms van die ribbebene.

Algemeen

Op die sesde Internasionale Kankerkongres wat van 23-29 Julie, 1954 in Sao Paulo, Brazilië gehou is, het die hoof van die Eenheid 'n verhandeling oor Nutrisie en Kanker voorgedra. Hy is gekies tot lid van die Uitvoerende Komitee van die Internasionale Unie teen Kanker en is gevra om op die Programkomitee te dien. Hy is ook gekies tot lid van die Uitvoerende Komitee van die Kommissie vir Kankerbeheer en is benoem tot President van die Internasionale Komitee vir die Opsporing van Kanker.

Besoekers aan die Eenheid

In die afgelope jaar het professor Sir Charles Dodds, direkteur van die Courtauld-Instituut vir Biochemie by die Middlesex-hospitaal, Londen en dr. Cicely Williams, senior lektor in die Departement van Voeding by die Londense Skool van Higiëne en Tropiese Medisyne, die Eenheid besoek.

TERINGNAVORSINGSEENHEID

Hoof van die Eenheid: DR. B. A. DORMER.
(Koning George V-hospitaal)

In die Jaarverslag van 1952-53 is die groot kliniese en patologiese veranderinge, hoofsaaklik te danke aan moderne antibiotiese middels, wat besig is om op die gebied van tering plaas te vind, aangedui. Die antibiotiese middels het nuwe probleme aan die lig gebring en navorsingswerk in verband hiermee het baie nuttige inligting verskaf.

Baie teringpasiënte wat gedoem sou wees tot 'n vinnige of langsame dood is volkome gesondgemaak, ander, hoewel hulle nie meer teringbasille uitskei nie, hou nog holtes oor, terwyl ander met pulmonale tering, hoewel hulle oënskynlik gesond is, nog besmette speeksel uitthoes. Party gevalle word slegs tydelik beter en gaan dan weer agteruit.

Die navorsingswerk i.v.m. die beste behandelingsmetodes van pasiënte met holtes, van die positiewe uit-skeiers en van gevalle wat slegs tydelik beter word, is kliniese en laboratoriumsake wat mekaar moet aanvul.

30% melanin, 30% diffusible protein, 30% non-diffusible protein, 2% lipid, and less than 0.5% nucleic acid. The total carbohydrate content is approximately 10% and it is apparent that the chemistry of the melanin granule is markedly different from that of mitochondria. Spectroscopic examination of the pigment isolated from the melanin granule indicates that it compares with the pigment prepared enzymatically and chemically from tyrosine. The information obtained supports the hypothesis that the pigmented component of melanins is derived from tyrosine or a tyrosine precursor.

A fine collection of children's ribs obtained from the Government Medico-Legal Laboratories is being investigated. It is hoped that the various bone lesions occurring in the Bantu population will be disclosed from correlative studies of the histology and X-ray appearance of these ribs.

General

At the Sixth International Cancer Congress held in Sao Paulo, Brazil, from July 23rd - 29th, 1954, the Head of the Unit presented a paper on Nutrition and Cancer. He was elected to the Executive Committee of the International Union against Cancer and was invited to serve on the Programme Committee. He was also elected to the Executive Committee of the Cancer Control Commission and was appointed President of the International Committee for Cancer Detection.

Visitors to the Unit

During the year, Professor Sir Charles Dodds, Director of the Courtauld Institute of Biochemistry at the Middlesex Hospital, London, and Dr. Cicely Williams, Senior Lecturer in the Department of Nutrition at the London School of Hygiene and Tropical Medicine, visited the Unit.

TUBERCULOSIS RESEARCH UNIT

Head of Unit: DR. B. A. DORMER.
(King George V Hospital)

The 1952-53 Annual Report indicated the great changes that were occurring in the field of tuberculosis, clinically and pathologically, mainly due to modern antibiotics.

These antibiotics have produced new problems, and researches into these have produced much useful information.

Many tuberculous patients who would have been doomed to a rapid or lingering death are completely cured, others though no longer excreting tubercle bacilli are left with residual cavities, whilst others with pulmonary tuberculosis, though themselves apparently well, still cough up infected sputum, and some cases improve temporarily only and then regress.

The researches into the best method of treating patients with cavities and the positive excretors, and cases that only improve temporarily are clinical and laboratory matters which must be complementary.

Verlede jaar het die hoof van die Eenheid die gebruik van gehidrogeneerde plantaardige olies, wat antibiotiese middels bevat, voorgestel om holtes in pasiënte waar reseksie teenaangedui is, te vul. Verskeie pasiënte is op dié wyse behandel, met goeie resultate; ander was nie so suksesvol nie. Daar is navorsing gedoen na die oorsake van mislukking in die gevalle. Groot snitte van 'n hele long is gesny en die histologie van spesiale dele van holtewande is ondersoek. Die gesamentlike kliniese en laboratoriumondersoeke het getoon dat noukeurige keuring van gevalle van die grootste belang is en het aanduidings gegee van die maatstawwe wat toegepas moet word in die keuring van gevalle vir die behandeling. Navorsing hieroor duur voort.

Die ander probleme van pasiënte wat aanhoudend positiewe speeksel lewer of wat nie beter word nie, is ook ondersoek. Dit is belangrik om te weet of die veroorsakende organismes gevoelig is vir die antimikrobiële middels wat gebruik word. Daar is navorsing gedoen om die verskeie gebruiklike metodes te ondersoek en te vergelyk en hieruit het 'n tegniek ontwikkel wat ons baie nuttig en beter as enige ander metode gevind het. 'n Beskrywing van tegniek en vergelykende bevindinge is ingedien vir publikasie. (Die werk is in medewerking met die Oxford-Universiteitspan van die Teringnavorsingsvereniging gedoen.)

Dit is nou moontlik om gevoeligheidsresultate te verkry 10 dae nadat die kultuur positief gevind is, en in noodgevalle 10 dae na ontvangs van die speeksel, as die direkte ondersoek van die speeksel positief is. Met die metode wat deur die Mediese Navorsingsraad aanbeveel is, was sestig dae die gewone tyd.

Die tydsbesparing is baie belangrik, aangesien die agteruitgang dikwels baie skielik intree.

Die tegniek toon die ontwikkeling van die ongevoelige mutante tussen die gevoelige stamme en dit is maklik om afgesonderde kweekgroepe vir verdere studie te verwyder. Navorsingswerk word gedoen oor die kwekings- en biologiese eienskappe van die mutante en van afwykende kolonies wat in die gevoeligheidstoetse aan die lig kom.

Die prognose van tuberkuleuse meningitis het aansienlik verander sedert 'n lid van die Eenheid begin het om die gevalle met adrenokortikotropiese hormone tesame met antimikrobiële middels te behandel. Met die tegniek vir gevoeligheidstoetse is navorsing na die konsentrasie van antimikrobiële middels in die harsing- en rugmurgvloeistof gedoen. Dit skakel die gebruik van duur apparaat wat vir chemiese metodes nodig is, uit.

'n Aansienlike hoeveelheid verdere werk is gedoen oor die indeling van *M. tuberculosis* in lyne wat aangepas is op mens of bees. In die loop van hierdie ondersoeke is daar talle suurbestandende en alkoholbestandende basille, voorheen losweg beskryf as „saprofiete”, gevind en hulle word nou nader bestudeer.

Ondersoek na die „stremstowwe” wat in kalbasuurmelk voorkom is ook ingestel. *M. tuberculosis*,

Last year, the Head of the Unit suggested the use of hydrogenated vegetable oils with incorporated antibiotics to fill cavities in patients where resection was contraindicated. Several patients were treated in this manner, with good results; others were not so successful; and research into the reasons for failure in these cases was done. Large sections of whole lung were cut, and histology of special portions of cavity walls has been examined. The combined clinical and laboratory investigations have shown that careful selection of cases is of utmost importance and have given some indications of the criteria which should be followed in the selection of cases for such treatment. Research on this is still in progress.

The other problems of persistent “Positive Spitters”, and cases that fail to progress were also investigated. It is important to know whether the causative organisms are sensitive to the antimicrobial agents used. Research was done to investigate and compare the various methods in common use, and from this developed a technique which we have found most helpful and better than any other. A description of technique and comparative findings has been submitted for publication. (This work was done in conjunction with the Oxford University team from the Tuberculosis Research Association.)

It is possible now to obtain sensitivity results 10 days after the culture is positive, and in emergencies, 10 days after receipt of the sputum, if direct examination of sputum is positive. Sixty days was the usual time with the Medical Research Council recommended method.

This saving in time is most important because the onset of deterioration is often abrupt.

The technique shows up the development of resistant mutants amongst sensitive strains, and it is easy to pick off isolated colonies for further study. Research is being done on the cultural and biological characteristics of these mutants and of atypical colonies appearing in the sensitivity tests.

