

SUID-AFRIKAANSE
WETENSKAPLIKE EN NYWERHEID-
NAVORSINGSRAAD

SOUTH AFRICAN
COUNCIL FOR SCIENTIFIC
AND INDUSTRIAL RESEARCH

ELFDE
JAARVERSLAG

ELEVENTH
ANNUAL REPORT

1955 — 1956

P R E T O R I A

UNIE VAN SUID-AFRIKA

UNION OF SOUTH AFRICA

Posbus 395,

Pretoria.

17 Augustus 1956.

Meneer,

Ek het die eer om aan u voor te lê die Elfde Jaarverslag van die Wetenskaplike en Nywerheidsnavorsingsraad. Met die oog op die feit dat die doelstellings en verpligtings van die Raad 'n aanmerklike verandering ondergaan het as gevolg van die verordening van die Wet op Standaarde (Oordrag van Uitvoering) van 1956 gedurende die afgelope sitting van die Parlement, is hierdie verslag net beperk tot die tydperk 5 Oktober 1955 tot 16 Augustus 1956, waartydens die Raad gehandel het ooreenkomstig die bepalings van die Wet op die Wetenskaplike Navorsingsraad van 1945 soos gewysig

'n Balansstaat en 'n staat van inkomste en uitgawe vir die boekjaar geëindig 31 Maart 1956, gesertifiseer deur die Kontroleur en Ouditeur-generaal, word ook voorgelê.

Dienswillig die uwe,

S. M. NAUDE

President: Wetenskaplike en Nywerheidsnavorsingsraad

*Sy Edele Dr. A. J. R. van Rhijn,
Minister van Ekonomiese Sake,
Paulhof,
Minnaarstraat,
PRETORIA.*

P.O. Box 395,
Pretoria.

17th August, 1956.

Sir,

I have pleasure in presenting to you the Eleventh Annual Report of the Council for Scientific and Industrial Research. In view of the fact that the objects and responsibilities of the Council have undergone a substantial change as a result of the enactment of the Standards (Transfer of Administration) Act of 1956 during the last session of Parliament, this report is confined to the period 5th October, 1955, to 16th August, 1956, during which the Council was governed by the provisions of Scientific Research Council Act of 1945 as amended.

A balance sheet and statement of income and expenditure for the financial year ended 31st March, 1956, 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. Dr. A. J. R. van Rhijn,
Minister of Economic Affairs,
Paul Hof,
Minnaar Street,
PRETORIA.*

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Samestelling en Vergaderings van die Raad

Lede van die Raad op 5 Oktober 1955 was:

Dr. S. M. Naudé	..	<i>President</i>
Dr. T. B. Davie	..	<i>Prinsipaal, Universiteit van Kaapstad.</i>
Dr. F. J. de Villiers	..	<i>Nywerheidsraadgewer vir die Departement van Handel en Nywerheid, en Voorsitter van die S.A. Raad vir Standaarde.</i>
Dr. P. J. du Toit, F.R.S.		<i>Voorsitter van die Raad vir Wetenskaplike Navorsing in Afrika Suid van die Sahara, en gewese President van die W.N.N.R.</i>
Mnr. F. G. Hill	..	<i>Raadgewende Ingenieur, Rand Mines Ltd.</i>
Dr. H. O. Mönnig	..	<i>Besturende Direkteur, Agricura Laboratoria Bpk., en voorsitter van die Raad van die Universiteit van Pretoria.</i>
Mnr. P. E. Rousseau	..	<i>Besturende Direkteur, S.A. Steenkool-, Olie- en Gas-korporasie Bpk.</i>
Dr. E. T. Stegmann	..	<i>Professor in Wiskunde, Universiteit van Stellenbosch.</i>
Dr. E. Taberner	..	<i>Direkteur, African Explosives and Chemical Industries, Ltd.</i>
Dr. H. J. van Eck	..	<i>Besturende Direkteur, Nywerheidsontwikkelingskorporasie.</i>
Dr. R. W. Wilcocks	..	<i>Voormalige Rektor, Universiteit van Stellenbosch.</i>
Mnr. J. E. Worsdale	..	<i>Besturende Direkteur, White's S.A. Portland Cement Co. Ltd.</i>

Dr. T. B. Davie is op 13 Desember 1955 in Engeland oorlede.

Die Raad het gedurende die tydperk van hierdie verslag twee gewone en twee spesiale vergaderings gehou. Een vergadering is in Junie 1956 in Port Elizabeth gehou.

Membership and Meetings of the Council

Membership of the Council on 5th October, 1955, was:

Dr. S. M. Naudé	..	<i>President.</i>
Dr. T. B. Davie	..	<i>Principal, University of Cape Town.</i>
Dr. F. J. de Villiers	..	<i>Industrial Adviser to the Minister of Economic Affairs and Chairman of the S.A. Standards Council.</i>
Dr. P. J. du Toit, F.R.S.		<i>Chairman of the Council for Scientific Research in Africa south of the Sahara and former President of the C.S.I.R.</i>
Mr. F. G. Hill	..	<i>Consulting Engineer, Rand Mines, Ltd.</i>
Dr. H. O. Mönnig	..	<i>Managing Director, Agricura Laboratoria Ltd., Chairman of the Council of the University of Pretoria.</i>
Mr. P. E. Rousseau	..	<i>Managing Director, S.A. Coal, Oil and Gas Corporation Ltd.</i>
Dr. E. T. Stegmann	..	<i>Professor in Mathematics, University of Stellenbosch.</i>
Dr. E. Taberner	..	<i>Director, African Explosives and Chemical Industries Ltd.</i>
Dr. H. J. van Eck	..	<i>Managing Director, Industrial Development Corporation.</i>
Dr. R. W. Wilcocks	..	<i>Former Rector of the University of Stellenbosch.</i>
Mr. J. E. Worsdale	..	<i>Chairman and Managing Director, White's S.A. Portland Cement Co. Ltd.</i>

Dr. T. B. Davie died in England on 13th December, 1955.

During the period under review the Council held two ordinary and two special meetings. One meeting in June, 1956, was held in Port Elizabeth.

Lidmaatskap en Vergaderings van die Uitvoerende Komitee

Die uitvoerende Komitee het drie gewone vergaderings gehou. Die lede van die komitee was op 5 Oktober 1955 en op 16 Augustus 1956 dieselfde as wat hulle op 5 Oktober 1954 was, te wete:

Dr. S. M. Naudé (*Voorsitter*),
Dr. F. J. de Villiers,
Dr. P. J. du Toit, met
Dr. E. Taberner en mnr. J. E. Worsdale as plaas-
vervangende lede.

Sekretaris-Tesourier

Mnr. A. J. Miller-Smit, B.A., M.Com.

Navorsingsadvieskomitees

Die Raad wil sy dank betuig aan die groot aantal wetenskaplikes en nyweraars wat weer, soos in vorige jare, hul tyd opgeoffer het om in die Nasionale Advieskomitees te dien en leiding te gee aan die navorsingswerkzaamhede van sy laboratoriums en institute.

Membership and Meetings of the Executive Committee

The Executive Committee held three ordinary meetings. On 5th October, 1955, and 16th August, 1956, the membership of the Committee was the same as on 5th October, 1954, viz.:

Dr. S. M. Naudé (*Chairman*),
Dr. F. J. de Villiers,
Dr. P. J. du Toit, with
Dr. E. Taberner and Mr. J. E. Whorsdale
as floating alternates.

Secretary Treasurer

Mr. A. J. Miller-Smit, B.A., M.Com.

Research Advisory Committees

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

Algemene Oorsig

Die belangrikste gebeurtenis vir die Raad gedurende die jaar was ongetwyfeld die verordening van die *Wet op Standaarde (Oordrag van Uitvoering)* gedurende die afgelope parlamentsitting. Kragtens hierdie Wet is die Raad van die Suid-Afrikaanse Buro vir Standaarde afgeskaf en sy verantwoordelikhede en funksies oorgedra aan die Wetenskaplike en Nywerheidsnavorsingsraad met 'n verhoogde ledetal.

In hooftrekke bepaal die Wet dat die Wetenskaplike en Nywerheidsnavorsingsraad die Standaarderaad se verantwoordelikhede vir die opstel van nasionale veiligheidsespesifikasies, gebruikskodes en gehaltespesifikasies vir die nywerheid oorneem. Dit sal ook die S.A.B.S.-merkskema administreer om te waarborg dat nywerheidsprodukte sal voldoen aan die betrokke spesifikasies en sal beheer uitoefen oor die gebruik van die nasionale stempels op artikels wat van goud en silwer gemaak is.

Die *Wet op Standaarde (Oordrag van Uitvoering)* sal in werking tree op 17 Augustus 1956, d.w.s. 'n dag later as die tydperk waarvoor hierdie verslag handel.

Navorsingstoekennings

Die Regering het aan die Raad die funksie toegewys vir die toekenning en verdeling van die fondse wat elke jaar deur die Parlement bewillig word vir wetenskaplike navorsing in die nywerheid en in die universiteite; sowat 20 persent van die fondse wat die Parlement jaarliks aan die Raad toewys, word vir hierdie doel gebruik. Gedurende die boekjaar geëindig op 31 Maart 1956, het navorsingsubsidies en -toekennings wat deur die Raad uitbetaal is, £157,000 bedra. Elke universiteit in die land het voordeel getrek uit hierdie toekennings en die navorsingsonderwerpe dek feitlik die hele reeks van wetenskappe. Nagenoeg £75,000 is toegeken vir navorsing in die algemene wetenskappe en die res het gegaan vir mediese navorsing. Hoewel die bedrag groter was as ooit tevore, het die W.N.N.R. aansoeke ontvang vir meer as dubbel die bedrag wat beskikbaar was. Die keurkomitee het dit egter moontlik gevind om al die verdienstelike aansoeke met toekennings te ondersteun.

Altesaam 207 individuele Suid-Afrikaanse wetenskaplikes het geldelike steun van die Raad ontvang vir hul navorsingswerk. In die algemene wetenskappe het die Raad 21 senior en 73 nagraadse beurse toegeken, en geldelike hulp verleen vir bestryding van lopende uitgawes, die aankoop van 'n tipe kapitaaltoerusting wat nie gewoonlik in 'n goed toegeruste universiteitslaboratorium beskikbaar is nie, en die dekking van publikasiekoste van navorsingsbevindinge. Soortgelyke toekennings is gemaak op die gebied van die mediese navorsing, maar

General Review

Undoubtedly the most important event for the Council during the year was the enactment of the *Standards (Transfer of Administration) Act* during the last session of Parliament. In terms of this Act, the Council of the South African Bureau of Standards was abolished and its responsibilities and functions transferred to the Council for Scientific and Industrial Research with an increased membership.

In broad outline the Act provides that the Council for Scientific and Industrial Research shall assume the Standards Council's responsibility for drawing up national safety specifications, codes of practice and industrial quality specifications. It will also administer the S.A.B.S. Mark scheme for guaranteeing that industrial products conform with the relevant specifications and will control the use of the national hallmarks on objects made from gold and silver.

The *Standards (Transfer of Administration) Act* will come into force on 17th August, 1956, the day after the terminal date of the period under review in this report.

Research Subsidies

The Council acts as the principal agent of the Government for the allocation and distribution of the funds voted each year by Parliament for the support of research in Industry and the Universities, some 20 per cent. of the Council's budget being earmarked for this purpose. During the financial year which ended on 31st March, 1956, research subsidies and grants paid out by the Council amounted to £157,000. Every university in the country benefited from these grants and the subjects for investigation covered practically the whole range of the sciences from atomic physics to zoology. Approximately £75,000 was allocated to research in general sciences and the remainder was earmarked for medical research. Although the amount was greater than ever before, the C.S.I.R. received applications for more than double the amount it had available. The Selection Committee did, however, find it possible to award grants to all deserving applicants.

In all, 207 individual South African scientists received financial assistance from the C.S.I.R. to help them carry out their research. In the general sciences the Council awarded 21 senior and 73 post-graduate bursaries, and made grants to cover running expenses, the purchase of capital equipment of a type not normally available in a well-equipped university laboratory and the costs of the publication of research findings. Similar grants were made in the field of medical research, but, in addition, the Council supported the research of teams of workers

deur die verlies van verskeie senior personeelle gedurende die tydperk onder beskouing, met die gevolg dat 'n aantal projekte van nasionale belang uitgestel moes word. Hoewel die Raad se personeelvraagstuk nog nie as kritiek beskou kan word nie, is daar alle aanduidings dat dit so sal word. Dit sal miskien moontlik wees om hierdie toestand te verbeter deur middel van 'n algemene salarisverhoging wat die Raad in 'n betreklik beter posisie sal plaas om sy bestaande personeel te behou, maar dit sal geen oplossing bied vir die basiese probleem van 'n tekort aan jong manne en vroue wat in die wetenskap opgelei is nie.

Die Raad doen sy bes om die wetenskap gewild te maak onder die jeug van die land, maar volgens sy wetlike beperkinge mag die Raad slegs regstreeks gemoed wees met die nagraadse stadiums van onderrig in die wetenskap, terwyl die vroeër stadiums van hoërskool- en voorgraadse onderrig binne die bestek van die onderwysowerhede val. Dit is 'n nasionale vraagstuk en as die Unie van Suid-Afrika nie in 'n minderwaardige posisie geplaas wil word onder die nasies van die wêreld nie, sal die vraagstuk sonder versuim op nasionale skaal aangepak moet word.

Internasionale Betrekkinge in die Wetenskap

Die wetenskap speel al meer en meer 'n belangrike rol in internasionale aangeleenthede en in ooreenstemming met hierdie ontwikkeling, het die Raad die tempo van sy werksaamhede op hierdie gebied versnel.

Op sy vergadering in Januarie het die Raad besluit om 'n nuwe wetenskaplike skakelkantoor in Duitsland op te rig. Dr. J. P. van Zyl, 'n voormalige hoof van die Afdeling Skeikundige Diens in die Departement van Landbou, is gekies as die eerste wetenskaplike skakelbeampte in Duitsland. Onderhandelinge met die Departement van Buitelandse Sake om dr. van Zyl geakkrediteer te kry by die Wes-Duitse Federasie as Wetenskapsattaché vir die Suid-Afrikaanse Ambassadeur in Keulen, is nou in die finale stadium.

Nog 'n ontwikkeling op die gebied van wetenskaplike verteenwoordiging in die buiteland is dat dr. R. G. Shuttleworth, die Raad se Wetenskaplike Skakelbeampte in Washington, nou geakkrediteer is by die Kanadese Regering as Wetenskapsattaché vir die Suid-Afrikaanse Hoë Kommissaris in Ottawa. Hy sal dus beide kantore in die Verenigde State en Kanada behartig.

Gedurende die jaar het die Raad besluit om die sekretariaat te verskaf vir die nasionale komitee (onder voorsitterskap van dr. T. E. Schumann, Direkteur van die Weerburo) wat belas is met die organisasie vir die Unie se deelname aan die Internasionale Geofisiese Jaar. Dit is 'n wêreldwye poging om meer lig te werp op die fisika van die aarde en die atmosfeer. Hierdie onderneming staan onder die beheer van die Internasionale Raad van Wetenskaplike Unies. Deur ontleiding van gelyktydige waarnemings wat by verskillende punte op

during the period under review, with the result that a number of projects of national importance have had to be postponed. While the Council's staff problem cannot yet be regarded as critical, there is every indication that it will become so. It might be possible to ameliorate these conditions by means of a general increase of salaries, which would place the Council in a relatively better position to retain its existing staff, but this would not affect the basic problem of the lack of young men and women trained in scientific method.

The Council is doing what it can to popularize science among the youth of the country but, in terms of its statutory limitations, it may concern itself directly only with the postgraduate stages of education in science, while the earlier stages of high school and undergraduate training fall within the province of the educational authorities. The problem is a national one and, if the Union of South Africa is not to be relegated to an inferior position among the nations of the world, the problem will have to be tackled on a national scale without delay.

International Relations in Science

Year by year science plays a more important part in international affairs and, in keeping with this trend, the Council has stepped up the tempo of its activities in this field.

At its January meeting the Council decided to open a new scientific liaison office in Germany. Dr. J. P. van Zyl, a former Chief of the Division of Chemical Services in the Department of Agriculture, has been selected as the first C.S.I.R. Scientific Liaison Officer in Germany, and negotiations with the Department of External Affairs for him to be accredited to the West German Federation as Scientific Attaché to the South African Ambassador in Cologne are in their final stages.

Another development in the field of scientific representation abroad is that Dr. R. G. Shuttleworth, the Council's Scientific Liaison Officer in Washington, has now been accredited to the Canadian Government as Scientific Attaché to the South African High Commissioner in Ottawa. He will divide his time between the United States and Canada.

During the year, the Council agreed to provide the secretariat for the national committee (under the chairmanship of Dr. T. E. W. Schumann, Director of the Weather Bureau) responsible for organizing the Union's participation in the International Geophysical Year. This is a world-wide endeavour to elucidate the physics of the Earth and its atmosphere and is sponsored by the International Council of Scientific Unions. By analysing

hierbenewens het die Raad ook ondersteuning gegee vir navorsingswerk van spanne navorsers in elf mediese navorsingseenhede by mediese skole en hospitale, en £7,500 bygedra vir die navorsingswerk wat deur die Suid-Afrikaanse Instituut vir Mediese Navorsing in Johannesburg uitgevoer word.

Tekort aan Wetenskaplikes en Ingenieurs

Die Raad beskou geld wat aan navorsing bestee is as 'n goeie belegging, want baie hiervan is aangewend vir die opleiding van jong gegradueerdes in die toepassing van gevorderde navorsingstegnieke. In hierdie verband ag die Raad dit sy plig om klem te lê op die feit dat daar glad te min wetenskaplikes en ingenieurs in Suid-Afrika opgelei word. Vir die wat wel opgelei word is daar so 'n sterk mededinging deur die nywerheid dat dit moeilik word, as gevolg van die hoë aanvang-salarisse wat hulle aangebied word, om die jong gegradueerdes te probeer oorreed om lank genoeg by die universiteite te bly vir deeglike navorsingsopleiding.

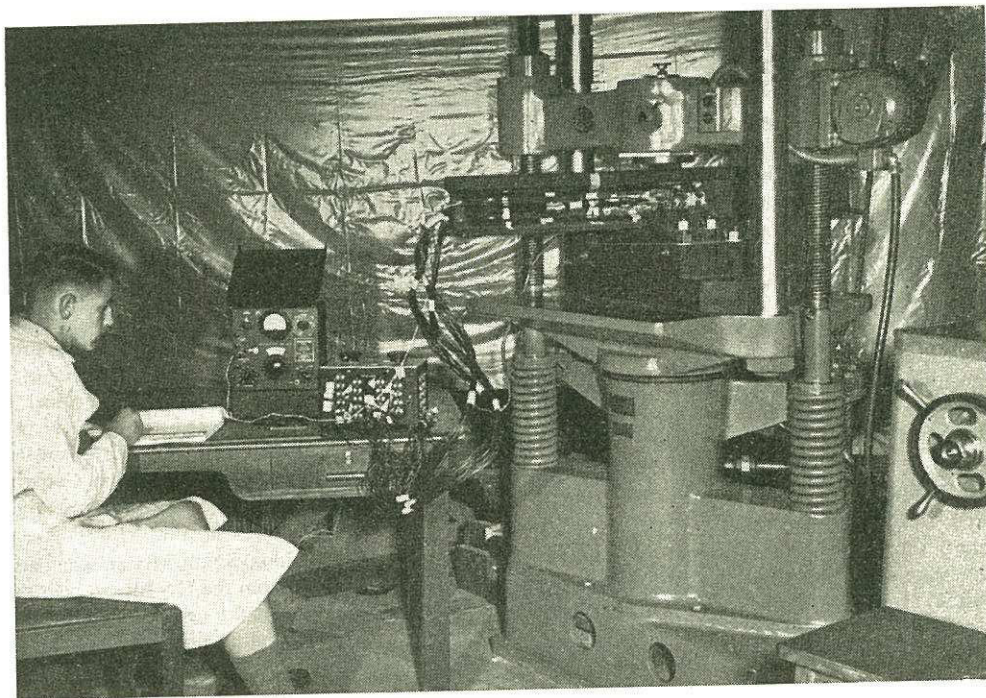
Die Raad self vind dit baie moeilik om sy betrekking gevul te kry omdat hy nie manne en vroue met voldoende bekwaamheid en ondervinding kan trek met die salarisse wat aangebied kan word nie. Die toestand is vererger

in eleven medical research units attached to medical schools and hospitals, and contributed £7,500 towards the research carried out by the South African Institute for Medical Research in Johannesburg.

Shortage of Scientists and Engineers

The Council considers money contributed towards research well spent, for much of it has gone towards the training of young graduates in the use of advanced research techniques. At the same time, the Council would be failing in its duty if it did not stress the fact that far too few scientists and engineers are being trained in South Africa. As a result, there is considerable competition from Industry for those graduates that are produced, and it becomes difficult, in the face of the high starting salaries offered, to tempt young graduates to remain at universities long enough to obtain training in research.

The Council itself is experiencing considerable difficulty in filling its establishment because it cannot attract men and women with adequate ability and experience at the salaries it is able to offer. The position has been aggravated by the loss of several senior members of staff



'n Student-assistent doen ondervinding op met die hantering van een van die groot toetsmasjiene in 'n laboratorium van die W.N.N.R.

A student assistant gains experience on one of the large testing machines in the C.S.I.R. laboratories.

die aarde se oppervlakte gemaak word, hoop wetenskaplikes om meer te wete te kom van die natuurwette wat sulke verskynsels soos die weer, klimaat, aardbewings, seestrome en lugsteurings beheer. Die werk is van ont-saglike praktiese belang. Om maar een voorbeeld te noem: in die toekoms kan dit miskien moontlik wees om, as gevolg van die gegewens wat gedurende die Internasionale Geofisiese Jaar ingesamel word, droogtes maande vooruit te voorspel, sodat boere tydig voorsorg-maatreëls kan tref.

Nog 'n internasionale projek waaraan die Raad deel-neem, is dié van die Internasionale Waterontsoutings-groep. Deur middel van die O.E.E.C. (Organisasie vir Europese Ekonomiese Samewerking) het verskeie lande, insluitende Suid-Afrika, die Verenigde Koninkryk, Australië, Frankryk en die Nederlande besluit om 'n gesamentlike projek aan te pak vir die snelle ontwikkeling en aanbou van 'n grootskaalse installasie vir die ont-souting van brakwaters deur elektrodialise. Die Raad het £5,000 bygedra vir hierdie projek, asook 'n aansienlike hoeveelheid kennis wat ingewin is deur navorsingswerk in sy eie laboratoriums, en sal dan 'n deel hê aan die eksploitasie van die resultate hiervan. Die werk word uitgevoer in die laboratoriums van die Nederlandse T.N.O. (Organisasie voor Toegepast Natuurweten-schappelijk Onderzoek). Die inwerkinstelling van hierdie program, die eerste in sy soort, kan beskou word as 'n mylpaal in internasionale samewerking in die wetenskap.

Die Raad verteenwoordig die Unie in tien inter-nasionale wetenskaplike unies en verskaf ook die plaas-like sekretariaat vir die Unie se deelname aan die werk-saamhede van hierdie liggame. Hierdie werk het van groter belang geword as gevolg van die Unie se ont-trekking aan die Opvoedkundige, Wetenskaplike en Kulturele Organisasie van die Verenigde Volke (Unesco), wat in die jongste tyd in 'n toenemende mate 'n aktiewe rol gespeel het in die ondersteuning van die internasionale wetenskaplike unies.

Vennootskap met die Nywerheid

Die Raad is bewus van die feit dat in 'n staatsonder-steunde organisasie soos die W.N.N.R., navorsingswerk nie beskou kan word as die einddoel van sy taak nie, maar dat kragdadige stappe gedoen moet word om te verseker dat die resultate wat in sy laboratoriums verkry word, prakties toegepas moet word.

Aanvanklik het die Raad hom net daarop toegelê om sy resultate vir vrye gebruik te publiseer in die veronder-stelling dat die Nywerheid ywerig sou wees om dit kommersieel te eksploiteer. Dit het egter nie gebeur nie, en die Raad het tot die gevolgtrekking geraak dat die vernaamste rede vir hierdie oënskynlike gebrek aan onder-nemingsgees by die nywerheid is dat daar so baie geleent-hede in Suid-Afrika bestaan vir die toepassing van beproefde prosesse uit die buiteland sodat nywerars

simultaneous observations made at numerous points on the Earth's surface, scientists hope to learn more about the laws governing such phenomena as the weather, climate, earthquakes, ocean tides and atmospheric disturbances. The practical significance of this work is immense. To give one example, it may in future, as a result of the data collected during the International Geophysical Year, be possible to predict dry spells months in advance, so that farmers can plan accordingly.

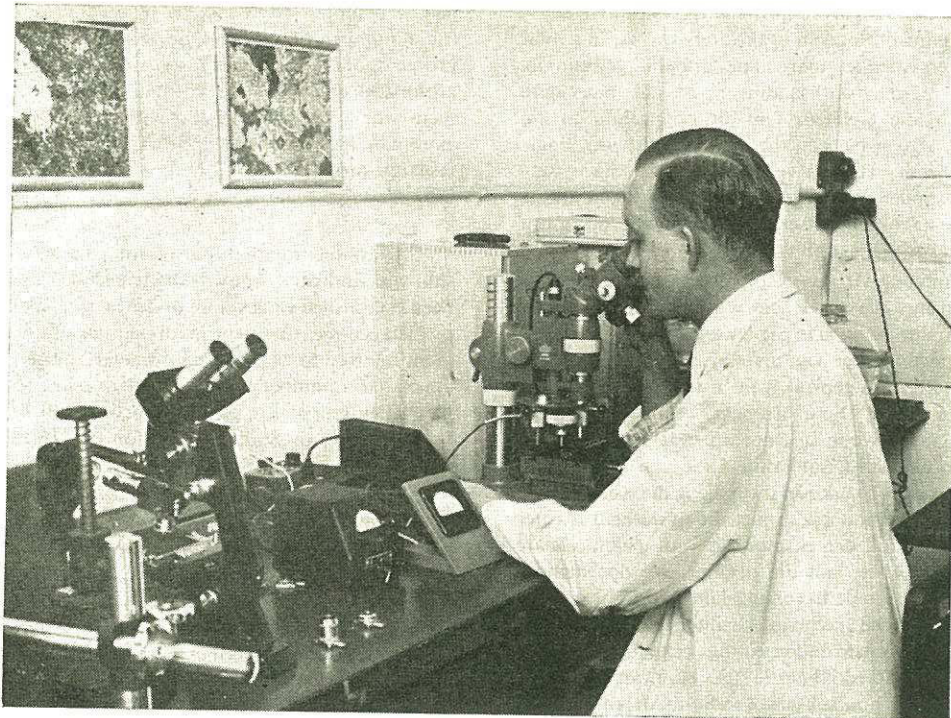
Another international project in which the Council is participating is the International Water De-salting Group. Working through O.E.E.C. (Organization for European Economic Corporation) several countries, including South Africa, the United Kingdom, Australia, France and the Netherlands, decided to embark on a joint project to speed up the development and construction of large-scale plant for the de-salting of saline waters by electro-dialysis. The Council has contributed £5,000 towards this project together with a considerable amount of "know-how" derived from work in its own laboratories, and will participate in the exploitation of the results. The work is being carried out in the laboratories of the Dutch T.N.O. (Organisatie voor Toegepast Natuur-wetenschappelijk Onderzoek). The initiation of this programme, the first of its kind, may be regarded as a milestone in international co-operation in science.

The Council adheres on behalf of the Union to ten international scientific unions, and has provided the local secretariat to administer the Union's participation in the activities of these bodies. This work has assumed added importance as a consequence of the Union's withdrawal from the United Nations Educational, Scientific and Cultural Organization which in recent years has played an increasingly active role in the support of the inter-national scientific unions.

Partnership with Industry

The Council is conscious of the fact that in a state-supported organization such as the C.S.I.R. research cannot be regarded as an end in itself, and that it must take steps to ensure that the results obtained in its labora-tories are put to practical use.

Initially, the Council was content merely to publish its results freely on the assumption that Industry would be quick to exploit them commercially. This in fact did not happen, and the Council has come to the conclusion that the main reason for this apparent lack of enterprise on the part of Industry is that so many opportunities exist in South Africa for the introduction of tried pro-cesses from overseas that industrialists prefer not to risk their venture capital on entirely new developments.



Om die probleem van metaalvermoeidheid vir die nywerheid op te los, maak die Nasionale Instituut vir Meganiese Ingenieurswese gebruik van 'n toetsapparaat om die hardheid van metaalstukke te meet.

Micro-hardness testing equipment is used on behalf of industry by the Mechanical Engineering Research Institute in solving problems arising from the failure of metal components.

verkie om nie kapitaal te waag vir heeltemal nuwe ontwikkelinge nie. Nog 'n punt is dat voordat 'n nuwe idee of proses gereed is vir kommersiële eksplorasie, 'n duur ontwikkelingsprogram onvermydelik vereis word. Geen nyweraar sou gewillig wees om hierdie finansiële waagstuk aan te gaan nie tensy hy vir 'n redelike tydperk verseker kan wees van beskerming teen mededinging om die finansiële belegging lonend te maak. Die Raad het dus sy toevlug geneem tot die patenteer van sy uitvindings, gevolg deur die toestaan van eksklusiewe lisensies.

Verskeie patente vir die stelsel van enkelkristal-frekwensiebeheer van radio-uitrusting wat deur mnr. T. L. Wadley van die Telekommunikasie-navorsingslaboratorium uitgevind is, word op dié wyse geëksploiteer. Eksklusiewe lisensies is toegestaan aan een firma in die Unie om Afrika te dek, en een in die Verenigde Koninkryk om die res van die wêreld te dek. Die Raad verwag om aansienlike tantiëme op hierdie patente te ontvang, veral van hul eksplorasie in die Verenigde Koninkryk.

Daar is egter verskeie ander patente van die Raad wat nie so 'n byval gevind het nie, en dit is duidelik dat indien 'n idee vinnig in 'n kommersiël-gesonde proposisie omgeskep moet word, die belangstelling van potensiele gebruikers in 'n baie vroeë stadium gewek moet word.

Another point is that before a new idea or process is ready for commercial exploitation a costly development programme is invariably necessary. No industrialist would be willing to accept this financial risk unless he can be assured of protection against competition for a reasonable time so as to make the investment worth while. The Council has therefore resorted to patenting its inventions followed by the grant of exclusive licences.

Several patents covering the system of single-crystal frequency control of radio equipment, invented by Mr. T. L. Wadley of the Telecommunications Research Laboratory, are being exploited in this way. Exclusive licences have been granted to one firm in the Union, covering Africa, and one in the United Kingdom for the rest of the world. The Council expects to receive substantial royalties on these patents, particularly from their exploitation in the United Kingdom.