The prognosis of tuberculous meningitis has changed remarkably since a member of the Unit began treating these cases with Adrenocorticotrophic hormones together with antimicrobial agents. Research into the concentration of antimicrobial agents in the cerebro-spinal fluid has been done by adopting the technique for sensitivity tests. This dispenses with expensive apparatus required for chemical methods.

Further work on an extensive scale has been done on the typing of *M. tuberculosis* into human and bovine strains. In this research, numbers of acid- and alcohol-fast bacilli hitherto loosely labelled “Saprophytes” have been found. These are also being studied.

Research into the inhibitory substances in calabash soured milk has also been done. Growth of *M. tuberculosis*, subjected to lactic acid of the same pH, (4.5) as the lactobacilli culture filtrate, was definitely less than that

blootgestel aan melksuur van dieselfde pH (4.5) as die filtraat van laktobasil-kulture, het beslis swakker gegroei as op die kontrolebodems, maar beter as wanneer die filtraat by die kweekbodem gevoeg is. Die firma Pfizers van Amerika, aan wie die Eenheid suurmelkbasil vir ondersoek gestuur het, het die mening uitgespreek dat hulle antibiotiese eienskappe moontlik veroorsaak mag word deur 'n vlugtige bestanddeel. Die interessante feit bly egter staan dat die tuberkelbasil binne 6 dae deur kalbas-suurmilk vernietig word.

'n Verdere aantal navorsingsprogramme, veral in verband met verskillende kiemdodende stowwe, het aandag ontvang of is nog aan die gang. Namate nuwe antibiotiese stowwe ontdek word en volgens die resultate van gevoeligheidstoetse, word die behandeling toegepas of verander.

Uitgebreide massa-X-straalopnames is verlede jaar onderneem en duur nog voort. Selfs stofdeeltjies uit verskeie dele van verskillende steenkoolmyne word ondersoek op *M. tuberculosis*.

VIRUSNAVORSINGSEENHEID

Hoof van die Eenheid: PROFESSOR M. VAN DEN ENDE.
(Universiteit van Kaapstad)

Fisies-chemiese Studies oor Dierevirsusse *Besmettingsdeeltjies*

Dit is bewys dat in sekere viruspreparate (bv. sinkdalkoors, MEF₁-lyn van poliovirus en perdesiekte in besmette harsings van suipmuisies of kuikenembrio-emulsies) daar besmettingsdeeltjies is wat redelik skerp in twee groepe val. Hulle kan gedeeltelik geskei word deur differensiële sentrifugering. Of die bevinding van belang is, is nog nie vasgestel nie. In die geval van sinkdalkoors is daar besmettingsdeeltjies van twee groottes teëgekome slegs in suspensies van virus wat gedurende sy lewe herhaaldelik in eiers oorgeënt is.

Afskeiding uit virussuspensies en suiwering van oplosbare antigene

In sommige gevalle (bv. hondsdoelheid) is oplosbare antigeen baie belangriker in komplementbinding as die virusdeeltjies self. In ander gevalle (bv. MEF₁) is die oplosbare antigeen verantwoordelik vir minstens die helfte van die komplementbindingsvermoë van ongesuiwerde antigeen met sy ooreenstemmende immuun serum wat in muis berei is. Oplosbare antigeen is ook in harsingsuspensies van diere wat met sinkdalkoors- en perdesiektevirusse besmet is, gevind.

Daar word ook pogings aangewend om immuniserende antigene wat geheel en al uit oplosbare antigeen sonder virus bestaan, te berei met die doel om vas te stel wat die rol van die antigeen in aktiewe immunisering is. *Die behoud van besmetlikheid van virussuspensies*

Monsters van virus wat gedeeltelik deur sentrifugering gesuiwer, in 'n verskeidenheid van mediums hersuspendeer en by 37° C. gehou is, is vir besmetlikheid getoets oor 'n tydperk van 'n paar weke. Normale haas-serum het 'n besliste beskermende werking. 'n Soort-

on control media, but also more than on media to which filtrate has been added. Messrs. Pfizers in America who investigated the antibiotic properties of the lacto-bacilli sent to them by the Unit suggested that this might be due to a volatile antibiotic. The interesting fact remains that tubercle bacilli are killed within 6 days in milk soured in a calabash.

A number of other research programmes mainly on treatments with different antimicrobial agents have been, and still are, in progress.

As new antibiotics are discovered, and as sensitivity tests indicate, so treatment is administered or altered.

Extensive mass X-ray surveys were undertaken last year and still continue. Even dusts from various parts of different coal mines have been investigated for *M. tuberculosis*.

VIRUS RESEARCH UNIT

Head of the Unit: PROF. M. VAN DEN ENDE.
(University of Cape Town)

Physico-chemical Studies on Animal Viruses *Infective particles*

It has been demonstrated that in some virus preparations, (e.g., Rift Valley Fever, MEF₁ strain of polio virus and Horse-sickness in infected suckling mouse brain or chick embryo emulsion) there are infective particles falling fairly sharply into two groups. These can be partially separated by differential centrifugation. The significance of this finding has not yet been established. In the case of Rift Valley Fever infective particles of two sizes have only been encountered in suspension of virus which during its maintenance has been repeatedly passed through eggs.

Separation from virus suspensions of soluble antigens and their purification

Soluble antigen in some cases (e.g., Rabies) are far more important in complement fixation than the virus particles themselves. In other cases (e.g., MEF₁) the soluble antigen accounts for at least half of the complement fixing power of crude antigens with corresponding immune sera prepared in mice. Soluble antigen has also been found in suspensions of brains from animals infected with Rift Valley Fever and Horsesickness viruses.

Attempts are also being made to prepare immunizing antigens consisting entirely of soluble antigen free of virus to determine the significance of the antigen in active immunization.

The preservation of infectivity of virus suspensions

Samples of virus partially purified by centrifugation, resuspended in a variety of media and held at 37° C. were tested for infectivity over a period of several weeks. Normal rabbit serum has a definite protective action. Similar protection was shown by the albumin fraction of

gelyke beskerming is getoon deur die albumiengedeelte van die serum, terwyl die virus vinnig vernietig is in gamma-globulien. Die meganisme van beskerming deur albumien en ander proteïene word verder ondersoek.

Suiwering van virusse

Daar is pogings aangewend om die isoëlektriese punte van virusse (bv. MEF₁-stam van Polio) met papier-elektroforesemetodes te bepaal. Hoewel die eintlike doel van die ondersoek nie bereik is nie, het die bevindings aan die lig gebring dat die neerslaan by pH 4·3 in 'n lae sout-konsentrasie gevolg deur CHCl₃-ekstrasie, 'n nuttige metode bied vir die suiwering van virusse. Dit was byvoorbeeld moontlik om van die MEF₁-besmette harsings van 300 suipmuisies 'n virussuspensie te berei met 'n aansteeklikheidsiter van 10⁸. Elektronmikroskopie het buitengewoon suiwere deeltjies van eenvormige grootte aangetoon. Die finale viruspreparaat het slegs 0·008% van die nie-dialiseerbare stof wat in die oorspronklike emulsie teenwoordig was, bevat.

Antigeniese struktuur van bloutongvirusse

Deur kwantitatiewe komplementbindingstoetse waarin gebruik gemaak is van immune serums wat in muise berei is en van antigene wat van die harsings van soogmuisies deur ekstrasie met aseton en eter berei is, was dit moontlik om immunologiese verskille te toon tussen stamme wat verskillend reageer in neutralisasietoetse.

Ongesuiwerde soutekstrakte van besmette soogmuissharsings en oplosbare antigene van sulke uittreksels kan ook in komplementbindingstoetse gebruik word. Die doel is om vas te stel of enige *in vitro*-toetse met ongesuiwerde antigene, met asetoneter geëkstraheerde antigeen of met oplosbare antigeen, immunologiese verskille sal toon wat ooreenstem met *in vivo*. As geen van die *in vitro*-toetse verskille toon nie, sal 'n poging aangewend word om die rede vir die verskillende werking van immuun serum *in vivo* en *in vitro* vas te stel.

Bakteriofaagonderdrukkers

'n Verskynsel waaraan nog steeds besondere aandag geskenk word, is die stuiting van sekere *Ps. aeruginosa* fage deur trichloorasynsuurekstrakte van gladde stamme van die organismes, en veral ekstrakte van 'n lyn, L 11, wat klaarblyklik ongevoelig is vir die werking van die fage.

Pogings om homogene preparate van die ongeskonde stuitmiddel te verkry deur fisies-chemiese metodes, word bemoeilik deur die feit dat faagonderdrukking getoon word deur deeltjies van verskillende grootte wat nietemin chemies homoloog kan wees. Om die moeilikheid te oorbrug en om die stuitkrag te verduidelik, word pogings aangewend om die stuitmiddel wat lyk asof dit identies is met die gladde liggaamsantigeen, in sy lipiedkoolhidraat-proteïenbestanddele te splits.