Several other patents held by the Council have, however, not proved so successful and it is apparent that, to ensure the rapid transition of an idea to a commercially sound proposition, it is necessary to interest potential users at a very early stage. This was done in the case of research into the demineralization of saline waters which

Hierdie prosedure is gevolg in die geval van navorsingswerk oor die outsouting van brakwaters wat vir 'n aantal jare deur verskillende myngroepe geldelik gesteun is. Gedurende hierdie werksaamhede is die besondere probleme van die mynbedryf in die oog gehou en die betrokke myngroep het aan die werklike ontwikkelingswerk deelgeneem. Hierdie vennootskap met die nywerheid was besonder vrugbaar en dit lyk of die resultate van hierdie navorsingsprogram onmiddellik op groot skaal prakties toegepas sal word.

Nog 'n metode vir die eksploitasie van 'n patent in vennootskap met die nywerheid word nou op die proef gestel. 'n Private firma is in die lewe geroep om kragtens lisensie 'n nuwe metode van afstandsmeting te ontwikkel deur middel van die gebruik van 'n instrument genoem die „Tellurometer”. Die instrument, wat 'n aantal voordele het bo die gewone instrumente wat vir geodetiese opname gebruik word, sal in die Unie van Suid-Afrika vervaardig word vir verkoop dwarsdeur die wêreld.

Die Raad se vennootskap met die nywerheid is egter nie net beperk tot die eksploitasie van patenteerbare uitvindings nie. Een van die belangrikste doelstellings waarvoor die nasionale navorsingslaboratoriums opgerig is, was om moderne navorsingsfasiliteite wat slegs deur 'n paar van die grootste ondernemings bekostig kan word, aan die nywerheid beskikbaar te stel. Baie van die nywerheidsprosesse wat nou suksesvol in Suid-Afrika toegepas word, kan deur navorsing verbeter word, en navorsing is dikwels nodig voordat oorsese prosesse in die Unie ingevoer kan word en aangepas kan word om te voldoen aan plaaslike vereistes en vir die gebruik van plaaslike grondstowwe.

Werk wat onder geheimhouding volgens kontrak vir nywerheidsfirmas in die laboratoriums uitgevoer word, het jaar vir jaar so toegeneem dat gedurende die tydperk onder beskouing, verskeie van die laboratoriums gevind het dat hulle nie al die werk wat aangebied word kan aanvaar nie. Dit is 'n gesonde teken, nie slegs vir sover dit die toenemende vertroue van die kant van nywerers in navorsingsmetodes toon as 'n oplossing vir hul praktiese vraagstukke nie, maar ook vir sover werk van dié aard verseker dat die navorsers in voeling sal bly met die probleme van die nywerheid.

Chemiese Navorsing

Gedurende die jaar was navorsingswerk oor die outsouting van water een van die belangrikste werksaamhede van die Nasionale Chemiese Navorsingslaboratorium. Die werk was hoofsaaklik toegespits op die ontwikkeling van ioonselektiewe membrane, en met reg kan daar aanspraak op gemaak word dat Suid-Afrika sy plek volstaan onder die leiers van navorsing op hierdie gebied. 'n Proefinstallasie vir die outsouting van ondergrondse mynwater, is nou vir sowat 'n jaar op die Vrystaatse goudveld in gebruik. Die installasie met 'n kapasiteit van sowat 1,000 gallon per uur, was so geslaag dat die

has been supported financially by several mining groups for a number of years. During this work the specific problems of the Mining Industry were kept in view and the group concerned has participated in the actual development work. This partnership with Industry has proved extremely fruitful and it appears that the results of this research programme will be put to immediate practical use on a large scale.

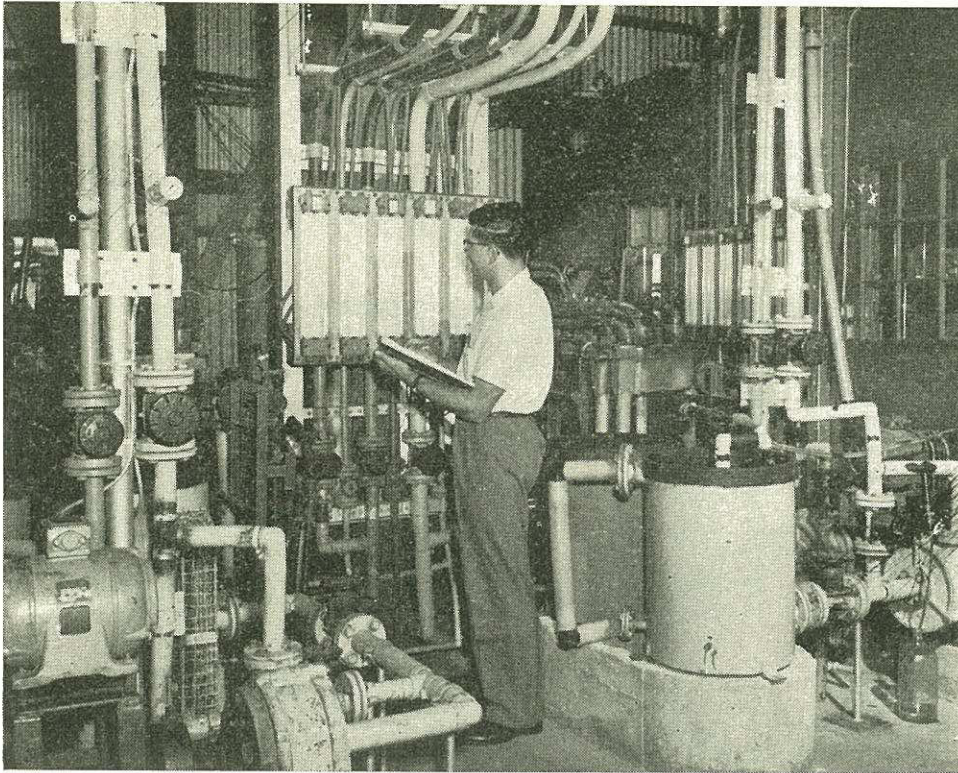
Still another method of exploiting a patent in partnership with Industry is now being tried. A private firm has been established to develop, under licence, a novel means of distance measurement involving the use of an instrument referred to as the “Tellurometer”. The instrument, which has a number of advantages over the conventional instruments used for geodetic survey, will be produced in the Union of South Africa for sale throughout the world.

The Council's partnership with Industry has not been confined to the exploitation of patentable inventions. One of the main purposes for which the national research laboratories were established was to make available to industry the modern research facilities which only a few of the largest undertakings can provide for themselves. Many of the industrial processes now being operated successfully in South Africa can be improved by research, and research is frequently necessary before overseas processes can be introduced to the Union and adapted to meet local conditions and to use local raw materials.

Work done in the laboratories on a confidential contract basis for industrial firms has increased year by year until, during the period under review, several of the laboratories found themselves unable to accept all the work offered. This is a healthy sign, not only in that it indicates the increasing confidence of industrialists in research techniques as a solution to their practical problems, but also in that work of this kind ensures that the research scientists will be kept in touch with the realities of Industry.

Chemical Research

Work on the demineralization of water has been one of the major activities of the National Chemical Research Laboratory during the year. The work has been concentrated mainly on the development of perm-selective membranes and it can be justifiably claimed that South Africa takes its place among the leaders of research in this field. A pilot plant for the de-salting of an underground effluent has now been operating on the Orange Free State Goldfields for about a year. This plant, which has a capacity of about 1,000 gallons per hour, has been so successful that the company concerned is planning the



'n Proefinstallasie vir die ontsouting van water.

Pilot plant for desalting water.

betrokke maatskappy van plan is om 'n volskaalse installasie op te rig wat 100,000 gallon per uur kan hanteer.

'n Nuwe ontwikkeling was die oprigting van streekeenhede van die Waternavorsingsafdeling in Windhoek en Pietermaritzburg, in medewerking met die Administrasies van Suidwes-Afrika en Natal onderskeidelik.

'n Bemoedigende teken gedurende die afgelope jaar was die toenemende samewerking met navorsingsinrigtings van die Departement van Landbou. 'n Aantal nuwe gesamentlike projekte is begin en ander is voortgesit. Die chemiese deel van die navorsingswerk is hoofsaaklik in die laboratoriums van die W.N.N.R. uitgevoer, terwyl die werk in verband met diere en plante by Onderstepoort en ander laboratoriums van die Departement uitgevoer is. Daar was egter 'n vrye uitwisseling van personeel en waar dit gerieflik was het skeikundiges van die W.N.N.R. in die landboulaboratoriums gewerk, en omgekeerd.

Noue samewerking tussen die Nasionale Chemiese Navorsingslaboratorium en die mediese navorsingseenhede het voortgeduur en veral die Afdeling Organiese Skeikunde het baie navorsingswerk gedoen in verband met die chemiese aspekte van die navorsing oor die metabolisme van vitamien A, wat deur die Voedingnavorsingseenheid aan die Universiteit van die Witwatersrand uitgevoer is.

erection of a full-scale plant capable of handling 100,000 gallons an hour.

A new development has been the establishment of regional units of the Water Research Division in Windhoek and Pietermaritzburg in co-operation with the South West Africa and Natal Provincial Administrations respectively.

A healthy sign during the past year has been the increased co-operation with research institutions of the Department of Agriculture. A number of new collaborative projects has been started and others have been continued. In this work the chemical research has for the most part been done in the C.S.I.R. laboratories while the animal and plant side was carried out at the Onderstepoort and other laboratories of the Department. There has, however, been a free interchange of staff and, where convenient, C.S.I.R. chemists have worked in the agricultural laboratories and *vice versa*.

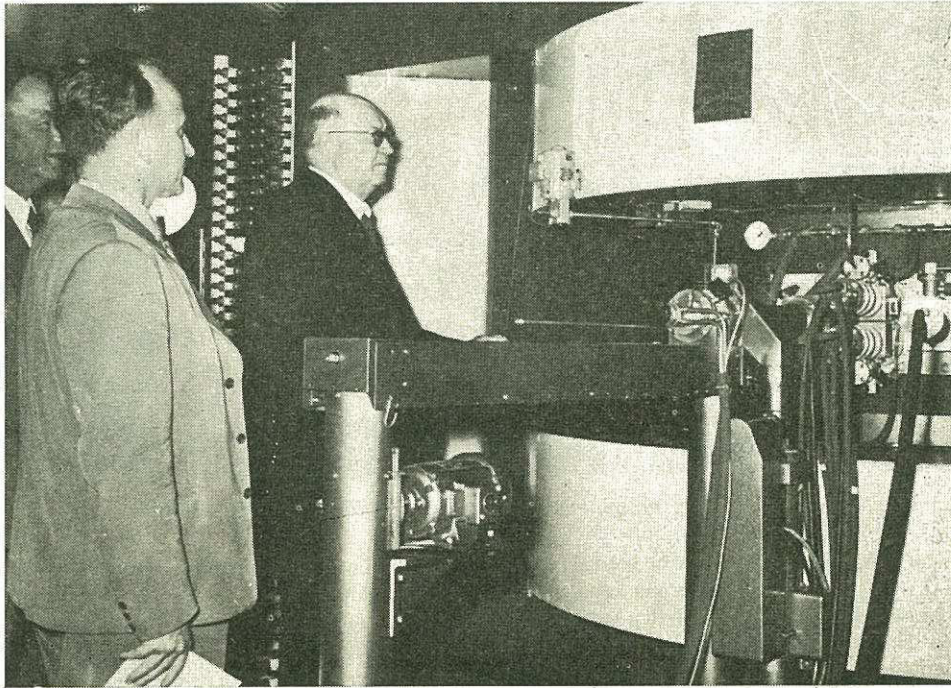
The National Chemical Research Laboratory has continued its close collaboration with the medical research units and, in particular, the Organic Chemistry Division has done a considerable amount of research on the chemical aspects of the research into the metabolism of vitamin A being conducted by the Nutrition Research Unit at the University of the Witwatersrand.

Fisiese Navorsing

Een van die glanspunte van die werk van die Nasionale Fisiese Laboratorium gedurende die jaar was die ingebruikstelling van die siklotron deur Sy Edele dr. A. J. R. van Rhijn, Minister van Ekonomiese Sake. Hierdie plegtigheid was die hoogtepunt van baie jare se werk en getuig van die groot vorderings wat gedurende die afgelope paar jaar in die wetenskap sowel as die tegnologie in Suid-Afrika gemaak is.

Research in Physics

One of the highlights of the activities of the National Physical Laboratory during the year was the inauguration of the cyclotron by the Hon. Dr. A. J. R. van Rhijn, Minister for Economic Affairs. This ceremony marked the culmination of many years' work, and bears testimony to the considerable advances that have been made during recent years in South Africa in both science and technology.



Die Minister van Ekonomiese Sake, Sy Edele Dr. A. J. R. van Rhijn, onthul 'n gedenkplaat by geleentheid van die ingebruikneming van die Siklotron.

The Minister of Economic Affairs, Dr. the Honourable A. J. R. van Rhijn, unveils a plaque commemorating the inauguration of the cyclotron.

Goeie vordering is gemaak met navorsing, en waarnemings in verband met die fundamentele prosesse wat betrokke is by die val van reën. Voorlopige aanduidings was dat die waarnemings wat gedurende die jaar oor Pretoria gedoen is, nie in stryd is met die „meteorietstof”-teorie vir die ontstaan van reën nie. Verdere navorsing op dié gebied kan moontlik lei tot belangrike en verreikende wetenskaplike bevindinge wat weer op hul beurt belangrike ekonomiese implikasies kan hê.

Gedurende die jaar was daar 'n groot toename in die toepassing van erkende akoestiekbeginsels in die ontwerp van kerke, sale, ateljees en auditoriums. Uitvoerige ondersoeke van akoestiektoestande is byvoorbeeld by die lughawe Jan Smuts en die Kaapstadse ateljees van die

Notable progress was made with research and observations in connection with the fundamental processes involved in the precipitation of rain. Preliminary indications were that the observations carried out over Pretoria during the year are not in conflict with the “meteorite dust” theory of the causation of rain. Further research in this field may possibly lead to important and far-reaching scientific findings which, in their turn, may have important economic implications.

During the year, there has been a substantial increase in the application of well-founded acoustic principles to the design of churches, halls, studios and auditoria. Thus, for example, detailed investigations of acoustic conditions were carried out at Jan Smuts Airport and the Cape Town

Suid-Afrikaanse Uitsaaikorporasie uitgevoer en aanbevelings gemaak oor hoe sommige van die akoestiekgebreke oorkom kon word. Akoestiekinstallasies wat aanbeveel is vir die meganiese opname van hofverrigtinge het nie slegs baie tyd en koste bespaar nie, maar ook bewys dat die resultate wat deur dié metode verkry is, 'n groot verbetering is op die gewone metodes van opname.

Resultate wat onlangs gepubliseer is in verband met fundamentele navorsing op die gebied van metaalfisika het aansienlike belangstelling in die buiteland gewek waar soortgelyke werk aan die gang is. Dit is bewys dat die ontwirtings in suiwer metale en legerings gedurende plastiese vervorming slegs langs enkelkristalvlakke plaasvind en nie langs die aangrensende atoomvlakke nie, soos sommige navorsers op dié gebied gemeen het. Hierdie bevindinge het baie meer lig gewerp op die basiese meganisme wat voorkom gedurende die plastiese vervorming van metale.

Telekommunikasies

Die grootste prestasie van die Telekommunikasie-navorsingslaboratorium gedurende die jaar was die ontwikkeling van 'n nuwe stelsel van afstandsmeting deur middel van radar. Die behoefte aan 'n instrument vir die regstreekse metings van afstande (in teenstelling met indirekte metodes soos die berekening van afstande deur

Studios of the South African Broadcasting Corporation and recommendations were made as to how some of the acoustic defects could be overcome. Acoustic installations recommended for the mechanical recording of court proceedings not only saved much time and expense, but also proved that the results obtained by this method were a great improvement on the conventional methods of recording.

Results published recently in connection with fundamental research in the field of metal physics evoked considerable interest overseas where similar work is in progress. It was proved that the dislocations in pure metals and alloys during plastic deformation take place only along single crystal planes and not along the adjacent atomic planes as some research workers in the field have postulated. These findings have greatly clarified the basic mechanisms that occur during the plastic deformation of metals.

Telecommunications

The most spectacular achievement of the Telecommunications Research Laboratory during the year has been the development of a novel system of distance measurement by means of radar. The need for an instrument for the direct measurement of distances (as opposed to indirect methods such as the computation of distances



'n Proefmodel van die tellurometer wat gebruik word om die juiste afstand tussen Pretoria en Johannesburg te meet.

An experimental model of the Tellurometer being used to measure the exact distance between Pretoria and Johannesburg.

die meting van hoeke tussen bepaalde punte) is reeds lank gevoel en navorsing hieroor word reeds vir 'n aansienlike tyd in 'n aantal oorsese laboratoriums uitgevoer. Navorsingswerk oor hierdie onderwerp is minder as drie jaar gelede in die Telekommunikasie-navorsingslaboratorium begin en was so suksesvol dat die eerste produksiemodelle van die instrument wat ontwikkel is en die „Tellurometer” genoem word, na verwagting vroeg in 1957 te koop sal wees.

Wat die meer fundamentele sy van die werk betref, het navorsingswerk oor die kenmerke van die laer ionosfeer onlangs gelei tot die publikasie van verskeie verhandelinge wat hoog aangeprys is deur oorsese deskundiges op die gebied. Die praktiese belang van hierdie werk is dat 'n beter kennis van die ionosfeer as die medium waardeur radiogolwe voortgeplant word, die ontwerp van doeltreffender radioverbindingstelsels moontlik sal maak.

Soos in vorige jare, is spesiale werk vir die Departement van Verdediging deur verskeie personeellede van die laboratorium onderneem.

Meganiese Ingenieurswese

Gedurende die jaar het die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese baie uitgebrei. 'n Nuwe Hidromeganiese Afdeling is opgerig en die navorsingsfasiliteite van die ander afdelings uitgebrei.

Veral in die Afdeling Lugmeganika het aansienlike ontwikkeling plaasgevind. 'n Reeks nuwe windtonnels, wat gebruik sal word in navorsingsprojekte oor waaierontwerp met betrekking tot geraas, hoëspoed-lugdinamika en lugvloeiweerstand in mynskagte, is ontwerp en sommige hiervan is in aanbou.

Ten gevolge van die vordering wat die Instituut gemaak het met die ondersoek na rotsstortings in diep myne, gedurende die tydperk 1952 tot 1955, het die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese besluit om die kontrak oor te neem wat voorheen gefinansier is deur die Central Mining and Investment Limited en om hierdie navorsingswerk vanaf Januarie 1956 op 'n nywerheidsgrondslag te ondersteun. Met hierdie verhoogde geldelike steun sal dit moontlik wees om die vraagstuk op 'n breër grondslag aan te pak en om die bepaalde ondersoek uit te brei na die myne van al die betrokke myngroepe. Met die uitbreiding van die navorsingsprojek moet die personeel aansienlik uitgebrei word om die ondersoek uit te voer.

Die Suid-Afrikaanse Spoorweë het die Instituut versoek om 'n uitgebreide reeks ondersoek te onderneem oor die vermoeidheidseienskappe van spoorprofiële. Spesifieke sub-projekte staan in verband met die bepaling van die vermoeidheidseienskappe van spore in draaie, termiet- en booggesweisde spore, hoë-mangaanstaal-spore en spore met rolrate. In al hierdie gevalle sal die ondersoek spanningsontledings sowel as vermoeidheidstoetsing van die betrokke spoormonsters insluit.

Ter aanvulling van hierdie werk het die Nasionale

by measurement of angles between fixed points) has long been felt and research to this end has been going on for a considerable time in a number of overseas laboratories. Research on this subject was started less than three years ago in the Telecommunications Research Laboratory and has been so successful that the first production models of the instrument developed, and referred to as the “Tellurometer”, are expected to be on sale early in 1957.

On the more fundamental side, research into the characteristics of the lower ionosphere has recently resulted in the publication of several papers which have been accorded high praise from overseas authorities on the subject. The practical importance of this work is that a better knowledge of the ionosphere, as the medium through which radio waves are propagated, will permit the design of more efficient radio communications systems.

As in past years, special work for the Department of Defence has occupied the time of several members of the laboratory's staff.

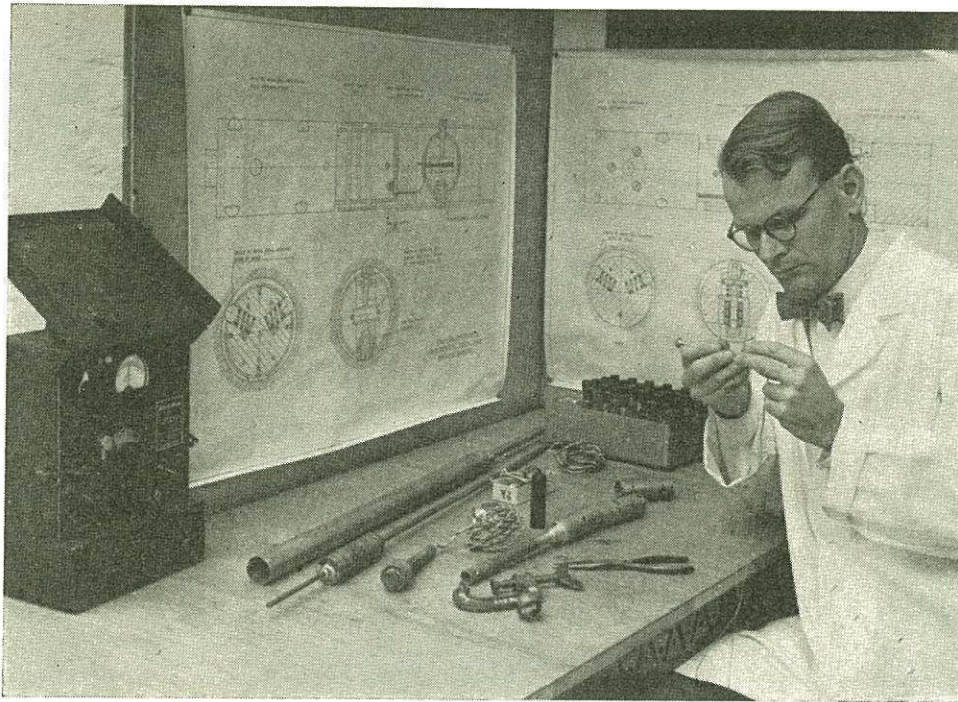
Mechanical Engineering

During the year, the National Mechanical Engineering Research Institute has been considerably expanded. A new Hydromechanics Division was set up and the research facilities of the other divisions augmented. In particular, considerable development has taken place in the Aeromechanics Division where a series of new wind tunnels, which are to be employed in research projects into fan design in relation to noise, high speed aerodynamics and air flow resistance in mine shafts, have been designed and in some cases are in the course of construction.

As a result of the progress made by the Institute in the investigation into rock bursts in deep-level mining during the period 1952 to 1955, the Transvaal and Orange Free State Chamber of Mines decided to take over the contract previously financed by the Central Mining and Investment Corporation Limited and to sponsor this research on an industry basis as from the 1st January, 1956. With this increased financial support it will be possible to tackle the problem on a broader basis and to extend the specific investigations to the mines of all mine groups concerned. The enlargement of the research project necessitates a considerable increase in staff to conduct the investigations.

The South African Railways have requested the Institute to undertake an extensive series of investigations dealing with the fatigue properties of rail sections. Specific sub-projects involve the determination of the endurance properties of rails in curves, thermit- and arc-welded rails, high manganese rails and piped rails. In all these cases, the investigations will involve both stress analyses and fatigue testing of the relevant rail specimens.

Supplementing this work, the National Building Research Institute has started an extensive investigation



Die montering van 'n sel vir spanningsmetings ondergronds in die ondersoek na die oorsake van rotsstorings in goudmyne.

The assembly of a cell for stress measurements underground in research into the causes of rock bursts in gold mines.

Bounavorsingsinstituut begin met 'n uitgebreide ondersoek van die optimum spasiering van die dwarslêers waarop die spore rus. As die dwarslêers selfs 'n duim verder uitmekaar verskuif kan word as wat hulle tans is, sal dit groot besparings vir die spoorweë meebring.

into the optimum spacing of the sleepers which carry the rails. If the sleepers can be moved even an inch further apart than they are at present the savings to the railways will be substantial.

Bounavorsing

In die navorsingswerk oor behuising, het die klem tot dusver geval op verskeie aspekte van behuising vir die stedelike Bantoe, maar dit is nou verskuif na behuising vir blankes in die laer inkomstegroep. Net soos behuising vir die Bantoe, sal dit ook 'n langtermynprojek wees, maar resultate behoort binne 'n korter tydperk beskikbaar te wees, aangesien baie van die navorsingswerk vir die vorige projek hier van toepassing is.

Voortspruitend uit werk oor natuurlike behuising het die Nasionale Bounavorsingsinstituut navorsingswerk gedoen oor geskikte ontwerpe vir skole in natuureldorpe en as gevolg van die sukses van hierdie werk, is versoeke ontvang van verskeie provinsiale administrasies vir soortgelyke werk oor skole vir blankes.

Op versoek van die Transvaalse Provinsiale Administrasie het die Instituut onlangs 'n eksperimentele skool ontwerp wat by Waterkloof, Pretoria, gebou sal word. Die ontwerp is gebaseer op die navorsingsbevindinge tot dusver. Die belangrikste oogmerke was om te toon dat

Building Research

The emphasis of work on housing, which has hitherto been concentrated on various aspects of accommodation for the urban Bantu, has now been shifted to housing for Europeans in the lower income groups. This, like Bantu housing, will be a long-term project but results should be available in a shorter period as much of the research undertaken for the former is applicable to the latter.

As a corollary to work on Native housing, the National Building Research Institute carried out research into suitable designs for schools in Native townships and, as a result of the success of this work, requests have been made by several provincial administrations for similar work to be undertaken in respect of European schools.

At the request of the Transvaal Provincial Administration, the Institute has recently designed an experimental school to be built at Waterkloof, Pretoria. This design has been based on the research findings to date. The main aims have been to show that by functional planning, such



'n Argitek in die Nasionale Bounavorsings-instituut werk aan 'n tekening in perspektief van 'n nuwe skoolgebou.

An architect in the National Building Research Institute works on the perspective drawing of a new school.

deur funksionele beplanning, soos die ontwerp van eenvoudige fondamente, spesiaal ontwerp om op die perseel te pas, die vermindering van onnodige ruimte, verlaging van plafonhoogtes en ekonomiese gebruik van materiale, kan koste verminder word sonder dat die vereiste standarde vir 'n onderwysinrigting enigsins verlaag word. Dit was selfs moontlik om sommige van die geriewe wat gewoonlik vir skole verskaf word, te vermeerder: kunsmatige verligting is byvoorbeeld in alle klaskamers verskaf. Tenders is aangevra en hopelik sal die bouwerk binnekort begin.

'n Uitvoerige ondersoek is gedoen van die faktore wat minimum-plafonhoogtes in geboue beheer. Dit is 'n saak van aansienlike ekonomiese belang, nie slegs in die Unie nie, maar ook elders in Afrika. Verder staan dit in noue verband met weerlig, ventilasie en warmtetoestande in geboue en as sulks vereis dit noukeurige studie. Aanbevelings is opgestel en sal binnekort gepubliseer word.

Gedurende die afgelope vier jaar is navorsingswerk aan die gang oor dakverwe vir direkte aanwending op nuwe gegalvaniseerde staal. Gedurende die jaar het hierdie werk vrug afgewerp in die formulering van twee nuwe soorte betreklik goedkoop dakverwe wat, toe hulle op nuwe dakke aangewend is, meer duursaam was as die

as the design of simplified foundations especially planned to fit the site, reducing unnecessary space, lowering of ceiling heights, and economical use of materials, it is possible to reduce costs without in any way lowering the standards necessary for a teaching institution. In fact, it has been found possible to increase some of the amenities usually provided for schools: artificial lighting has, for example, been provided in all classrooms. Tenders have been invited and it is hoped that construction will commence soon.

A detailed investigation of the factors that dictate minimum ceiling heights in buildings was carried out. This is a matter of considerable economic importance, not only in the Union but elsewhere in Africa too. Furthermore, it is closely linked with lighting, ventilation and the thermal conditions in buildings and, as such, requires careful study. Recommendations have been drafted and will be published soon.

During the past four years research has been in progress on roof paints for direct application to new galvanized steel. During the year this work achieved its object, in the formulation of two new types of reasonably low-cost roof paints which, when applied to new roofs, were found to be more durable than most commercial paints in the same price range. Details of their formulations

meeste kommersiële verwe in dieselfde prysreeks. Besonderhede oor hul formulerings is beskikbaar gestel aan die verfnwyerheid en baie vervaardigers het reeds getoon dat hulle gewillig is om hierdie verfsorte te bemark.

Aangesien die Boubedryf verantwoordelik is vir meer as die helfte van die totale plaaslike kapitaalvorming vir alle werksaamhede in die Unie, bied dit 'n wye gebied vir kostevermindering en vir metodes om beskikbare kapitaal ten beste te gebruik. Die mening is dat verreikende ekonomiese voordele verkry kan word deur beter organisasie, die gebruik van 'n stelsel van voorbeplanning van alle bouwerk en 'n metode van terreinbeheer waarvolgens beplande resultate daagliks nagegaan kan word teenoor werklike resultate, sodat foute onmiddellik gekorrigeer kan word. 'n Voorlopige metode van beplanning en beheer wat deur die Nasionale Bounavorsingsinstituut ontwikkel is, is tydens die oprigting van 'n kraaminrigting by Vlakfontein naby Pretoria toegepas en het groot moontlikhede getoon vir kostevermindering op boupersele.

Padnavorsing

Gedurende die jaar het die Raad se Nasionale Padnavorsingsinstituut hom toegelê op die uitbou van sy fasiliteite vir die uitbreiding van sy program om alle aspekte van padnavorsing te dek. Die werwing van geskikte personeel was 'n groot struikelblok, ten spyte van die pogings van die Direkteur gedurende 'n uitgebreide besoek aan die buiteland.

Werk in verband met bitumineuse materiale vir padbolae het egter voortgeduur en die Instituut het 'n bulletin gepubliseer oor die gebruik en instandhouding van die masjiene wat gebruik word om bindstowwe op paaie aan te wend. Dit behoort baie nuttig te wees vir owerhede wat verantwoordelik is vir padinstandhouding en -herstel.