Die faagstuitende krag van gewaste selwande van kulture wat meganies opgebreek is, is ook ondersoek. Dit is opmerklik dat die selwande van *Ps. aeruginosa*, stam L 11, aktief stuitend is vir fage wat aktief is op L 11, maar slegs gedeeltelik stremmend vir die fage, soos Faag 14, wat nie-aktief is op L 11, maar onderdruk word

the serum, whilst in gamma globulin the virus was rapidly destroyed. The mechanism of protection by albumin and other proteins is being investigated further.

Purification of viruses

The determination of isoelectric points of viruses (e.g., MEF₁ strain of Polio) by paper electro-phoresis methods was attempted. Although the initial objects of the investigations were not achieved, the findings did reveal that precipitation at pH 4·3 in low salt concentration followed by CHCl₃ extraction offered a useful method for the purification of viruses. It has been possible for instance to prepare from 500 MEF₁ infected suckling mouse brains a virus suspension with an infective titre of 10⁸ which on electron microscopy reveals particles of uniform dimensions singularly free of impurities. The final virus preparation contained only 0·008% of the non-dialysable material present in the original emulsion.

Antigenic structure of Blue Tongue Viruses

By quantitative complement fixation tests using immune sera prepared in mice, and antigens prepared from suckling mouse brains by acetone and ether extraction it has been impossible to show immunological differences between strains which can be shown to be different in neutralization tests.

Crude saline extracts of infected suckling mouse brains and soluble antigens from such extracts can also be used in complement fixation tests. The aim is to ascertain whether any *in vitro* test using crude antigens, acetone ether extracted antigen or soluble antigen will reveal immunological differences to parallel *in vivo* differences. If none of the *in vitro* tests reveal differences, an attempt will be made to determine the reason for differences between the *in vivo* and *in vitro* activity of immune sera.

Bacteriophage Inhibitors

The phenomenon to which particular attention continues to be given is the inhibition of certain *Ps. aeruginosa* phages by trichloroacetic acid extracts of smooth strains of the organisms, and especially extracts of a strain, L 11, which is apparently insensitive to the action of the phages.

Attempts to obtain homogeneous preparations of the intact inhibitor by physico-chemical methods are complicated by the fact that phage inhibition is shown by particles of varying sizes which may nevertheless be chemically homogeneous. To overcome the difficulty and to explain the inhibitory power, attempts are being made to split the inhibitor — which appears to be identical to the smooth somatic antigen — into its lipid, carbohydrate and protein components.

The phage inhibitory power of washed cell walls from cultures disintegrated mechanically have also been investigated. It is of interest that the cell walls from *Ps. aeruginosa* strain L 11 are actively inhibitory for phages active on L 11, but only partly inhibitory to those

deur sy TCA-ekstrakte. Aan die ander kant word faag 14 aktief gestuit deur 'n 1M. NaCl-uittreksel wat gedurende die was van die selwande verkry is.

Die verskynsel is van groot belang met betrekking tot die werking van gematigde fage of die verhouding van fage tot hul lisogeniese gasheer. 'n Verklaring vir die besondere verskynsel van faagstuiting kan moontlik lig werp op die verskynsel van lisogenisiteit in besonder en latente virusbesmettings in die algemeen.

In die laaste jaar is 'n tweeledige papierionofere-apparaat ontwerp en opgebou. Daar word verwag dat die apparaat baie waardevol sal wees in die chemiese ontleding van die faagstuitmiddels, en ook van ander biologiese stowwe.

Kultivering van poliovirusse

Daar is voortgegaan met pogings om die MEF₁-stam by eiers of dagoud-kuikens aan te pas deur hoogs-gezuiverde stowwe wat van die virus-besmette harsings van soogmuisies verkry is as primêre entstof te gebruik. Pogings met serie-oorenting in eiers het misluk ten spyte van die feit dat materiaal met 'n omvangstiter (in muis) van 10⁸ gebruik is. In een geval wat belowende resultate gelewer het, is virus in eiers ingeënt wat oorgeplant is op die chorioallantois met testikelstof van ape. Daar word voortgegaan met die pogings en terselfdertyd sal die uitwerking van kortisone op die aanpassing ondersoek word.

Hindernis- en herverbindingsproefnemings met polio-stamme

In opvolging van die werk van Burnet i.v.m. herverbinding tussen griepvirusse, is gepoog om kruisings tussen tipe 1 en 2 poliovirusse in weefselkultuur en in muis te verkry. Aanvangsproewe het negatiewe resultate getoon. Hulle het egter gelei tot die besef dat uitvoerige voorbereidingstoete oor die gedrag van die virusse in weefselkultuur noodsaaklik is.

Proefnemings word nou uitgevoer met die doel om die snelheid te bepaal waarteen een van beide virusse die ander wat later bygevoeg word, sal uitsluit van vermenigvuldiging in weefselkultuur. As die juiste toestande vir die bepaalde dwarsboming eers vasgestel is, kan geskikte proefnemings ontwerp word vir die herverbinding tussen die twee stamme.

Afsondering van virusse

Studies van weefselkultuur en oordrageksperimente in eiers en varke is uitgevoer met limfkliere van gevalle van Hodgkin se siekte. Materiaal van twee pasiënte wat in varke ingespuut is, het klierreaksies verwek wat histologies oormatige groei en eosinofilie getoon het, maar geen reusselreaksies nie. Sub-inokulasie van kliere in kuikenembrio's het abnormale groei van die embrio's veroorsaak. Die uitwerking het egter nie voortgeduur in die kuikenembrio na oorenting nie.

Griepvirusse van Tipe A is gedurende die onlangse griep epidemie afgesonder.

Stamme van die C-virus is afgesonder uit die ontlasting van drie klinies-tipiese gevalle van Bornholm se siekte.

phages, such as Phage 14, which are inactive on L 11, but inhibited by its TCA extracts. On the other hand phage 14 is actively inhibited by a 1M.NaCl extract obtained during the washing of the cell walls.

This phenomenon is one which is of great interest in relation to the action of temperate phages or the relation of phages to their lysogenic hosts. An explanation of this particular phenomenon of phage inhibition may throw light on the phenomenon of lysogenicity in particular and latent virus infections in general.

During the last year a two-way paper ionophoresis apparatus has been designed and constructed. It is anticipated that this apparatus will prove of great value in the chemical analysis of the phage inhibitors, as well as of other biological materials.

Cultivation of the Poliomyelitis Viruses

Attempts have continued to adapt the MEF₁ strain to eggs or day old chicks — using highly purified materials obtained from virus-infected suckling mouse brains as primary inoculum. Attempts at serial passage in eggs have failed in spite of the use of material with an initial titre (in mice) of 10⁸. In one attempt which gave encouraging results, virus was inoculated into eggs which were also implanted on the chorioallantois with monkey testicular material. These attempts are being continued and at the same time the effect of cortisone on the adaptation will be investigated.

Interference and Recombination Experiments with Poliomyelitis Strains

Following the work of Burnet on recombination between Influenza viruses, attempts have been made to obtain hybrids between Types 1 and 2 Polio viruses in tissue culture and mice. Initial experiments were undertaken in mice and tissue culture with negative results. These initial experiments however led to the realization of the need for elaborate preliminary experiments on the behaviour of the viruses in tissue culture.

Experiments now under way are aimed at determining the rate at which either of the viruses will exclude the subsequently added virus from multiplication in tissue culture. Once the exact conditions for such specific interference have been established, appropriate experiments can be designed for the recombination between the strains.

Isolation of Viruses

Tissue culture studies and transmission experiments in eggs and pigs have been undertaken with lymph glands from cases of Hodgkin's disease. Material from two patients has, on injection into pigs, elicited glandular reactions which histologically revealed hyperplasia and eosinophilia, but no giant cell reactions. Sub-inoculation of glands into chick embryos has resulted in growth abnormalities of the embryos. The effects on the chick embryo have, however, not been maintained on passage.

Influenza viruses of Type A have been isolated during the recent influenza epidemic.

Strains of C virus have been isolated from stools of three cases of clinically typical Bornholm's disease.