Nywerheidsielkunde

Die Nasionale Instituut vir Personeelnavorsing is nog 'n laboratorium van die Raad wat gely het onder die verlies aan opgeleide navorsers. In sekere mate is dit 'n maatstaf van die Instituut se eie sukses, want die personeelkeurings- en bestuurstechnieke wat deur hulle ingevoer is, word in toenemende mate in die nywerheid toegepas met die gevolg dat daar 'n groot vraag vir opgeleide sielkundiges is. Terselfdertyd neem die aanvrae om hulp van die Instituut met die praktiese oplossing van personeelvraagstukke in die nywerheid en staatsdepartemente steeds toe tot nadeel van sommige van die meer fundamentele navorsingswerk waarvoor daar 'n gebrek aan ervare opgeleide navorsingspersoneel is.

Die tekort aan arbeidskragte is nie beperk tot wetenskaplikes en ingenieurs nie, maar is akute onder al die blanke groepe wat gewoonlik as opsieners, tegnisi en masjienbedieners in die nywerheid, die handel en ander beroepe gebruik word. Dit is dus van die uiterste belang

have been made available to the paint industry and many manufacturers have already indicated their willingness to market these types of paint.

Since the Building Industry is responsible for more than half the total domestic capital formation for all activities in the Union, it offers wide scope for cost reductions and for methods of using available capital to the best advantage. It is considered that far-reaching economic benefits can be achieved by better organization, employing a system of pre-planning of all building operations and a method of site control which enables planned results to be checked daily against actual results, so that corrective action, where necessary, can be taken immediately. A provisional method of planning and control developed by the National Building Research Institute was put into operation during the erection of a maternity hospital at Vlakfontein near Pretoria, and has been shown to hold great potentialities for cost reduction on building sites.

Road Research

During the year, the Council's National Institute for Road Research has concentrated on the building up of its facilities to provide for the expansion of its programme to cover all aspects of road research. The recruiting of suitable staff has proved to be a major obstacle, despite the efforts of the Director during an extended visit overseas.

Work on bituminous road surfacing materials has, however, been continued, and the Institute published a bulletin on the use and maintenance of the machines used to spray binders on the roads. This should prove of great value to authorities responsible for road construction and repair.

Industrial Psychology

The National Institute for Personnel Research is another of the Council's national laboratories which has suffered from the loss of experienced research workers. To some extent this is a measure of the Institute's own success, for the personnel selection and management techniques it has pioneered are being applied to an increasing extent in Industry with the result that trained psychologists are at a premium. At the same time the demands on the Institute for assistance in the practical solution of personnel problems in Industry and Government Departments continue to increase to the detriment of some of the more fundamental research work for which the experienced research staff is lacking.

The manpower shortage is not confined to scientists and engineers but is acute among all the European groups normally employed as supervisors, technicians and operators in Industry, Commerce and other walks of life. It

dat die beskikbare arbeidskragte ten volle gebruik word. 'n Opname deur die Nasionale Instituut vir Personeelnavorsing sal toon of dit die geval is in die Unie. Die doel is om die potensiele bekwaamheid van 'n verteenwoordigende monster van die blanke manlike bevolking tussen die ouderdomme van 18 en 20 vas te stel en om te bepaal in watter mate hierdie bekwaamhede ontwikkel word deur middel van onderrig en beroepsopleiding en hul huidige of voorgenome beroep. Die voorlopige werk om die gegewens op byna 100,000 geponste kaarte aan te teken, is byna voltooi, maar die finale ontleding sal sowat twee jaar duur.

'n Toename in die produktiwiteit van die individuele werker is vir praktiese doeleindes gelykstaande aan 'n toename in arbeidskragte, en in die afgelope jare het 'n aantal firmas bonus-aansporingskemas ingevoer om hierdie doel te bereik. Die meeste van die skemas wat in die Unie in gebruik geneem word, is egter gebaseer op skemas wat in die buiteland baie geslaag was en aangesien toestande hier in baie opsigte verskil, het hierdie oorsprings nie altyd die gewenste resultate gehad nie. Om vas te stel watter faktore bydra tot die doeltreffendheid van 'n aansporingskema, het die Instituut gedurende die jaar begin met 'n opname van die firmas wat die skemas in gebruik geneem het.

Voedingnavorsing

Net soos die Navorsingsinstituut vir Meganiese Ingenieurswese het die Nasionale Voedingnavorsingsinstituut gedurende die tydperk onder beskouing aansienlik uitgebrei. Voorsiening is nou gemaak vir kliniese werk om in 'n spesiale saal by die Pretoriase Algemene Hospitaal onderneem te word en 'n mikrobiologiese afdeling is opgerig, sodat die Instituut se basiese fasiliteite vir voedingnavorsing nou volledig is. Op die gebied van kliniese navorsing het die Instituut heelwat bygedra tot die studie van kwashiorkor, 'n toestand van wanvoeding wat dikwels onder kinders van die minderbevoorregtes voorkom.

Histopatologiese werk bly een van die basiese werksaamhede van die Instituut.

Gedurende die jaar is baie aandag geskenk aan die proteïenverryking van brood en meliemeel, die twee stapelvoedsels in Suid-Afrika. Die verrykingswaarde van vismeel is nagegaan en geskikte formules vir die algemene gebruik daarvan is opgestel. As gevolg van hierdie werk beplan die Departement van Voeding 'n grootskaalse proefneming van die gebruik van brood wat verryk is met vismeel in die Kaapse Skiereiland.

Die tegnologiese afdeling van die Instituut is besig met die ontwikkeling van 'n proses vir die vervaardiging van 'n ontwaterde magouprodukt (mahewu). Magou is 'n gfermenteerde meliemeel wat baie gewild is onder die Bantoes.

Een van die ander projekte waarmee die Instituut gedurende die jaar besig was, was die opstel van 'n handboek oor die samestelling van Suid-Afrikaanse voedsels.

is therefore of the utmost importance that the manpower available is used to the best advantage. A survey carried out by the National Institute for Personnel Research will indicate whether this is the case in the Union. The aim is to establish the potential aptitudes of a representative sample of the European male population between the ages of 18 and 20 and to find out to what extent these aptitudes are being developed by means of schooling and vocational training, and their present or intended occupation. The preliminary work of recording the data on nearly 100,000 punched cards is nearing completion, but the final analysis will take about two years to complete.

An increase in the productivity of the individual worker is for practical purposes equivalent to an increase in manpower, and during recent years a number of firms have introduced bonus incentive schemes to attain this end. However, most of the schemes introduced in the Union are based on schemes which have proved successful overseas and, as conditions here differ in many respects, these transplantations have not always produced the desired result. In order to discover what factors contribute to the effectiveness of an incentive scheme the Institute during the year commenced a survey of the firms which have introduced them.

Nutrition Research

Like the Mechanical Engineering Research Institute, the National Nutrition Research Institute has undergone considerable expansion during the period under review. Provision has now been made for clinical work to be undertaken in a special ward at the Pretoria General Hospital and a microbiology section has been established, thus completing the Institute's basic facilities for work in the field of nutrition research. In the clinical research field, the Institute has already contributed much to the study of kwashiorkor, a condition of malnutrition which occurs frequently among children of the under-privileged.

Histopathological work remains one of the basic activities of the Institute.

Much attention has been given during the year to the protein enrichment of bread and maize meal, the two staple items of diet in South Africa. In particular, the enriching value of fish meal was established and suitable formulae for its general use worked out. As a result of this work the Department of Nutrition is planning a large-scale user trial of bread enriched with fish meal in the Cape Peninsula.

The technological division of the Institute is engaged in developing a process for the manufacture of a dehydrated and enriched magou (mahewu) product. Magou is a fermented maize meal gruel, very popular with the Bantu.

One of the other projects which engaged the Institute during the year was the drawing up of a manual on the Composition of South African Foodstuffs. At present an American manual is being used but it is planned to

Op die oomblik word 'n Amerikaanse handboek gebruik, maar die plan is om al hoe meer van die oorsese syfers te vervang met Suid-Afrikaanse gegewens wanneer hulle beskikbaar word as gevolg van die Instituut se langtermynnavorsingsprogram.

Soos in ander lande is daar 'n neiging in Suid-Afrika vir voedselvervaardigers om al hoe meer vreemde chemikalieë te gebruik om die voorkoms, hou vermoë en gemak van hantering van voedsels te verbeter. Aangesien baie van hierdie middels die gesondheid in gevaar mag stel of dit minstens nog nie bewys is dat hulle onskadelik is nie, het dit nodig geword vir die Instituut om te begin met die studie van bederfwerende en kleurbyvoegings in voedsels.

In die algemeen het die Instituut voortgegaan om dienste te lewer aan die Departement van Voeding.

Mediese Navorsing

Die belangrikste ontwikkeling op dié gebied was die oprigting van 'n nuwe eenheid vir pneumokoniose-navorsing. Hierdie eenheid verskil van die Raad se ander mediese eenhede in dié opsig dat dit nie rondom 'n bestaande groep uitgebou is nie, maar meer opgerig is om die navorsing van 'n aantal verskillende organisasies te koördineer en om leemtes te vul waarvoor daar voorheen nie voorsiening gemaak is nie. Dit is opgerig op versoek van die Minister van Mynwese op aanbeveling

replace more and more of the overseas figures with South African data when these become available as a result of the Institute's long-term research programme.

As in other countries there is a tendency in South Africa for food manufacturers to introduce more and more extraneous chemicals to improve the appearance, keeping qualities and ease of handling of foodstuffs. Since many of these agents may be a danger to health, or may at least not yet have proved to be harmless, it has become necessary for the Institute to initiate a programme for the study of preservative and colouring additives in foodstuffs.

In general, the Institute has continued to render service to the Department of Nutrition.

Medical Research

The main development in this field has been the establishment of a new unit for pneumoconiosis research. This unit differs from the Council's other medical units in that it was not built around an existing research group, but has been established more to co-ordinate the research of a number of different organizations and to fill in any gaps not previously catered for. It was brought into being at the request of the Minister of Mines on the recommendation of a departmental committee which, under the



'n Vergadering van die direkteure van mediese navorsingseenhede wat gedurende die jaar in Durban gehou is.

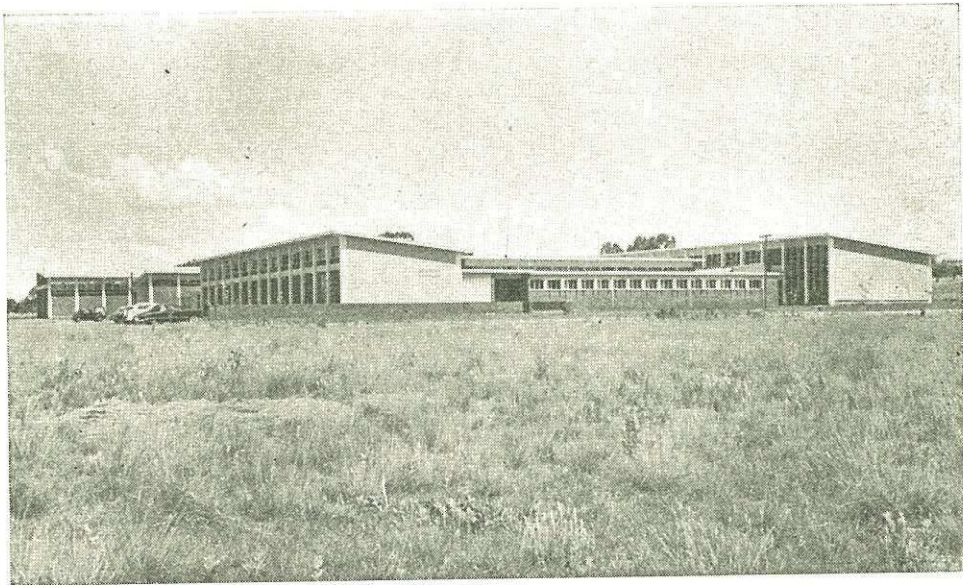
A meeting of the directors of medical research units held during the year in Durban.

van 'n departementele komitee wat, onder voorsitterskap van professor S. F. Oosthuizen, voorsitter van die S.A. Mediese Raad, die vraagstuk van silikose aan die Witwatersrandse goudmyne ondersoek het. Die eenheid sal ook anders wees in dié opsig dat die meeste van sy navorsingswerk onderneem sal word deur samewerkende liggame wat insluit die navorsingslaboratoriums van die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese, die Suid-Afrikaanse Instituut vir Mediese Navorsing, die Mediese Silikoseburo en die Raad se eie nasionale laboratoriums. Die koste van die eenheid word gedek uit bydraes van die Departement van Mynwese, die Mynwerkers-unie en die Kamer van Mynwese. Behalwe die beskikbaarstelling van sy eie laboratoriumdienste aan die eenheid, verskaf die W.N.N.R. ook sekretariële en administratiewe dienste.

Dit lyk miskien partydig om die werk van een eenheid spesiaal aan te haal, maar die navorsingswerk deur die Kliniese Voedingseenheid en die Universiteit van Kaapstad oor die betekenis van onversadigde vette in die dieet met betrekking tot koronêre hartkwaal is 'n belangrike stap op dié gebied. Die werk is sedertdien elders in Suid-Afrika uitgebrei en word opgevolg deur soortgelyke navorsingswerk in 'n aantal belangrike inrigtings in verskeie oorsese lande.

chairmanship of Professor S. F. Oosthuizen, Chairman of the S.A. Medical Council, investigated the problem of silicosis on the Witwatersrand gold mines. The unit will differ also in that most of its research work will be undertaken by co-operating bodies which include the Research Laboratories of the Transvaal and Orange Free State Chamber of Mines, the South African Institute for Medical Research, the Silicosis Medical Bureau and the Council's own national laboratories. The cost of the Unit is being met by contributions from the Department of Mines, the Mineworkers Union and the Chamber of Mines. The C.S.I.R., in addition to making its laboratory services available to the Unit, is providing secretarial and administrative services.

It is perhaps invidious to single out the work of any one unit, but the research carried out by the Clinical Nutrition Unit and the University of Cape Town into the significance of unsaturated fats in the diet in relation to coronary heart disease appears to be a major breakthrough in this field. The work has since been extended elsewhere in South Africa and is being followed up by similar research in a number of major institutions in several overseas countries.



Die nuwe gebou waarin die Sentrale Werkplaas van die W.N.N.R. gehuisves is.

The new building which houses the C.S.I.R. Central Workshops.

Die Bouprogram

Gedurende die jaar is goeie vordering gemaak met die oprigting van geboue op die Raad se nuwe navorsingsentrum sewe myl oos van Pretoria. Aan die begin van die tydperk was die Nasionale Bounavorsingsinstituut, die Kernfisika-, Biofisika-, Akoestiek- en Windtonnelgeboue reeds betrek. Die Sentrale Werkplaas het gedurende die jaar na hul nuwe gebou getrek en vordering is gemaak met die nuwe biblioteekgebou en die hoofgebou van die Nasionale Fisiese Laboratorium. Die biblioteek sal teen die end van die jaar betrek word en laasgenoemde vroeg in 1957. Die fundamente van die nuwe administratiewe gebou vir die hoofkantoor is reeds gelê en uitbreidings aan die windtonnelgebou van die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese is in aanbou. Planne vir sommige van die nuwe geboue vir die Nasionale Chemiese Navorsingslaboratorium en vir die Nasionale Voedingnavorsingsinstituut nader voltooiing. Aansienlike vordering is gemaak met die uitlê van die perseel as 'n geheel.

Onderhandelinge met die Universiteit van die Witwatersrand vir persele vir die oprigting van geboue vir die Nasionale Instituut vir Personeelnavorsing en die Telekommunikasienavorsingslaboratorium op die Universiteitsterrein is in die finale stadium.