Research Bursaries and Assistantships

awarded by the C.S.I.R. during 1954

Navorsingsbeurse en Assistenteskappe

wat deur die W.N.N.R. gedurende 1954 toegeken is

GENERAL RESEARCH — ALGEMENE NAVORSING

BURSARIES — BEURSE

1. Senior Bursaries/Senior Beurse (£200-£1,000)

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
BOITTO, Dr. G., Dr. of Laws, M.Ph., M.Litt. Volta Prize, Research Bursar £240	Transvaal Museum, Pretoria	Catalogue of Southern African Coleoptera.
DE WAAL, Prof. H. L. B.Sc. (Agric.) met lof M.Sc. (Enologie) met lof Dr. Phil. (Chemie) met lof D.Sc. (Chemie) met lof £650	Universiteit van Pretoria	Struktuur- en konfigurasiebepaling van natuur- en/of sintetiese organiese verbindings.
EWER, Dr. (Mrs.) R. F. B.Sc., Ph.D. Research Bursar £400	University of Natal	Continuation of research on fossil mammals from the deposits at Sterkfontein, Swartkrans and Kromdraai in which the Australopithecine (Ape-man) fossils have been discovered. (Previous awards 1948, 1950, 1951, 1953.)
FREEDMAN, L. B.Sc. Research Bursar £720	Transvaal Museum Pretoria	The Fossil Cercopithecoidea of Southern Africa. (Previous award : 1953.)
KING, W. H. B.Sc. (Civil Eng.), B.A. (Admin.), A.M.I.C.E., A.Inst. Mun. E., M.R. San. I., A.M.I. (S.A.) C.E., Senior Lecturer in Civil Engineering £600	Cement and Concrete Re- search Station, Wexham, England.	Mix design for prestressed concrete.
NEETHLING, J. D. B.Sc., M.Sc. (met lof) Navorsingstudent £300	Gettingen Universiteit, Duitsland	Die matematiese behandeling van transoniese (gemengde super-en subsoniese) vloeie verby 'n versperring.
PUGH, Prof. W. B.Sc., D.Sc., F.R.I.C., F.R.S. (S.A.) Professor of Chemistry and Dean of Faculty of Science. £600	Cambridge University, England	Hydrazine : Preparation and characterisation of some new compounds.

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
Civil Engineering/ Siviele Ingenieurswese BAYER, M. A.	University of Natal	A verification of the plastic design of prestressed concrete sections.
HALIBURTON, D. J. B.Sc. (Eng.)	University of Natal	Effect of fly ash and other substances of varied natures on the strength and permeability of concrete.
LOUW, J. M.	Iowa State College, Iowa, U.S.A.	The real points of rotation in applying moment distribution to frames with haunched trusses with deep gussets.
Entomology/Insektekunde GORDON, (Miss) H. R. S. B.Sc.	University of the Witwatersrand	The social behaviour of insects.
Electrical Engineering/ Elektriese Ingenieurswese VAN DER SPUY, Dr. E. E. B.Sc. (Elec. Eng.), Ph.D (Elec. Eng.)	Manchester University, England.	The interaction of α -particles (2 He ⁺) and neutrons in relation to nuclear forces.
Geology/Geologie AMDURER, S. S. B.B.A., B.A.	University of Cape Town	The engineering geology of the Cape Flats. (Previous awards : 1952, 1953.)
COETZEE, G. L.	University of the Witwatersrand	An investigation into the copper, cobalt and nickel contents of some South African pyrites.
ORTLEPP, R. J. B.Sc. (met lof)	Universiteit van Pretoria	Boorkerns van 'n gedifferensieerde stollingskompleks in die distrik Trompsburg, O.V.S.
PRETORIUS, D. A. B.Sc. (Eng.) (Mining Geology)	University of the Witwatersrand	Geological and geophysical investigations of certain groundwater problems in Greece and Egypt.
VILJOEN, J. J. B.Sc.	Universiteit van Pretoria	Die kobaltvoorkoms by Balmoral, Transvaal.
Hydrobiology/Hidrobiologie CLAASSEN, Mej. M. I.	Universiteit van Pretoria	Hidrobiologie
Mathematics/Wiskunde LIEBECK, H. B.Sc., M.Sc., B.A. (Hons.)	Cambridge University, England	Theory of groups.
REITSMA, A. B.Sc., B.Sc. (Hons.) M.Sc. (met lof) T.O.D.	Universiteit van Amsterdam, Nederland	Studie in die Wiskundige Steekproefteorie.
VAN DER MARK, J. B.Sc. (met lof), M.Sc. (Fisika), M.Sc. (Wiskunde)	Universiteit van Leiden, Nederland	Algebra en getalenteorie (spesiaal onderwerp : Bepaling van groepenkaraktters, zowel voor eindige als voor oneindige groepe, meer in het bijzonder voor modulaire groepe).
Physics/Fisika ALLSOPP, H. L.	H.H. Wills, Physical Laboratory, Bristol	Investigation of the properties of ferro-electric materials. (Previous award : 1953.)
BROOKS, F. D. B.Sc., B.Sc. (Hons.)	Rhodes University	Fluorescent properties of organic solutions. (Previous award : 1953.)
CAMERON, A. J. W. B.Sc., B.Sc. (Hons.)	Rhodes University	Radiation damage of organic phosphors.
CONCER, D. B. B.Sc.	University of the Witwatersrand	Theoretical investigation of certain problems on heat flow.

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
SCOTT, Dr. (Mrs.) K.M.F. B.Sc. (1st Class Honours), Ph.D., F.R.E.S., Senior Research Bursar £800	University of Cape Town	(1) Taxonomic study and description of the Trichoptera (caddis flies) of South Africa (including both adults and larvae). (2) Taxonomic and ecological study of the chironomidae (especially the larvae) of the Western Cape and later of other parts of South Africa. (3) Continuance of hydrobiological studies in the Western Cape Province.
SMITH, Prof. J. L. B. B.A., M.Sc., Ph.D., F.R.S. (S.A.), C.M.Z.S. Professor in Ichthyology £1,300	Rhodes University	Fishes. (Previous awards : every year since 1946.)
TAGER, Dr. J. M. B.Sc. (Landbou) met lof, Ph.D., Navorsingsbeurshouer £800	Universiteit van Pretoria	(i) Chemiese omsettings gedurende asemhaling in plantweefself. (ii) Die invloed van lae temperatuur en ander faktore op die kieming van perskesade.
VAN SCHALKWYK, T. G. D. B.Sc. (with distinction), M.Sc. Lecturer in Physics £400	Cavendish Laboratory, Cambridge, England	X-Ray investigation of the crystal structure of 2-2 ¹ Dinitrodiphenyl.
VON WILlich, G. P. R. B.Sc. (Ing.) met lof. Landmeeteksamen Navorsingstudent £400	Massachusetts Institute of Technology, V.S.A.	Die elastisiteitsteorie in strukturele ingenieurswese.

(ii) Student bursaries/Student beurse.

Astronomy/Sterrekunde BEGGS, D. W. B.Sc., B.Sc. (Hons).	Cambridge University Observatories, Cambridge, England	Polarization of stellar radiation.
Botany/Plantkunde EDMONSTONE-SAMMONS, Miss C. B.Sc., B.Sc. (Hons.)	Rhodes University	Fungal flora of citrus and pineapple soils.
Chemistry/Chemie ARCHER, A. A. P. G. B.Sc., B.Sc. (Hons.)	University of Cape Town	Investigation of plant products with particular interest in alkaloids from plants.
CAMPBELL, W. E. B.Sc., B.Sc. (Hons.)	Rhodes University	The elucidation of the structure of resorcinol-formaldehyde resins.
CHALSTY, J. S. B.Sc., B.Sc. (Hons.)	University of the Witwatersrand.	Experiments with organic hypochlorites.
COOKE, J. K. B.Sc.	University of Natal	Alkaloids from South African plants. (Previous awards : 1952, 1953.)
DAVIES, W. G. B.Sc., M.Sc.	Oxford University, England	A spectrophotometric investigation of inorganic salts. (Previous award : 1951.)
DE VILLIERS, J. P. B.Sc., M.Sc.	Oxford University, England	Synthetical experiments in the group of the alkaloids of amaryllidaceae. (Previous award : 1953.)
DRY, M. E. B.Sc., B.Sc. (Hons.)	Rhodes University	Determination of the solubility of calomel in water by electrometric methods.

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
EHLERS, A. B.Sc., M.Sc.	Universiteit van Pretoria	'n Vergelykende chemiese en biochemiese ondersoek van die uitskeidingsprodukte van <i>Ceroplastes helicrysis</i> Var. Sinoide en 'n ongeïdentifiseerde ceroplastes wat op die doringboom voorkom. (Vorige toekenning : 1953.)
EVE, D. J. B.Sc., B.Sc. (Hons.)	Rhodes University	A statistical comparison of methods of determination of one or more trace elements in plants and soils.
GRAY, A. B.Sc.	Universiteit van Stellenbosch	Die invloed van verskillende ione op die oplosbaarheid en presipitasiesnelheid van ammoniumfosfomolibdaat.
GOVINDEN, H. S. B.Sc., B.Sc. (Hons.)	Rhodes University	Construction of a wide-frequency-range, double super-heterodyne conductance bridge and its use in the investigation of polarisation errors in conductance measurements.
HOEVE, C. A. J. Kandidaatsgraad Doktorandusgraad	Universiteit van Amsterdam, Nederland	Some aspects of the physical chemistry of thermally polymerized oil.
LOIZ, C. R. B.Sc. (Applied and Industrial Chemistry)	University of Cape Town	A comparative study of the influence of the nitrides of the transition elements on the activation energy for the ammonia synthesis.
MARKS, G. S. B.Sc., M.Sc.	Oxford University, England	The chemistry of the lipids of tubercle bacilli.
MORKEL, A. T. B.Sc.	Universiteit van Stellenbosch	Kinetiek van die reaksie tussen Cu^{++} en = tydens die „induksieperiode“ wat die heterogene reaksie inlei.
MORRIS, J. B.Sc.	Universiteit van Pretoria	Bepaling van die disosiasiegraad van elektroliete in organiese oplosmiddels (waaronder aseton, etileen-glikoldiasetaat) d.m.v. geleidingsvermoë opmetings.
O'SULLIVAN, D. J. M. B.Sc., B.Sc. (Hons.)	Rhodes University	An investigation into the possible use of an ion exchange resin for the resolution of optically active compounds.
ROSSEINSKY, D. R. B.Sc., B.Sc. (Hons.)	Rhodes University	The synthesis of wetting agents from sucrose and the evaluation of their surface activity.
SOUTTER, R. D. B.Sc., B.Sc. (Hons.)	University of the Witwatersrand	A new synthesis of polysubstituted imidazoles.
THOMPSON, M. E. B.Sc., B.Sc. (Hons.)	University of Natal	The alkaloids of the Amaryllidaceae. The structure of Brunsvigine or haemanthine.
VAN DER WALT, R. B.Sc. (met lof)	Potchefstroomse Universiteit vir C.H.O.	Konstruksie van koïnsidensie en antikoïnsidensie elektriese stroombane en gebruik daarvan by metinge op bui-vorming en absorpsie van kosmiese strale.
WAITE, M. B.Sc., B.Sc. (Hons.)	University of the Witwatersrand	A chemical investigation of the bitter principle from <i>Cucumis Africanus</i> and <i>Lagenaria leucantha</i> .
WATLING, K. H. B.Sc., B.Sc. (Hons.)	University of Natal	The Triterpenes from Euphorbia resins. (Previous award : 1953.)
WHITCUTT, J. M. B.Sc., B.Sc. (Hons.)	University of the Witwatersrand	The functions of the amidine structure in the synthesis of cyclic compounds containing two nitrogen atoms in the ring.
WILLIAMS, H. V. B.Sc., B.Sc. (Hons.)	University of Cape Town	Investigation of plant products with particular interest in alkaloids from plants.
WRIGHT, (Mrs.) W. G. B.Sc., D.I.C.	University of Natal	The chemistry of the casia species. (Previous awards : 1951, 1953.)

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DANCOISNE, P. L. Certificate d'études supérieures de Physique Générale	University of the Witwatersrand	The rate of creep in a single crystal after sudden change in load.
DE VALENCE, E. L. P. B.Sc., M.Sc. (distinction)	Physics Department, Royal Cancer Hospital, London	The study of the optics of light-piping in scintillation counter techniques. (Previous awards : 1952, 1953.)
HAMILTON, T. D. S. B.Sc., B.Sc. (Hons.)	Rhodes University	Photo-fluorescence decay times of organic phosphors.
MCELHINNY, M. W. B.Sc., B.Sc. (Hons.)	Rhodes University	Scintillation and fluorescence characteristics of mixed organic crystals.
MCMURRAY, W. R. B.Sc., B.Sc. (Hons.)	University of Oxford, England	A problem involving the use of the 120 Mev. Syn- chrotron.
PIETERSE, P. H. B.Sc., M.Sc.	Universiteit van Stellenbosch	Die bepaling van die F waardes van Fe I en Mn I.
SCHÜLER, B. O. G. B.Sc., B.Sc. (Hons.)	University of Natal	Studies of the infrared absorptions of various covalent linkages.
VAN HEERDEN, I. J. B.A., B.Sc., M.Sc.	Manchester Universiteit, Engeland	Tyd-variasies van die kosmiese straal intensiteit. (Vorige toekenning : 1950.)
Zoology/Dierkunde ALEXANDER, A. J. M. B.Sc., B.Sc. (Hons.)	University of Natal	Active ion transport in the crustacea.
BROWN, A. C. B.Sc., B.Sc. (Hons.)	Rhodes University	Ecological survey of estuary and river mouth at Klein- mond, 10 miles east of Port Alfred.
CARNEGIE, A. J. M. B.Sc., B.Sc. (Hons.)	Rhodes University	Ecology of citrus trees — with special reference to animals and communities of animals living on a single exotic species of plant.
SHIFF, C. J. B.Sc., B.Sc. (Hons.)	Rhodes University	Some aspects of the animal ecology of <i>Elytropappus</i> <i>rhinocerotis</i> Less (Renosterbos).
VAN DIJK, D. E. B.Sc., B.Sc. (Hons.), T.O.D.	Universiteit van Stellenbosch	Ontwikkeling van die proctodaeum in anura. (Vorige toekenning : 1953.)
WEBB, M. B.Sc., M.Sc.	Universiteit van Stellenbosch	Cranial anatomy of the South African geckoes. (<i>Pal- matogekko rangei</i> and <i>Oedura karroica</i> .)
(iii) Directed Research Bursaries/Beurse vir Navorsing Onder Leiding.		
AHLERS, W. C. B.Sc. Chemie (met lof) M.Sc. Chemie (met lof)	Cambridge Universiteit, Engeland	Elektron uitrustingsreaksies in nie-waterige oplossings met die gebruik van radio-aktiewe yster as spoorelement. (Vorige toekenning : 1952.)
CUNDILL, D. E. B.Sc.	National Chemical Research Laboratory, Pretoria	The treatment of industrial effluents.
DE RIDDER, J. C. B.A., B.A. (Hons.)	National Institute for Personnel Research, Johannesburg	Educational and occupational differences in test per- formance on a battery of adaptability tests designed for Natives. (Previous award : 1953.)
DU PREEZ, (Mej.) M. L. B.Sc., M.Sc. (Fisika), M.Sc. (Wiskunde)	Royal Cancer Hospital en National Physical Laboratory, Londen, Engeland.	X-straal dosismetring.

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HARRINGTON, J. S. B.Sc., B.Sc. (Hons.), P.R. Ent.S.	London School of Hygiene and Tropical Medicine, London, England	A study of free amino acids in the haemolymph of <i>Rhodnius prolixus</i> by the method of paper chromatography; further studies of other bio-chemical aspects such as vitamin requirements, the role of the symbiotic micro-organisms in the gut of <i>Rhodnius</i> ; studies of amino acid metabolism by artificial feeding. (Previous awards: 1952, 1953.)
LANGER, G. B.Sc. (Eng.), M.Sc. (Eng.), A.M.I.Mech.E., A.F.R.Ae.S.	Cambridge University, England	Heat and mass transfer between gas streams with and without internal heat generation. (Previous award: 1953.)
KAPLAN, Dr. M. F. B.A., B.Sc. (Eng.), Ph.D. (Eng.), A.M.I. Struct. E., A.M.(S.A.)I.C.E., M. Am. C.I., A.M.(S.A.)P.C.A.	Road Research Laboratory, Harmondsworth, England	Investigation into methods of producing and controlling the quality of the high strength concrete required for prestressed concrete construction. (Previous awards: 1951, 1953.)
VAN ROOYEN, G. T. B.Sc. (Meganiese Ingenieurswese), M.Com. (Bestuur en Administrasie).	Navorsingseenheid vir Werktuigkundige Ingenieurswese, Pretoria	'n Ondersoek na die fundamentele faktore wat die plastiese vloei van staal by warmwalsing beïnvloed met spesiale verwysing na die vorm van die walse en kragte wat optree.

ASSISTANTSHIPS — ASSISTENTSKAPPE (£450 - £650)

(a) Grants for the employment of skilled research assistants/Toekennings vir die indiensneming van geskoolde navorsings-assistente

BADENHUIZEN, Prof. N. P. D.Sc. (cum laude) Professor of Botany	University of the Witwatersrand.	Biochemistry of starch metabolism.
BOTHA, Prof. P. J. M.Sc., Ph.D. Professor in Plantfisiologiese Navorsing en Hoof van die Plantfisiologiese- navorsingsinstituut	Potchefstroomse Universiteit vir C.H.O.	'n Fisiologiese studie van 'n aantal inheemse parasitiese blomplante. (Vorige toekennings, 1946, 1947, 1949, 1950, 1951, 1952, 1953.)
CONNELL, Prof. P. H. B.Arch., M.I.(S.A.)A., A.R.I.B.A. Professor of Architecture	University of Natal	Investigation into the use of building materials in South Africa. (Previous awards: 1951, 1952, 1953.)
DAY, Prof. J. H. B.Sc., Ph.D., F.R.S (S.A.) Professor of Zoology	University of Cape Town (2 Assistantships)	(1) The ecology of South African estuaries and shallow seas. (2) Stream surveys. (Previous awards: 1947, 1948, 1950, 1951, 1953.)
DUYVENE DE WIT, Prof. J.J. Dr. Phil. Nat. (cum laude) Professor in Dierkunde	Universiteit van die Oranje-Vrystaat	(i) Invloed van seisoensomkering op paartyd van <i>Rhodeus amarus</i> en later van ander vissoorte. (ii) Bereiding van hormone met korisoenagtige werking uit bynierkorsekstrakte.
ELOFF, Dr. G. M.A., D.Sc. Senior Lektor	Universiteit van die Oranje-Vrystaat	Leefwyse van knaagdiere en insektivoomolle met besondere aandag aan inheemse soorte. (Vorige toekennings: 1949, 1950, 1951, 1952.)