Erkennings

Die Raad betuig sy dank aan almal wat vrywillig hul tyd opgeoffer het om te dien in die verskillende adviserende komitees wat die werk van die laboratoriums gelei het. Hierdeur het hulle verseker dat die navorsingsprogramme in hul regte perspektief gebly het, in noue voeling met die behoeftes van die land as 'n geheel.

Die Raad bedank ook diegene wat opgetree het as beoordelaars vir hul deskundige menings, sodat die Raad in staat gestel is om die belowendste navorsingsprojekte en publikasies uit te kies vir ondersteuning.

The Building Programme

Substantial progress has been made during the year with the erection of buildings at the Council's new research centre seven miles east of Pretoria. At the beginning of the period, the National Building Research Institute, Nuclear Physics, Biophysics, Acoustics and Wind Tunnel Buildings had already been occupied. During the year the Central Workshops moved out to its new building and substantial progress was made with the new library building and the main building of the National Physical Laboratory. The former will be occupied towards the end of the year and the latter early in 1957. The foundations of the new Headquarters administrative building have been laid and extensions to the wind tunnel buildings of the National Mechanical Engineering Research Institute are under construction. Plans for some of the new buildings for the National Chemical Research Laboratory and for the National Nutrition Research Institute are nearing completion. Considerable progress has been made with the landscaping of the site as a whole.

Negotiations with the University of the Witwatersrand for sites for the erection of buildings for the National Institute for Personnel Research and the Telecommunications Research Laboratory on the campus of the University are in their final stages.

Acknowledgements

The Council expresses its gratitude to all those who have freely given of their time to serve on the various advisory committees which have guided the work of the laboratories. By so doing they have ensured that the research programmes have been kept in their proper perspective and related closely to the needs of the country as a whole.

The Council also thanks those who have acted as referees giving expert opinion which has enabled it to select the most promising research projects and publications for its support.

Skakelafdeling

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

PRETORIASE KANTOOR

Navorsingsaanvoerwerk

Hierdie aspek van die werksaamhede van die Skakelafdeling het hoofsaaklik te doen met die nasporing van die behoeftes vir navorsingswerk op gebiede wat nog nie spesifiek deur bestaande organisasies gedek word nie, of op gebiede waarin verskillende belanghebbende organisasies 'n gemeenskaplike belang het.

Sommige gebiede is van landswye belang, bv. rookmis. Op 31 Oktober 1955 is in Pretoria 'n simposium belê oor lugbesoedeling wat voorkom as gevolg van onvolledige verbranding van brandstof. Sowat 100 afgevaardigdes van munisipaliteite, nywerhede en staatsdepartemente het dit bygewoon. Besluite wat op hierdie konferensie geneem is, is deurgestuur aan die Nasionale Komitee oor Lugbesoedeling wat deur die Minister van Gesondheid aangestel is.

Daar is egter ander probleme wat beter deur streeknavoring benader kan word. Dit word gedoen met behulp van die drie streeknavoringskomitees: die Natalse Streeknavoringskomitee in Durban, die Middellandse Streeknavoringskomitee in Port Elizabeth en die Streeknavoringskomitee vir die Westelike Provinsie in Kaapstad. In November 1955 is 'n simposium oor „Navorsing en Streeksontwikkeling” in Pretoria belê wat bygewoon is deur lede van die W.N.N.R., verteenwoordigers van die streeknavoringskomitees, van die Raad vir die Ontwikkeling van Natuurlike Hulpbronne en van die Nasionale Raad vir Sosiale Navorsing.

Patente

Die werksaamhede in verband met die patentering van uitvindings deur die navorsingspersoneel van die W.N.N.R. neem steeds toe, en een senior beampte is nou voltyds hiermee besig.

Sy werk handel hoofsaaklik oor die bystand wat aan die President en die betrokke laboratoriums verleen word in verband met onderhandelinge met firmas vir lisensiering van patente en aangeleenthede wat daaruit voortspruit. Uit ondervinding blyk dat patente miskien die grootste waarde inhou as grondslag vir tegniese samewerking tussen die Raad se laboratoriums en nywerheidsfirmas vir die verdere ontwikkeling en praktiese toepassing van uitvindings.

Dienste in verband met die opstel, indiening, vernuwing van patente, ens., word met behulp van patent-agente verskaf. In geheel is dertien aansoeke in verskillende stadiums gedurende die jaar behandel.

Liaison Division

Head of the Division: MR. D. G. KINGWILL

PRETORIA OFFICE

Research Development

The activities of the Liaison Division in this field are concerned mainly with reviewing the needs for research in fields which are not specifically catered for by existing organizations or in which several different organizations are concerned.

Some of these fields are of nation-wide interest: e.g. smog. Problems of air pollution caused by the incomplete combustion of fuel were reviewed at a symposium organized in Pretoria on 31st October, 1955. It was attended by some 100 representatives of municipalities, industries and government departments. Resolutions adopted at this meeting were forwarded to the National Committee on Air Pollution, set up by the Minister of Health.

Problems in other fields lend themselves to a regional approach. These are reviewed with the assistance of the three regional research committees: the Natal Regional Research Committee in Durban, the Midland Regional Research Committee in Port Elizabeth and the Western Province Regional Research Committee in Cape Town. A symposium on "Research and Regional Development" held in Pretoria in November, 1955, was attended by members of the C.S.I.R., representatives of the regional committees, of the Natural Resources Development Council and the National Council for Social Research.

Patents

Activities in connexion with the patenting of inventions by the research staff of the C.S.I.R. have increased steadily, and now engage the full attention of one senior officer.

His work consists mainly of assistance to the President and the laboratories concerned in connexion with negotiations with firms for the licensing of patents and related matters. Experience indicates that possibly the greatest value of patents lies in the basis they provide for technical co-operation between the Council's laboratories and industrial firms for the development and practical application of research results.

Services in connexion with drafting and submission of applications and renewal of patents are provided with the assistance of patent agents. During the year thirteen applications were dealt with in various stages.

Bedryfsekonomie

In Junie 1956 het die Raad besluit dat alle ondersoeke van 'n ekonomiese aard wat in verband staan met die navorsingsprogramme van die nasionale navorsingslaboratoriums gesentraliseer moet word onder die Afdeling Bedryfsekonomie van die Skakelafdeling.

Tot dusver was die belangrikste werksaamheid die opstelling van 'n goedervloei-tabel van die Unie se ekonomie vir die jaar 1951-1952. Die doel van hierdie projek is om 'n sistematiese agtergrond te skep vir 'n meer gedetailleerde ekonomiese ondersoek van bepaalde sektors van die ekonomie met betrekking tot sekere tegniese navorsingsprojekte van die Raad, en om die dekking en interne konsekwenheid van sekere beskikbare statistiese gegewens oor die Unie se ekonomiese stelsel te bestudeer.

In medewerking met die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese se Navorsingsbeurshouer vir Houtverpakkingsnavorsing, wat deur die Lumber Millers' and Shook Manufacturers' Association ondersteun is, is met 'n ondersoek begin oor bedryfs-ekonomiese aspekte van die saagmeulbedryf.

Internasionale Wetenskaplike Skakeling

Vanaf 1946 is die Suid-Afrikaanse Wetenskaplike Skakelkantore in Londen en Washington die Raad se belangrikste agentskappe vir internasionale samewerking in die wetenskap.

Met goedkeuring van die Regering is nou ook stappe gedoen om 'n derde kantoor op te rig in Wes-Duitsland. Dit sal saamwerk met die Suid-Afrikaanse Ambassade in Keulen. Dr. J. P. van Zyl het in Augustus 1956 uit Suid-Afrika vertrek om aan die hoof van hierdie kantoor te staan. Dr. van Zyl, wat Hoof van die Afdeling Skeikundige Diens in die Departement van Landbou was voordat hy met pensioen afgetree het, het vir die afgelope twee jaar 'n betrekking in die Pretoriase kantoor van die Skakelafdeling beklee.

Die werksaamhede van die Londense en Washingtonse kantore word kortliks saamgevat aan die end van hierdie verslag. Die dienste van hierdie kantore is beskikbaar aan alle Suid-Afrikaanse staatsliggame, universiteite, nywerheidsfirmas, wetenskaplike inrigtings en individuele wetenskaplikes, en dit is aangenaam om te meld dat hierdie dienste ook in toenemende mate gebruik word deur organisasies buite die W.N.N.R. se onmiddellike „groep”.

Die Pretoriase kantoor dien as skakel tussen die oorsese kantore en Suid-Afrikaanse liggame, veral wat betref internasionale konferensies en verteenwoordiging op komitees van bv. die Britse Statebond en die Organisasie vir Europese Ekonomiese Samewerking (O.E.E.C.) Kennisgewings oor internasionale wetenskaplike konferensies word onder die aandag van wetenskaplikes in Suid-Afrika gebring en die kantore oorsee word ingelig oor die reisplanne van Suid-Afrikaanse wetenskaplikes om die buiteland te besoek.

Suid-Afrika se deelname aan die Internasionale

Industrial Economics

In June, 1956, the Council decided that all investigations of an economic nature related to the research programmes of the national research laboratories should be centralized under the Industrial Economics Section attached to the Liaison Division.

The main activity of this section up to the present has been the construction of an input-output table for the Union's economy for the year 1951-1952. The purpose of this project is to provide a systematic background for more detailed economic studies of specific sections of the economy in relation to certain of the Council's technical investigations, and to determine the coverage and internal consistency of certain available statistics on the Union's economic system.

An investigation into economic aspects of the saw-milling industry, on the basis of the operational research method was begun in association with the Wooden Packaging Research Fellowship established by the Lumber Millers' & Shook Manufacturers' Association in the National Mechanical Engineering Research Institute.

International Relations in Science

Since 1946, the South African Scientific Liaison Offices in London and Washington have been the Council's main agencies for international co-operation in science.

With the approval of the Government, steps have now been taken to establish a third office in Western Germany, which will work in close co-operation with the South African Embassy in Cologne.

Dr. J. P. van Zyl left South Africa in August, 1956, to take charge of this office. Dr. van Zyl, who was Chief of the Division of Chemical Services in the Department of Agriculture before retirement, has held a post in the Pretoria Office of the Liaison Division for the past two years.

The activities of the London and Washington Offices are summarized briefly at the end of this report. It is pleasing to record that the services of these offices which are available to all South African government agencies, universities, industrial firms, scientific institutions and individual scientists are being used to an increasing extent by bodies outside the immediate C.S.I.R. "family".

The Pretoria Office provides a link between the overseas offices and South African organizations on matters such as international meetings and representatives on committees, e.g., of the British Commonwealth and the O.E.E.C. Notices of international scientific and technical conferences are brought to the attention of scientists in South Africa and the offices overseas are informed of the travel programmes of South African scientists who plan to visit foreign parts.

Geofisiese Jaar 1957-1958 is een van die belangrike werksaamhede waarmee die Pretoriase kantoor hom besig hou aangesien dit sekretariële dienste lewer aan die Suid-Afrikaanse Nasionale Komitee van die Internasionale Geofisiese Jaar wat die Raad saamgestel het onder voorsitterskap van dr. T. E. W. Schumann, direkteur van die Weerbuuro. 'n Goed gebalanseerde program, in ooreenstemming met Suid-Afrika se wetenskaplike status, geografiese posisie en hulpbronne van wetenskaplike arbeidskragte en toerusting, is deur die Regering goedgekeur, en fondse hiervoor is deur die Parlement gestem.

Publikasies en Openbare Betrekkinge

Die hoofdoel van werk op hierdie gebied is om die navorsingswerksaamhede van die W.N.N.R. asook nuwe wetenskaplike en tegniese ontwikkelinge in ander dele van die wêreld onder die aandag van die algemene publiek en veral van die nywerheid te bring.

Inligting oor die werk van die W.N.N.R. word bekend gemaak deur middel van die Raad se Jaarverslag, die kwartaalblad *Navorsingsoorsig*, verklarings wat aan die Pers uitgereik word en deur algemene artikels in tegniese en handelstrydskrifte. Reëlins vir besoekers aan die W.N.N.R. en vir geleenthede soos die seremoniële



Dr. J. P. van Zyl.

South Africa's participation in the International Geophysical Year 1957-1958 is one of the major activities of the Pretoria Office, as it provides secretarial services to the South African National Committee which the Council set up under the chairmanship of Dr. T. E. W. Schumann, Director of the Weather Bureau. A well-balanced programme, which takes into account the particular advantages of South Africa's geographical position and the availability of scientific manpower and equipment, was approved by the Government and the funds voted by Parliament.

Publications and Publicity

The main object of activities in this field is to inform the general public and industry in particular about the research activities of the C.S.I.R. and about new scientific and technical developments in other parts of the world.

Information about the work of the C.S.I.R. is published in the Council's Annual Report, the quarterly *Research Review*, in statements to the Press and in general articles in technical and trade journals. Arrangements for visitors to the C.S.I.R. and for occasions such as the ceremonial inauguration of the cyclotron built by the National Physical Research Laboratory, performed by the Minister of Economic Affairs, Dr. the Hon. A. J. R. van Rhijn on 27th January, 1956, form an important part of this work.

A new development is a section to provide a central publishing service to C.S.I.R. laboratories, including duplicating, document reproduction, printing contracts and sale or distribution of C.S.I.R. publications.

Summaries of news items of scientific interest, received from the scientific liaison offices overseas, are issued weekly to the Press and to technical and trade journals in *Science News Selections*. Republication of these items has resulted in a gratifying number of inquiries for more detailed information.

In accordance with an arrangement made with the International Co-operation Administration (I.C.A.) in Washington and the European Productivity Agency (E.P.A.) in Paris, copies of the *U.S. Technical Digest* and the *E.P.A. Digest* produced by these bodies have been made available to *The Manufacturer*, official organ of the Federated Chamber of Industries, Johannesburg. These "Digests" comprise short summaries of articles in technical and trade journals, freed for republication outside the country of origin. The items are concerned chiefly with installations and processes for increasing productivity. In May, 1956, *The Manufacturer* began publication of a separate "Technical Digest Supplement" in which contents lists and selected items from these "Digests" are published.

ingebruikstelling van die Nasionale Fisiese Laboratorium se siklotron deur die Minister van Ekonomiese Sake, Sy Edele dr. A. J. R. van Rhijn, op 27 Januarie 1956, maak 'n belangrike deel uit van hierdie werk.

'n Nuwe ontwikkeling is 'n afdeling om sentrale publikasiediens aan die nasionale laboratoriums te verskaf in verband met duplisering, reproduksie van dokumente, kontrakte vir drukwerk, verkoop en verspreiding van publikasies van die W.N.N.R.

Opsommings van items van wetenskaplike belang wat van die wetenskaplike skakelkantore oorsee ontvang word, word weekliks aan die pers en tegniese en handelsblaaie uitgereik in die vorm van 'n *Keur van Wetenskaplike Nuus*. Herpublikasie van hierdie items het 'n bevredigende aantal navrae vir meer besonderhede uitgelok.

Volgens ooreenkoms met die Administrasie vir Internasionale Samewerking (I.C.A.) in Washington en die Europese Produktiwiteitsagentskap (E.P.A.) in Parys, is eksemplare van die *U.S. Technical Digest* en die *E.P.A. Digest* beskikbaar gestel aan *The Manufacturer*, die amptelike blad van die Gefedereerde Kamer van Nywerhede, Johannesburg. Hierdie uittreksels bevat kort opsommings van tegniese artikels wat in tegniese en handelstydskrifte verskyn het, maar vrygestel word vir herpublikasie buite die lande van oorsprong. Die items handel hoofsaaklik oor toestelle en prosesse vir die verhoging van produktiwiteit. *The Manufacturer* het in Mei 1956 begin met die publikasie van 'n „Technical Digest Supplement” waarin die inhoudslyste en uitgesoekte items uit hierdie uittreksels oorgeneem word.

WETENSKAPLIKE SKAKELKANTOOR, LONDEN

Mnr. A. M. Schady wat sedert April 1953 hoof van hierdie kantoor was, het na 'n dienstydperk van drie jaar in Londen, in April 1956 na die Pretoriase Kantoor teruggekeer en hy is opgevolg deur mnr. E. Boden.

Die Skakelkantoor in Londen het voortgegaan om spesifieke dienste te lewer en algemene verkenningwerk in verband met wetenskaplike inligting te doen. Met die toenemende aantal besoekende wetenskaplikes, tesame met 'n styging in die aantal versoeke vir dokumente, het hierdie diensfunksie die belangrikste werksaamheid uitgemaak.

Besondere aandag is geskenk aan atoomkrag, lug-besoedeling, outomatisasie, elektroniese rekenmasjiene en produktiwiteit, en baie verslae oor hierdie onderwerpe is na Suid-Afrika gestuur.

Besoekende Wetenskaplikes

Daar was 'n aansienlike styging in die aantal besoekers, terwyl besoekers van die Suid-Afrikaanse Buro vir Standaarde en Suid-Afrikaanse universiteite al hoe meer gebruik maak van die kantoor se dienste. Reisplanne is opgestel en reisreëlings getref vir 47 wetenskaplikes, waarvan nege nie in diens van die W.N.N.R. was nie.

SCIENTIFIC LIAISON OFFICE, LONDON

Mr. A. M. Schady, who had been chief of this office since April, 1953, returned to the Pretoria office in April, 1956, after a term of three years' service in London. He has been succeeded by Mr. E. Boden.

The office has continued to fulfil both a service function and an intelligence function. The increasing number of visiting scientists, together with an increase in the number of requests for documents, has tended to make the service function predominate.

Particular attention was paid to atomic energy, air pollution, automation, electronic computers and productivity, and many reports on these subjects were despatched to South Africa.

Visiting Scientists

There was a considerable increase in the number of visitors, while visitors from the South African Bureau of Standards and South African universities are making increasing use of the office. Itineraries and travel arrangements were prepared for 47 scientists, of whom 9 were not officers of the C.S.I.R.



Mr. Eric Boden.
Mnr. Eric Boden.

Tegniese Navrae

Drie-en-vyftig belangrike navrae is afgehandel wat heelwat ondersoekwerk vereis het. Sowat 19 verslae en skakelmemorandums is uitgereik waarvan die belangrikste handel oor meettoerusting vir wolkhoogte, temperatuur-gevoelige spanningslakke, spontane verhitting en verbranding van vismeel, spesiale juutsakke, gespesialiseerde ontleding van voedsels en van stowwe wat die aankleef van beton verhoed.

Hierdie kantoor het ook hulp verleen met die lisen-siëring in Brittanje van die W.N.N.R. se patent vir die Telekommunikasie-navorsingslaboratorium se Kristal-beheerde Ontvanger en Ontwikkelaar (Wadley).

Die hoof van die kantoor het Suid-Afrika verteenwoordig in die Loodskomitee van die Internasionale Navorsingsprojek vir die Ontsoouting van Water wat belê is deur die Nasionale Raad vir Industriële Navorsing (T.N.O.) in die Nederlande, en was ook behulpsaam met onderhandelinge tussen die W.N.N.R. en die T.N.O. in verband met patente en die uitruil van navorsingsinligting op die gebied van ontsouting.

Verhoudings met Suid-Afrika-huis

Die Hoë Kommissaris se kantoor het aansienlike bystand aan die Skakelkantoor verleen, terwyl hierdie kantoor weer hulp aan beamptes in Suid-Afrika-huis verleen het met die opstel van reisplanne vir staatswetenskaplikes en met die verkryging van chemikalieë en toerusting, en daarby ook, op versoek van die Hoë Kommissaris, Suid-Afrika op 'n hele aantal funksies van wetenskaplike aard verteenwoordig het.

Komitees

Die Wetenskaplike Skakelbeamptes het Suid-Afrika in die volgende komitees verteenwoordig: Werksgroep van die Wetenskaplike Konferensie van die Britse Statebond; Voedselondersoekraad van die D.S.I.R.; Organiserende Komitee van die Sweiswerkkonferensie van die Britse Statebond; Londense Sekretariaat van die Statebondskomitee vir Brandstofnavorsing; Werksgroep van die Adviserende Komitee van die Gemeenes oor Verdedigingswetenskap; Sentrale Sekretariaat van die Adviserende Raad van die Statebond insake Lugvaartnavorsing; O.E.E.C.-Komitee vir Produktiwiteit- en Toegepaste Navorsing; Loodskomitee vir die Koöperatiewe WaterontsoTINGSprojek; Komitee van die Britse Standaard-inrigting vir Gebruiklike Name vir Plaagdoders, en die Internasionale organisasie vir Standaardisasie. Lidmaatskap van laasgenoemde twee komitees is namens die Suid-Afrikaanse Buro vir Standaard onderneem.

Konferensies

Die hoof van hierdie kantoor het die President van die W.N.N.R. en die Suid-Afrikaanse afvaardiging vergesel na die konferensie in Genève oor die aanwending van

Technical Enquiries

Fifty-three major enquiries, which entailed considerably more investigation work, were handled. Some 19 reports and liaison memoranda were issued, the more important dealing with cloud height measuring equipment, temperature sensitive strain lacquers, spontaneous heating and combustion of fish meal, special jute bags, specialized analyses of foods and bond breakers in concrete.

This office has continued to assist with the developments arising from the licensing in Britain of the C.S.I.R. patent covering the Telecommunications Research Laboratory (Wadley) Crystal Controlled Receiver and Generator.

The Chief Scientific Liaison Officer has represented South Africa on the Steering Committee of the International Water Demineralization Research Project, organized by the National Council for Industrial Research in the Netherlands, (T.N.O.), and has been concerned with much of the negotiation between the C.S.I.R. and the T.N.O. in connexion with patents and the exchange of research information in the demineralization field.

Relations with South Africa House

The High Commissioner's Office has continued to give considerable assistance to the Liaison Office, while this office assists officials at South Africa House wherever possible in such matters as arranging itineraries for Government scientists and locating chemicals and equipment, and at the High Commissioner's request the Scientific Liaison Officers represented South Africa at a number of functions organized by learned societies and similar bodies.

Committees

The Scientific Liaison Officers represented South Africa on the following Committees: Working Party of the British Commonwealth Scientific Conference; D.S.I.R. Food Investigation Board; Organizing Committee of the British Commonwealth Welding Conference; London Secretariat of the Commonwealth Committee on Fuel Research; Working Party of the Commonwealth Advisory Committee on Defence Science; Central Secretariat of the Commonwealth Advisory Aeronautical Research Council; O.E.E.C. Productivity and Applied Research Committee; Steering Committee for the Co-operative Water Demineralization Project; the Common Names for Pesticides Committees of the British Standards Institution and the International Organization for Standardization. Membership of the latter two Committees was undertaken on behalf of the South African Bureau of Standards.

Conferences

The Chief Scientific Liaison Officer accompanied the President of the C.S.I.R. and the South African delegation to Geneva to the Conference on the Peaceful

atoomkrag vir vreedsame doeleindes; en Suid-Afrika is ook in Oslo verteenwoordig op die algemene vergadering van die Internasionale Raad van Wetenskaplike Unies.

Ander konferensies wat ook deur die wetenskaplike skakelbeampte bygewoon was, is die „International Congress of Documentation of Applied Chemistry”, die „Printing, Packaging and Allied Trades Research Association Letterpress Methods Conference” in Eastbourne, die „Ergonomics Conference” in Bristol en die „Cloud Physics Conference” in Londen.

Werwing van Personeel vir die W.N.N.R.

Deur middel van advertensies en ander middele was die kantoor ook behulpsaam met die werwing van 10 personeellede vir die W.N.N.R., en vir reëlings met hul reis na Suid-Afrika.

Suid-Afrikaners wat aan Universiteite in die Verenigde Koninkryk studeer, is by die Universiteit van Cambridge ontmoet om sodoende hul belangstelling te wek vir die werksaamhede van die W.N.N.R.

Die kantoor was ook in noue voeling met Suid-Afrikaanse immigrasiebeamptes in Den Haag.

Literatuur en Dokumente

In die afgelope jaar het die getal dokumente wat in antwoord op bepaalde versoeke verkry is, verdubbel terwyl die getal pakkette met dokumente en literatuur vervyfdubbel het.

WETENSKAPLIKE SKAKELKANTOOR, WASHINGTON

Die omvang en werksaamhede van hierdie kantoor het aansienlik uitgebrei gedurende die afgelope jaar, veral wat betref die aantal belangrike besoekende wetenskaplikes, die verkryging van dokumente en die aantal belangrike tegniese navrae wat gehanteer word.

Vir meeste van die sowat twintig belangrike besoekende wetenskaplikes is uitgebreide reisreëlings getref. Lede van Universiteite, die Buro vir Standaarde, die Geologiese Opname, die Raad op Atoomkrag, ens., het hierdie kantoor in groot mate vir dié doel gebruik.

Hoewel die ouer laboratoriums en institute steeds baie gebruik van hierdie kantoor maak vir tegniese navrae, is dit veral die nuut-gestigte organisasies soos die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese en die Nasionale Voedingnavorsingsinstituut wat hierdie kantoor baie waardevol vind vir die maak van kontakte en die inwin van inligting oor huidige navorsing in die V.S.A. en Kanada. Nagenoeg 20 persent van die navrae en projekte wat gehanteer word, is ten behoewe van sulke nuwer organisasies.

Die Wetenskaplike Skakelbeampte is ook die Wetenskaplike Attaché vir die Ambassade en namate die wetenskap en tegnologie 'n steeds belangriker rol speel

Use of Atomic Energy. During the same period, the Scientific Liaison Officer represented South Africa at the General Meeting of the International Council of Scientific Unions at Oslo.

Other conferences which the Scientific Liaison Officers attended included the International Congress of Documentation of Applied Chemistry, the Printing, Packaging and Allied Trades Research Association Letterpress Methods Conference at Eastbourne, the Ergonomics Conference at Bristol and the Cloud Physics Conference in London.

Recruiting Staff for C.S.I.R.

As a result of advertisements and other means, this office assisted with the recruiting of 10 officers for service with the C.S.I.R. and assisted them and their families in transferring to South Africa.

South Africans studying at universities in the United Kingdom were met at Cambridge University, in order to interest them in the activities of the C.S.I.R.

The office has been in close touch with South African immigration officials in The Hague.

Literature and Documents

In the past year the number of documents procured as the result of specific requests has increased twofold, while the number of parcels containing documents and literature has increased fivefold.

SCIENTIFIC LIAISON OFFICE, WASHINGTON

The extent and scope of the activities of this office have developed considerably during the year, mainly in connection with the number of eminent visiting scientists, the procuring of documents and the number of important technical enquiries handled.

Extensive itineraries have been arranged for some twenty important visiting scientists. Members of Universities, the Standards Bureau, Geological Survey, the Atomic Energy Board, etc., make extensive use of this office.

Although the older laboratories and institutes continue to make extensive use of this office for technical enquiries, it is especially the newly created organizations such as the National Mechanical Engineering Research Institute and the National Nutrition Research Institute that have found this office very useful for making the necessary contacts and for obtaining information on recent research work in the U.S.A. and Canada. About one-fifth of the enquiries and projects handled were on behalf of these newer organizations.

The Scientific Liaison Officer also acts as Scientific Attaché for the Embassy, and in view of the growing importance of the role played by science and technology

in wêreldaangeleenthede, word hierdie aspek al hoe belangriker. Die Wetenskaplike Skakelbeampte lewer ook dienste aan die Kanadese Hoë Kommissaris in Ottawa.

Werksaamhede op die gebied van atoomkrag het toegeneem en noue skakeling word in verband hiermee met die Ambassade gehandhaaf. Die Wetenskaplike Skakelbeampte was een van die vyf Suid-Afrikaanse afgevaardigdes op die konferensie van twaalf lande wat van die end van Februarie tot vroeg in April 1956 in Washington D.C. gehou is en die konsep-opdragte van die voorgestelde Internasionale Atoomkrag-agentskap opgestel het.

In samewerking met die Ambassade is reëlings getref om die tegniese biblioteek oor die gebruik van Atoomkrag vir vreedsame doeleindes, wat deur die Amerikaanse Regering aan Suid-Afrika geskenk is, aan die W.N.N.R. deur te stuur.

Na bywoning van die Internasionale Konferensie oor Sonkrag in Phoenix, Arizona, is 'n reeks besoeke gedurende Oktober en November 1955 aan navorsingsorganisasies en plantasies in Meksiko, Kuba en Florida gebring in verband met inligting oor die verwerking van stokroosvesel. 'n Omvattende verslag, vergesel van veselmonsters en 'n aantal gekleurde fotografiese skyfies van toerusting en werk, is aangestuur.

Tydens die besoek van die President van die W.N.N.R., dr. S. M. Naudé, aan Kanada teen die end van Februarie 1956, is 'n driedaagse besoek aan Ottawa gebring. In Augustus 1955 is besoeke gebring aan die Hoë Kommissaris se kantoor, die Nasionale Navorsingsraad en aan die firma Atomic Energy of Canada Limited, in Ottawa, aan Chalk River, en die Papierpap- en Papiernavorsingsinstituut in Montreal.

'n Totaal van 56 B.C.S.O.-verslae is aangestuur. Hierdie verslae word gewoonlik deur korttermynspesialisbeamptes van die Verenigde Koninkryk se Wetenskaplike Sending opgestel; verder is daar sowat 3,000 roetinestukke en ongeveer 1,000 spesiale dokumente, mikrofilms, fotostatiese afdrukke, ens., na Hoofkantoor gestuur. Inligting vir die W.N.N.R. se Inligtingsdiens *Keur van Wetenskaplike Nuis* is gereeld gestuur.

in world affairs today, this function becomes of increasing importance. Services are also being rendered for the High Commissioner in Canada.

Work in connection with Atomic Energy has increased and a close liaison is being maintained with the Embassy.

The Scientific Liaison Officer was one of the five South African delegates to the conference of 12 countries held in Washington D.C. from the end of February to early in April, 1956, and which drew up draft resolutions for the proposed International Atomic Energy Agency.

In co-operation with the Embassy, arrangements were made for the despatch to the C.S.I.R. of the technical Library on the peaceful use of Atomic Energy which was presented to South Africa by the American Government.

After attending the International Conference on Solar Energy in Phoenix, Arizona, a series of visits were made during October and November to research organizations and plantations in Mexico, Cuba and Florida to collect information on the treatment of kenaf fibre. A comprehensive report accompanied by fibre samples and a number of coloured photographic slides of equipment and operational procedures has been forwarded.

On the occasion of the visit to Canada by Dr. S. M. Naudé, President of the C.S.I.R., towards the end of February, 1956, the Scientific Liaison Officer made a three-day visit to Ottawa. In August, 1955, visits were made by him to the High Commissioner's Office, the National Research Council and Messrs. Atomic Energy of Canada Ltd., in Ottawa, to Chalk River and to the Paper Pulp and Paper Research Institute in Montreal.