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
GANE, Dr. P. G. B.Sc., M.Sc., Ph.D., A.Inst. P. Deputy Director of the Bernard Price Institute for for Geophysical Research	University of the Witwatersrand	(i) Sub-crustal exploration by seismic methods, using the Witwatersrand earth-tremors and associated in- vestigations. (ii) The effects of certain known geological features, such as the Bushveld complex upon travel times by a procedure described as "fan shooting". (iii) A study of the seismicity of the Rand. (Previous awards : 1949, 1950, 1951, 1952, 1953.)
GOULD, Prof. A. J. Ph.D., D.S., M.I.Mech.E., M.I.C., M.I.N.A. Professor of Mechanical Engineering	University of Natal	(i) An investigation of the air-fatigue and some corrosion-fatigue properties of a range of steels of South African manufacture—also of the fatigue properties of some light-alloys. (ii) A fundamental investigation of the phenomenon of caustic cracking in boilers.
ISAAC, Prof. W. E. B.Sc (First Class Honours) Ph.D. Harry Bolus Professor and Head of Department of Botany	University of Cape Town	Investigations on South African seaweeds in relation to commercial and industrial exploitation. (Previous awards : 1950, 1951, 1952, 1953.)
JAMES, Prof. R. W. B.A., M.A., B.Sc., Natural Sciences Tripos, F.R.S.(S.A.)	University of Cape Town	The structure of crystals.
KRUGSMAN, Dr. B. J. Ph.D. (First Class Honours) Senior Lecturer	University of Cape Town	(i) Physiology of the heart of invertebrate animals. (ii) Electrophysiology of the nerve-muscle-sense-system of marine animals in relation to distribution (salinity). (iii) Digestive enzymes and structure haemoglobin of coelacanths. (Previous award : 1953.)
LUTJEHARMS, Prof. W. J. Nat. Phil. D. Professor in Plantkunde en Hoof van die Departement Plantkunde en die Instituut vir Bodembioëlogie	Universiteit van die Oranje-Vrystaat	'n Bakteriologiese studie van stikstofbindende organis- mes, (in die besonder peulplantknoletjies-bakteriëe) met die oog op stamspesifisiteit, doeltreffendheid en stikstofbindende vermoë onder Suid-Afrikaanse toe- stande. (Vorige toekenning : 1953.)
OCKLESTON, Prof. P. J. B.E., Ph.D., D.Sc. (Eng.) Professor of Structural Engineering	University of the Witwatersrand (2 Assistantships)	Demolition tests on old University dental hospital building : investigations of stress and distribution— the reduction of the results of the tests on the building, laboratory tests on the samples of materials, and analytical studies. (Previous awards : 1952, 1953.)
SCHONLAND, Dr. B. F. J. M.A., Ph.D., M.I.E.E.(S.A.), F.R.S., C.B.E. Director of the Bernard Price Institute for Geophysical Research	University of the Witwatersrand	Determination of the age of rocks by the rubidium and potassium radioactive decay methods.
STEYN, W. J. A. M.Sc. Lecturer in Soil Science	Rhodes University	The mineral status of plants and soils.
STRASZACKER, Prof. R. L. B.Sc. (Ing.) cum laude, M.Sc. (Ing.), Dipl. Ing. cum laude, Dr. Ing. cum laude Professor in Werktuig- kundige Ingenieurswese	Universiteit van Stellenbosch	Die uitwerking van oplading op die perdekrag van 'n petrolmotor wat deur generatorgas aangedryf word, asook die toets van die generator.

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
TWYMAN, Prof. E. S. B.Sc., B.Sc. (Hons.) Dip. in Ed., M.Sc., Ph.D. Professor of Botany	Rhodes University	(i) The minor element requirements of some South African grasses. (ii) The effect of varying rate of Fe supply on development of tomato plants. (iii) Trace element survey of Eastern Province. (iv) Grassland experiments at Bathurst.
WARREN, Prof. F. L. B.Sc., Ph.D., D.Sc. Professor of Chemistry and Chemical Technology	University of Natal	The chemistry of national products derived from South African plants. (Previous awards : 1950, 1951, 1952, 1953.)
ZEEMAN, Dr. P. B. B.Sc., M.Sc., D.Sc.	Universiteit van Stellenbosch	Die distribusie van spoorelemente in sterk gefraksioneerde silikaatryke en ertsdraende fases van Karo-doleriet, asook in verwante ongedifferensieerde gesteentes en lawas.

(b) Grants for the employment of unskilled research assistants/Toekennings vir die indiensneming van ongeskoolde navorsingsassistentente (£350 - £450)

BAYER, Prof. A. W. D.S., Professor of Botany	University of Natal	Preparation of "A Guide to the Trees and Shrubs of Eastern South Africa".
LEISEGANG, Dr. E. C. B.Sc., M.Sc. (distinction) Ph.D. Lecturer in Chemistry	University of Natal	Infra-red spectroscopy.
LUTJEHARMS, Prof. W. J. Nat. Phil. D., F.R.S.(S.A.) Professor in Plantkunde en Hoof van die Departement Plantkunde en die Instituut vir Bodembilogie	Universiteit van die Oranje-Vrystaat	'n Bakteriologiese studie van stikstofbindende organismes, (in die besonder peulplantknolletjies-bakterieë) met die oog op stamspesifisiteit. (Vorige toekenning : 1953.)

MEDICAL, DENTAL AND NUTRITIONAL RESEARCH—MEDIËSE, TANDHEELKUNDIGE EN VOEDINGS-
NAVORSING

BURSARIES — BEURSE

Senior Bursaries — Senior Beurse (£200 - £1,000)

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
ESTERHUIZEN, Dr. E. J. M.B., Ch.B. £100	Royal Infirmary, Bristol, Engeland	Moderne radiologiese ondersoek by kongenitale hart-siektes asook verworwe opereerbare hartsiektes.
MUSPRATT, J. B.A. (Hons.) Natural Sciences Tripos. £500	South African Institute for Medical Research	The <i>Aedes</i> and allied mosquitoes in South Africa in relation to yellow fever prevention. (Previous awards : 1950, 1951, 1952, 1953.)
SENIOR, Dr. B.	University of Cape Town	(i) The metabolism of phosphorus with special regard to the tubular transport of phosphorus. The effect of growth hormone and of cortisone on phosphorus metabolism. The effect of tubular blocking agents on P. excretion. Patients to be studied: rickets, acromegaly, renal rickets, osteomalacia, osteoporosis. (ii) The effect of tubular blocking agents on the excretion of amino-acids in gout.
SOUGIN-MIBASHAN, Dr. R. B.Sc. (Dist.), M.B., Ch.B. (1st Class Hons.) £800	University of Cape Town	Clinical and metabolic investigation of Benamid and Cortisone in gout, with additional work on the related problem of glutathione in various conditions in Bantu and Europeans. (Previous award : 1953.)

ASSISTANTSHIPS — ASSISTENTSKAPPE (£450 - £650)

(a) Grants for the employment of skilled research assistants/Toekennings vir die indiensneming van geskoolde navorsingsassistentente

ERASMUS, Prof. J. F. P. M.B., Ch.B., Ch.M., M.D. Professor of Surgery	University of Cape Town	The metabolic effects of surgical operations. (Previous awards : 1952, 1953.)
FORMAN, Prof. F. B.A., M.B., Ch.B., M.D., M.R.C.P., F.R.C.P. Professor of Medicine	University of Cape Town	An investigation into various clinical and metabolic aspects of gout. (Previous award : 1953.)
HEYNS, Prof. O. S. M.A., B.Sc., D.S., M.R.C.S., L.R.C.P., F.R.C.O.S. Professor of Obstetrics and Gynaecology	University of the Witwatersrand	(i) A study of the electrical potentials observed in the human uterus during pregnancy and labour. (ii) Contractile, mechanical and other physical properties of uterine (and other smooth) muscle. (Previous awards : 1947, 1950, 1951, 1952.)
KARK, Dr. A. E. (ex Dr. P. Theron) B.Sc., M.B., B.Ch., F.R.C.S.	University of the Witwatersrand	(i) Cirrhosis of liver and portal hypertension. (ii) Surgical shock. (iii) Small intestine obstruction. (Previous awards : 1951, 1952, 1953.)

<i>Name and Qualifications Naam en kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van navorsing</i>
MULLER, Prof. (Mev.) T. M.B., Ch.B. MEYER, Prof. B. J. B.Sc., M.Sc., D.Sc., M.B., Ch.B. KOK, Dr. O. V. S. M.B., Ch.B., D.A.(Eng.) D.A. (Ireland), D.T.M.	Universiteit van Pretoria	(i) Invloed van ACTH kortisoosn estrogene, stilboestrol, testosteroon en Vitamien C op bindweefsel. (ii) Verband tussen genoemde stowwe en wondgenesing. (iii) Verband tussen verskillende hormone en vitamien en spermatogenese. (iv) Verband tussen bynier en tiemus soos op proefdier waargeneem.
OOSTHUIZEN, Prof. S. F. M.D., D.Sc., F.R.C.P., F.F.R. SNYMAN, Prof. H. W. M.B., Ch.B., M.D. BRINK, Dr. A. J. M.D., M.R.C.P.	Universiteit van Pretoria	Kliniese navorsing oor hartaandoenings met elektrokard hemodinamiese en meganiese metodes met spesiale verwysing na pulmonale hipertensie en aritmieë.
PIJPER, Prof. A. M.D., D.Sc. (Hon.C.), D.Sc. (Hon.C.) Emeritus Professor in Patologie	Universiteit van Pretoria	Beweging van bakteries en hulle struktuur en bewegingsorgane. (Vorige toekennings : elke jaar 1947-1953.)
SNYMAN, Prof. H. W. M.B., B.Ch., M.D. Professor en Hoof van Departement Interne Geneeskunde	Universiteit van Pretoria	Miokard aandoenings by die Bantoe. (Vorige toekenning 1951.)

(b) Grants for the employment of unskilled research assistants/Toekennings vir die indiensneming van ongeskoolde navorsingsassistente — (£350 - £450)

BARNARD, Dr. P. J. J. M.B., Ch.B., M.R.C.P. Senior Lektor	Universiteit van Pretoria	Trombogenese Arteriosklerose as oorsaak van primêre pulmonale hipertensie. (Vorige toekenning : 1953.)
GOETZ, Prof. R. H. M.B., Ch.B., M.D. (Frankfurt), M.D. (Berne) Research Professor in Surgery	University of Cape Town	Anatomy and haemodynamics of the circulation through the head in the giraffe with special reference to changes in posture. Anatomy and physiology of the autonomic nervous system in general and the carotid sinus in particular in this animal.
HEEREMA, Dr. (Miss) J. C. Oogarts (Utrecht) Ophthalmic Surgeon	University of Cape Town	Healing of corneal injuries, and its influence on operative procedures. (Previous awards : 1950, 1952, 1953.)

Publications

Publikasies

A.—C.S.I.R. PUBLICATIONS/W.N.N.R. PUBLIKASIES

Library and Information Division

C.S.I.R. Information (monthly library accessions list)
Register of Current Research at South African Universities, 1954.
Books and pamphlets on lighting, Library Class list No. 6.
Books and pamphlets on food technology, Library Class list No. 7.

Biblioteek- en Inligtingsafdeling

W.N.N.R. Inligting (maandelikse biblioteekbyvoegingslys).
Register van Huidige Wetenskaplike Navorsing aan S.A. Universiteite 1954.

National Institute for Personnel Research

Journal of the N.I.P.R. thrice yearly/driemaal per jaar.

Nasionale Instituut vir Personeelnavorsing

National Building Research Institute

Information Sheet (Series DIS)—bi-monthly selections of technical enquiries with replies
Bulletin (Series DB)—twice yearly—articles in relation to the work of the Institute.
Final report of the socioeconomic survey at Payneville Location, Springs, undertaken to collect the necessary data for the design of the new Native township of Kwa Thema, Pretoria, Council for Scientific and Industrial Research, 1953.
Housing Brochure, Pretoria, Council for Scientific and Industrial Research, 1954.

Nasionale Bounavorsingsinstituut

Information Sheet (Reeks DIS)—twee-maandelikse seleksie van tegniese vrae met antwoorde.
Bulletin (Reeks DB)—tweemaal per jaar—artikels i.v.m. die werk van die Instituut.

Telecommunications Research Laboratory

Monthly basic radio-propagation predictions for Southern Africa.
Monthly bulletin of ionospheric characteristics observed at Johannesburg and Cape Town.

Telekommunikasie-Navorsingslaboratorium

Maandelikse voorspellings van basiese radiovoortplanting in Suidelike Afrika.
Maandelikse bulletin van ionosferiese karakteristieke soos waargeneem in Johannesburg en Kaapstad.

Liaison Division

Science Services for Industry—pamphlet.
Annual Report.
Research Review—quarterly.
Science News Selections—weekly for the Technical and Daily Press.

Skakelafdeling

Wetenskaplike Dienste vir die Nywerheid—pamflet.
Jaarverslag.
Navorsingsoorsig—viermaal per jaar.
Keur van Wetenskaplike Nuis—weekliks vir die Tegniese en Daaglikse Pers.

B.—PUBLICATIONS IN PERIODICALS BY MEMBERS OF THE C.I.S.R. STAFF

B.—PUBLIKASIES IN TYDSKRIFTE DEUR LEDE VAN DIE W.N.N.R. PERSONEEL

National Building Research Institute/Nasionale Bounavorsingsinstituut.

- CALDERWOOD, D. M. An approach to low-cost urban Native housing in South Africa. *The Town Planning Review*, vol. 24, no. 4, Jan. 1954, pp. 312-328.
 COLLINS, L. E. Some foundation experiences in the Durban area. *Trans. S. Afr. Inst. Civ. Engrs.*, vol. 4, no. 8, Aug. 1954, pp. 219-237.
 COLLINS, L. E. A preliminary theory for the design of under-reamed piles. *Trans. S. Afr., Inst. Civ. Engrs.*, vol. 3, no. 11, Nov. 1953, pp. 305-313.
 FRANK, D. and N. Stutterheim. Paints and plastics in relation to corrosion problems in sewerage, water treatment and disposal plants. *S. Afr. ind. Chem.*, vol. 8, no. 4, April, 1954, pp. 64-68.
 GLEN, A. L. Time studies of labour employed on the building of urban Bantu houses using European artisans. *N.B.R.I. Bulletin*, Series DB 11, Dec., 1953, pp. 24-48.

- GLEN, A. L. Time studies of labour employed on the building of urban Bantu houses using Native buildings workers on an operative basis. *N.B.R.I. Bulletin*, Series DB 2, June, 1954, pp. 84-109.
- GLEN, A. L. Time studies of labour employed on the building of urban Bantu houses using Native building workers on a craft basis. *N.B.R.I. Bulletin*, Series DB 11, Dec., 1953, pp. 49-70.
- GLEN, A. L. Time studies on the laying of orthodox blocks in walling of urban Bantu housing. *N.B.R.I. Bulletin*, Series DB 11, Dec., 1953, pp. 71-87.
- JENNINGS, J. E. B. Housing for the urban Bantu — a problem in whole engineering. *Trans. S. Afr. Inst. Civ. Engrs.*, vol. 4, no. 6, June, 1954, pp. 165-190.
- LAURIE, J. A. P. and Chas. A. Rigby. Some further investigations into the structural requirements of single storey urban Bantu houses. *N.B.R.I. Bulletin*, Series DB 12, June, 1954.
- RICHARDS, S. J. Considerations of thermal conditions in low-cost houses in South Africa in relation to climate and the health and well-being of the occupants. *N.B.R.I. Bulletin*, Series DB 12, June, 1954, pp. 17-54.
- SAMSON, D. The economics of different methods of foundation construction of urban Bantu houses in relation to the slopes of the ground. *N.B.R.I. Bulletin*, Series DB 12, June, 1954, pp. 110-135.
- STUTTERHEIM, N. Études sur le système quaternaire $\text{CaO-AI}^2\text{O}^3 - \text{SiO}^2 - \text{MgO}$ portant en particulier sur la possibilité de fabriquer du ciment de haut fourneau à haute teneur en magnésie. *Revue des Matériaux*, n. 455-456, Août/Septembre, 1953.
- STUTTERHEIM, N. Some solutions to the problem of sewer corrosion. *Municipal Affairs*, vol. 19, nos. 222 and 223, Feb./Mar. 1954, p. 15 and 27.
- STUTTERHEIM, N. The deterioration of concrete and reinforced concrete due to chemical and natural agencies. *N.B.R.I. Bulletin*, Series DB 12, June, 1954, pp. 5-16.
- STUTTERHEIM, N. The nature and properties of blast furnace slag cements. *N.B.R.I. Bulletin*, Series DB 11, Dec., 1953, pp. 5-12.
- STUTTERHEIM, N., J. P. A. Lochner and J. F. Burger. A method for determining the dynamic Young's modulus of concrete specimens developed for corrosion studies. *Mag. Concrete Res.*, vol. 6, no. 16, June, 1954, pp. 39-46.
- VAN STRAATEN, J. F. Permanent ventilation in urban Bantu houses of the type N.E. 51/9 *N.B.R.I. Bulletin*, Series DB 11, Dec., 1953, pp. 15-27.

National Chemical Research Laboratory/Nasionale Chemiese Navorsingslaboratorium

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- BLUMBERG, R. and J. S. Maritz. Mixing of solid particles. *Chem. eng. Sci.*, vol. 2, 1953, pp. 240-246.
- BURLEY, R. W. and J. B. Speakman. The plasticity of wool fibre, II: Variation with type of follicle. *Textile Research Journal*, vol. 23, no. 10, Oct., 1953, pp. 702-710.
- CARMAN, P. C. The surface area measurement of paint pigments. *J. Oil Colour Chem. Ass.*, vol. 37, no. 406, April, 1954, pp. 165-175.
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- SCHMIDT, E. R. and H. Heystek. A saponite from Krugersdorp District, *Transvaal Min. Mag.*, vol. 30, no. 222, Sept., 1953, pp. 201-210.
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- WIECHERS, S. G. Hoe bedrijft de overheid in Nederland toegepast natuurwetenschappelijk onderzoek. *S.A. ind. Chem.*, vol. 8, no. 6, June, 1954, pp. 112-116.

National Physical Laboratory/Nasionale Fisiese Laboratorium

- BASSON, J. K. and J. Steyn. Absolute alpha standardization with liquid scintillators. *Proc. Phys. Soc. A.*, vol. 67, 1954, p. 297.
- BURGERJON, J. J. New deuterium supply for cyclotron ion sources. *Rev. sci. Instrum.*, vol. 25, no. 5, May, 1954, pp. 522-523.
- CARTE, A. E. Heat flow in the Transvaal and Orange Free State. *Proc. Phys. Soc. B.*, vol. 67, 1954, pp. 664-672.
- CARTE, A. E. Liquid-in-glass thermometers and their use for precision temperature measurement. *S. Afr. ind. Chem.*, vol. 8, no. 3, March, 1954, pp. 50-52.
- CARTE, A. E. Optical pyrometers: standardisation of instruments and precautions in their use. *Engr. & Foundryman*, vol. 19, no. 3, July, 1954, pp. 76-77.
- EVANS, D. S., J. C. Heydenrych and J. D. N. van Wyk. Observations of the occultations of Antares. *Mon. Not. Astron. Soc.*, vol. 133, no. 6, 1953, pp. 781-885.
- FILTER, J. H. J. Microsecond timer checks concrete beams. *Electronics*, vol. 26, no. 10, Oct., 1953, pp. 152-154.
- HEYDENRYCH, J. C. R. Automatic control in industry. The theory and application of servomechanism. *J. Engrs. Ass. S. Afr.*, vol. 11, no. 3, June, 1954, pp. 72-81.
- LOUBSER, J. H. N. Preliminary work on the microwave spectrum of Acetic Acid. *J. Chem. Phys.*, vol. 21, no. 12, Dec., 1953, pp. 2231-2232.
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National Institute for Personnel Research/Nasionale Instituut vir Personeelnavorsing

- ARBOUS, A. G. and H. S. Sichel. New techniques for the analysis of absenteeism data. *Biometrika*, vol. 41, parts I and II, June, 1954.
- MUNDY-CASTLE, A. C. Electrical responses of the brain in relation to behaviour. *Brit. J. of Psycho.*, vol. 44, part 4, no. v, 1953.
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- MUNDY-CASTLE, A. C., L. A. Hurst, D. M. Beerstrecher and T. Prinsloo. The E.E.G. in senile psychosis. *J. EEG. Clin. Neurophysiol.*, vol. 6, no. 2, May, 1954, pp. 245-252.

Telecommunications Research Laboratory/Telekommunikasie-navorsingslaboratorium

- VICE, R. W. A survey of ground wave propagation conditions in South Africa. *Trans. S. Afr. Inst. Elect. Engrs.*, vol. 45, part 4, April, 1954, pp. 139-159.
- WADLEY, T. L. Variable-frequency crystal-controlled receivers and generators. *Trans. S. Afr. Inst. Elect. Engrs.*, vol. 45, no. 2, Feb., 1954, pp. 77-79.

Mechanical Engineering Research Unit/Navorsingseenheid vir Werktuigkundige Ingenieurswese

- ROUX, A. J. A. and H. G. Denkhuis. An investigation into the problem of rock bursts: an operational research project. *J. Chem. Met. Min. Soc. S. Afr.*, vol. 55, no. 5, 1954, pp. 103-125.

C.—PUBLICATIONS RECEIVED FROM MEMBERS OF MEDICAL RESEARCH UNITS

C.—PUBLIKASIES WAT VAN MEDIESE NAVORSINGSEENHEDE ONTVANG IS

Amoebiasis Research Unit,

King Edward VIII Hospital, Durban

Amebiasenavorsingseenheid

King Edward VIII-hospitaal, Durban.

- ARMSTRONG, T. G. Recent experiences in the treatment of amoebiasis. *S. Afr. med. J.*, vol. 27, 10 Jan., 1953, pp. 42-44.
 ELSDON-DEW, R. Housing and parasites. A comparison of slums with sub-economic housing. *S. Afr. med. J.*, vol. 27, 3 Oct., 1953, pp. 879-880.
 ELSDON-DEW, R., G. G. Roach and L. Freedman. *Isospora belli* (Wenyan) from duodenal intubation. *Lancet*, 14 Feb., 1953, p. 348.
 ELSDON-DEW, R., A. J. Wilmot and T. G. Armstrong. Fumagillin in amoebiasis. *Lancet*, Dec. 5, 1953, p. 1180.

Bilharzia Natural History Research Unit

South African Institute for Medical Research, Hospital Hill, Johannesburg.

Bilharzia-natuurgeskiedenisseenheid

Suid-Afrikaanse Mediese Navorsingsinstituut, Hospital Hill, Johannesburg.

- BERSOHN, I. and H. I. LURIE. Experimental bilharziasis in animals. II. Correlation of biochemistry ("liver function tests") and histopathological changes in the liver in early bilharziasis. *S. Afr. Med. J.*, vol. 27, 24 Oct., 1953, pp. 950-954.
 DE MEILLON, B., N. Stoffberg and H. I. Lurie. Urinary bilharziasis on the Witwatersrand. *S. Afr. med. J.*, vol. 27, March, 1953, pp. 257-258.
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Cardio-Pulmonary Research Unit

Medical School, University of the Witwatersrand, Johannesburg.

Kardio-pulmonale Navorsingseenheid

Mediese Skool, Universiteit van die Witwatersrand, Johannesburg.

- ELLIOTT, G. A. Razzo e malattie nel l'Unione Sud-Africana. *Minerva Medica*, Anno XLIV, vol. 1, n. 16, 24 Febraio, 1953.
 MCGREGOR, M., M. Zion and T. H. Bothwell. Oral hydergine in die treatment of hypertension. *S. Afr. med. J.*, vol. 28, April, 1954, pp. 292-294.
 VAN LINGEN, B. et al. The ballistocardiogram in aortic stenosis and aortic stenosis with incompetence. *S. Afr. J. med. Sci.*, vol. 18, 1953, p. 156.
 VAN LINGEN, B. and S. R. Bauersfeld. The electrocardiogram in Ebstein's anomaly of the tricuspid valve. *S. Afr. J. med. Sci.*, vol. 18, 1953, pp. 88-89.
 ZION, M. M., et al. Some effects of a hypotensive agent (l-Hydrayinophthaliyine : C 5968 : Apresoline) on the haemodynamics of hypertensive subjects. *S. Afr. J. clin. Sci.*, vol. 4, no. 4, Dec., 1953, pp. 275-288.

Dental Research Unit

University of the Witwatersrand, Johannesburg.

Tandheelkundige Navorsingseenheid

Universiteit van die Witwatersrand, Johannesburg.

- IRVING, J. T. The effect of the reimposition of rickets ater healing upon dentin calcification. *J. Dent. Res. (St. Louis)*, vol. 32, no. 2, April, 1953, pp. 189-192.

Family Health Research Unit

Institute for Family and Community Health, Private Bag, Merebak, Natal.

Gesinsgesondheidsnavorsingseenheid

Instituut vir Gesins en Gemeenskapgesondheid, Privaatsak, Merebank, Natal.

- KARK, Emily. The growth and nutritional state of Bantu girls in Durban. *S. Afr. J. med. Sci.*, vol. 18, 1953, pp. 109-124.
 SALBER, E. and E. Bradshaw. The effect of birth weight and time of first feed on the weight of Bantu babies in the first 10 days of life. *Human Biol.*, vol. 26, no. 2, May, 1954, pp. 156-171.

Human Biochemistry Research Unit
Medical School, University of the Witwatersrand,
Johannesburg.

Navorsingseenheid vir Menslike Biochemie
Mediese Skool, Universiteit van die Witwatersrand,
Johannesburg.

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