A total of 56 B.C.S.O. reports has been forwarded. Usually these reports are drawn up by short-term special officers of the United Kingdom's Scientific Mission. In addition, about 3,000 routine reports and about 1,000 special documents, micro films, photostatic prints, etc., have been forwarded to Head Office. Information for the C.S.I.R. Information Service *Science News Selections* has been forwarded regularly.

Biblioteek- en Inligtingsafdeling

Hoof van Afdeling: MEJ. HAZEL MEWS

Gedurende die jaar het twee vername nuwe ontwikkelings plaasgevind in die organisasie van hierdie afdeling. Die eerste was die benoeming van 'n Advieskomitee vir die Biblioteek om die Raad van advies te bedien oor sake rakende sy Biblioteek. Twee vergaderings van hierdie Advieskomitee is gedurende die jaar gehou.

Die tweede ontwikkeling het ontstaan as gevolg van die snelle uitbreiding van werksaamhede in die Afdeling oor die afgelope tien jaar wat dit noodsaaklik gemaak het om die werk in twee klaarblyklike onderafdelings te verdeel, nl. (1) die Biblioteek en (2) die Inligtingsafdeling, elk onder beheer van sy eie verantwoordelike beampste. Hierdie reorganisasie is gedurende die jaar tot stand gebring en dit het baie bevredigend gewerk.

BIBLIOTEEK

Die Biblioteek bestaan uit twee dele, naamlik die Boekevoorbereidingsseksie en die Uitleenseksie.

Boekevoorbereidingsseksie (Katalogisering/Klassifikasie en Boekbestellings)

Hierdie Seksie het al die boekbestellings vir die W.N.N.R., die Biblioteek en vir die takbiblioteke gehanteer. Op 31 Julie 1956 het die totale getal publikasies van die Biblioteek op 24,056 te staan gekom; hiervan is 5,131 gedurende die tydperk 1 Oktober 1955 tot 31 Julie 1956 ontvang, wat 'n gemiddelde van meer as 500 boeke per maand beteken.

Al die werk verbonde aan die klassifikasie en katalogisering word deur hierdie seksie gedoen, behalwe in die geval van die pamflette van die Nasionale Instituut vir Personeelnavorsing en die agterstallige nommers van die Telekommunikasie-Navorsingslaboratorium. Gedurende die tienmaande-tydperk, het die Biblioteek se personeel 2,149 publikasies geklassifiseer en 1,913 gekatalogiseer, terwyl 537 by die bestaande kaartjies gevoeg is. Daar is egter 'n agterstand in die bereiding van die publikasies wat ontvang is, wat toegeskryf moet word aan 'n tekort van gekwalifiseerde personeel.

Uitleenseksie (Insluitende Takke)

Die aantal publikasies wat uitgeleen is beloop 19,897 oor die afgelope tien maande. Hierdie syfers sluit die uitreikings van die takbiblioteke in.

Library and Information Division

Head of the Division: MISS HAZEL MEWS

During the course of the year two important new developments took place in the organization of this Division. The first was the appointment of a Library Advisory Committee to advise the Council on matters concerning its Library. Two meetings of this Advisory Committee were held during the year.

The second development arose out of the rapid growth that had occurred in the work of the Division during the past ten years, indicating the necessity for dividing the work into the two obvious compartments of (1) "Library" and (2) "Information", each with its own officer-in-charge. This reorganization was put into effect during the year and has proved most satisfactory.

LIBRARY

The Library is divided into two sections, the Processing Section and the Lending Section.

Processing Section (Cataloguing/Classification and Book Orders)

This section handled all the book orders for the C.S.I.R., for the Library and for the branch libraries in four of the research institutes. On 31st July, 1956, the book stock of the Library totalled 24,056, of which 5,131 were received during the period 1st October, 1955, to 31st July, 1956, an average of over 500 books a month.

All the work connected with classifying and cataloguing is done by this section, except for the pamphlets of the National Institute for Personnel Research and the back publications of the Telecommunications Research Laboratory. During this ten months' period, the Library Staff classified 2,149 and catalogued 1,913 publications, while 537 were added to existing cards. There is, however, a backlog in the processing of these publications, due to shortages of qualified staff.

Lending Section (Including Branches)

The number of publications issued on loan totalled 19,897 for the past ten months. These figures include the issues of the branch libraries.



'n Gedeelte van die hoofbiblioteek in Pretoria, met die jongste tydskrifte en die pamfletdose in die agtergrond.

A corner of the main library in Pretoria with the current periodicals and pamphlet boxes in the background.

Een van die assistente in die Uitleenseksie is voltyds besig met aantekening van die ontvangs en rekordhou van die 1,600 tydskrifte wat die Afdeling ontvang, asook met die voorbereiding van die volumes vir inbinding (waarvan 594 na die inbinders versend is). Sy is ook verantwoordelik vir die uitstuur van aanmanings aan lesers vir die terugstuur van boeke wat aan hulle op bruikleen verskaf is.

Gedurende die jaar het hierdie seksie twee lysse van duplikate voorberei wat aan ander biblioteke gestuur is. Uit navrae wat as gevolg hiervan ontvang is, is 806 tydskrifte aan 31 ander biblioteke gestuur. Duplikate van nie-Amerikaanse publikasies is aan die United States Book Exchange gestuur in ruil vir publikasies wat die Biblioteek van hulle ontvang het.

INLIGTING

Navrae vir Inligting

Die Inligtingsafdeling het 476 navrae oor inligting behartig. Baie van hierdie navrae het lang bibliografiese ondersoekereis, waarvan sommige 'n lengte van sestien bladsye bereik het. Behalwe die verstrekking van Bibliografiese antwoorde op navrae, word versoeke wat in hierdie Afdeling nie deur middel van dokumentêre lektuur beantwoord kan word nie, aan ander laboratoriums

One of the assistants in the Lending Section was fully occupied in checking the arrival and records of the 1,600 periodicals received, and in the preparation of volumes for the binder (594 volumes were sent off during the year). She is also responsible for sending out notices to borrowers, reminding them to return the publications sent to them.

During the year, this section prepared two lists of duplicates, which were circularized to other libraries. As a result requests were received for 806 periodicals to be sent to 31 other libraries. Duplicate non-American publications are sent to the United States' Book Exchange, in exchange for publications received from them.

INFORMATION

Enquiries for Information

The Information Branch dealt with 476 enquiries for information. Many of these enquiries entailed long bibliographical searches, some of the reference lists compiled being up to sixteen pages in length. Apart from giving detailed bibliographical replies to enquiries, this section passed on to the laboratories, questions which could not be satisfactorily answered by reference to

deurgestuur vir die nodige beantwoording. Hierdie navraediens het baie uitgebrei gedurende die jaar en het 'n groot verskeidenheid van onderwerpe gedek.

Fotografiese Afdrukke

Hierdie seksie hanteer die navrae vir enkelvoudige kopieë van artikels in wetenskaplike tydskrifte. Dit is toelaatbaar om sulke enkelvoudige kopieë te maak van artikels in tydskrifte waarvan die uitgewers die Royal Society Fair Copying Declaration onderteken het. Die Fotografiese Seksie van die Nasionale Fisiese Laboratorium maak afdrukke van artikels uit tydskrifte wat in besit van die W.N.N.R. Biblioteek self is. Waar navrae ontvang word vir artikels in tydskrifte wat nie in die Unie is nie, word dit gestuur aan die W.N.N.R. se Skakelkantore in Londen en Washington wat die verlangde kopieë van biblioteke in Europa en Amerika kry. Die keuse van 'n kopie per lugpos word oorgelaat aan die navraer; hierdie metode is duurder, tog blyk dit dat die meeste versoeke vir lugposkopieë is. Gedurende die verslagjaar is 766 navrae ontvang (290 vir artikels plaaslik verkrygbaar, 176 deur die Londense kantoor en 300 deur die Washingtonse kantoor).

Katalogus van Tydskrifte in die Unie

Hierdie seksie hou die rekordkaartjies vir die wetenskaplike, tegniese en mediese afdelings van die *Catalogue of Union Periodicals* (Katalogus van Tydskrifte in die Unie). Hierdie kaartjies is deur die Universiteit Witwatersrand aan die W.N.N.R. oorhandig en word nou alfabeties volgens die titels van tydskrifte gerangskik. Die werkswyse sluit in die hertik van alle kaartjies wat oorgeplaas moet word. Gedurende Mei, Junie en Julie is 950 hoofopgawes en 89 skakelverwysings na die nuwe alfabetiese rangskikking oorgeplaas en 950 nuwe biblioteekontvangste is by die kaartjies gevoeg. Die nuwe rangskikking sluit nou 1,140 opgawes in (skakelverwysings ingesluit).

Gemeenes se Indeks van Vertalings

Suid-Afrika se stel van die Gemeenes se Indeks van Vertalings word deur hierdie seksie gehuisves en op datum gehou. Dit is 'n kaartindeks van wetenskaplike artikels wat in buitelandse tydskrifte verskyn het en waarvan vertalings deur sommige inrigtings in die Gemeenes gemaak is. Die betrokke inrigtings is bereid om hierdie vertalings uit te leen (of 'n kopie te laat maak) teen 'n fooi, of soms gratis, na gelang van omstandighede. Daar die gemiddelde prys van 'n vertaling £30 (syfer deur Aslib aangegee) beloop, is die besparing dikwels aanmerklik. Tot dusver is nog geen vertaling wat die W.N.N.R. nodig gehad het, met behulp van hierdie indeks gevind nie. 'n Negatiewe bewys van hierdie aard is egter ook van waarde omdat dit bewys het dat niemand anders se werk gedupliseer sou word indien die W.N.N.R. die vertalings self sou laat maak nie. Die res van die Gemeenes, veral Kanada, het baie vertalings wat hulle

documentary material alone. The enquiries service has expanded considerably during the year and covered a great variety of subjects.

Photographic Copies

This section handles requests for single photographic copies of articles in scientific periodicals. It is permissible to make such single copies of articles in journals whose publishers have signed the Royal Society Fair Copying Declaration. The Photographic Section of the National Physical Laboratory makes the photographic copies of articles from journals in the possession of the C.S.I.R. Library. When requests are received for articles in journals not held in the Union, these are passed on to the C.S.I.R. Liaison Offices in London and Washington and they obtain the required copies from libraries in Europe and America respectively. The enquirer is permitted to state whether he wishes the copy to be sent by airmail or not. If by airmail, he naturally pays more than if by seamount. In practice, it was found that most people want the copies by airmail. During the period under review the number of requests received was 766 (290 for articles held locally, 176 through the London office and 300 through the Washington office).

Catalogue of Union Periodicals

This section keeps the record cards of the science, technology and medical sections of the *Catalogue of Union Periodicals*. These cards were transferred to C.S.I.R. from the University of the Witwatersrand Library and were subsequently re-arranged alphabetically by title of journal. The procedure includes the re-typing of all cards to be transferred. During May, June and July, 950 main entries and 89 "see references" were transferred to the new alphabetical arrangement, and 950 new library holdings were added to these cards. The new arrangement now includes 1,140 entries (including "see references").

Commonwealth Index of Translations

South Africa's copy of the Commonwealth Index of Translations is housed and kept up-to-date by this section. It consists of a card index of scientific articles in foreign periodicals of which translations have been made in certain institutions in the Commonwealth; the institutions are willing to lend these translations (or have a copy made) for a certain fee, or at no cost, depending on the circumstances. As the average cost of a translation is £30 (Aslib's figure), the saving is often considerable. Thus far no translations needed by the C.S.I.R. were already available in the Commonwealth; this negative evidence was, however, of value in that it showed that if the C.S.I.R. had had translations made it would not have been repeating someone else's work. The rest of the Commonwealth countries, particularly Canada, have found many translations they needed in the Commonwealth Index. South Africa is gradually becoming more

nodig gehad het in die Gemenebes se indeks gevind. Suid-Afrika word stadigaan meer vertalingsbewus en tans word meer navrae as in die verlede ontvang. Kaartjies van die Russiese vertalingseksie van die Library of Congress wat op een tydstip op kaartjies uitgestuur is, is in die Indeks geliasseer asook die van eie vertalings wat deur die W.N.N.R. laboratoriums gemaak is. Van 1 Oktober 1955 tot 31 Julie 1956 is altesaam 3,111 kaartjies in hierdie Indeks geliasseer.

Publikasies

Hierdie seksie tree op as die uitgewers van die Biblioteek- en Inligtingsafdeling. Gedurende die jaar is die volgende werk in verband met sulke publikasies verrig: *Register van die huidige wetenskaplike navorsing aan Suid-Afrikaanse universiteite.*

Die 1955-volume van die *Register* is uitgegee en bevat besonderhede oor 545 navorsingsprojekte, vergeleke met 484 in 1954. Gedurende April 1956 is vraelyste vir die 1956-volume aan die universiteite gestuur en 535 ingevulde vorms is terug ontvang. Die rangskikking van hierdie volume, volgens afdelings en universiteite, is ook reeds voltooi.

Klaslyste

Die volgende klaslyste is uitgegee:

- (1) Biblioteek-klaslys nr. 9: *Boeke en pamflette oor druk en uitgee.*
- (2) Biblioteek-klaslys nr. 10: *Boeke en pamflette oor keramiek.*

Van klaslys nr. 9 is 150 eksemplare deur die Skakelafdeling aan die drukkersnywerhede gestuur en 'n verkorte verwerking van hierdie lys het sedertdien in *Print Review: a journal of the graphic arts in Southern Africa* verskyn.

W.N.N.R.-Inligting

Die maandelikse byvoegingslys, onder die titel: *W.N.N.R.-Inligting*, het elke maand verskyn, maar weens omstandighede in die boekevoorbereidingseksie was dit onmoontlik om te voldoen aan die standaard van ongeveer 300 items per uitgawe wat in die verlede dikwels bereik is.

ALGEMEEN

Nuwe Biblioteekgebou

Aangesien die nuwe biblioteekgebou nou voltooiing nader, word gehoop dat hierdie Afdeling voor die end van 1956 die gebou kan betrek.

Atoomenergiebiblioteek

Daar is ooreengekom dat die versameling atoomenergieboeke en verslae wat as geskenk van die Amerikaanse regering ontvang is, die blywende eiendom van die W.N.N.R. sal word. Hierdie publikasies, waarvan 'n

translation-minded and more such enquiries are received than formerly. The Division has inter-filed into the Commonwealth Index some entries from the Russian translation section of the Library of Congress, which at one time were sent out in card form, as well as those translations made by the C.S.I.R.'s own laboratories. During the period 1 October, 1955, to 31 July, 1956, a total of 3,111 cards was filed in this Index.

Publications

This section acts as the publishing department of the Library and Information Division. During the year the following work was done on such publications:

Register of current scientific research at South African universities.

The 1955 volume of the *Register* was issued and contains particulars of 545 research projects, compared with 484 in 1954. During April, 1956, questionnaires for the 1956 volume were sent to the universities, and 535 completed forms were returned. The arrangement of this volume by departments and universities has also been completed.

Class Lists.

The following class lists were issued:

- (1) Library class list no. 9: *Books and pamphlets on printing and publishing.*
- (2) Library class list no. 10: *Books and pamphlets on ceramics.*

Of class list no. 9, 150 copies were distributed by the Liaison Division to the printing industry, and a shortened version of this list was subsequently published in *Print Review: a journal of the graphic arts in Southern Africa.*

C.S.I.R. Information

The Division's monthly bulletin of accessions, under the title: *C.S.I.R. Information*, was duly issued each month. Owing to the difficulties in the Processing Section, it was impossible to keep up the standard of about 300 entries per issue achieved in some previous years.

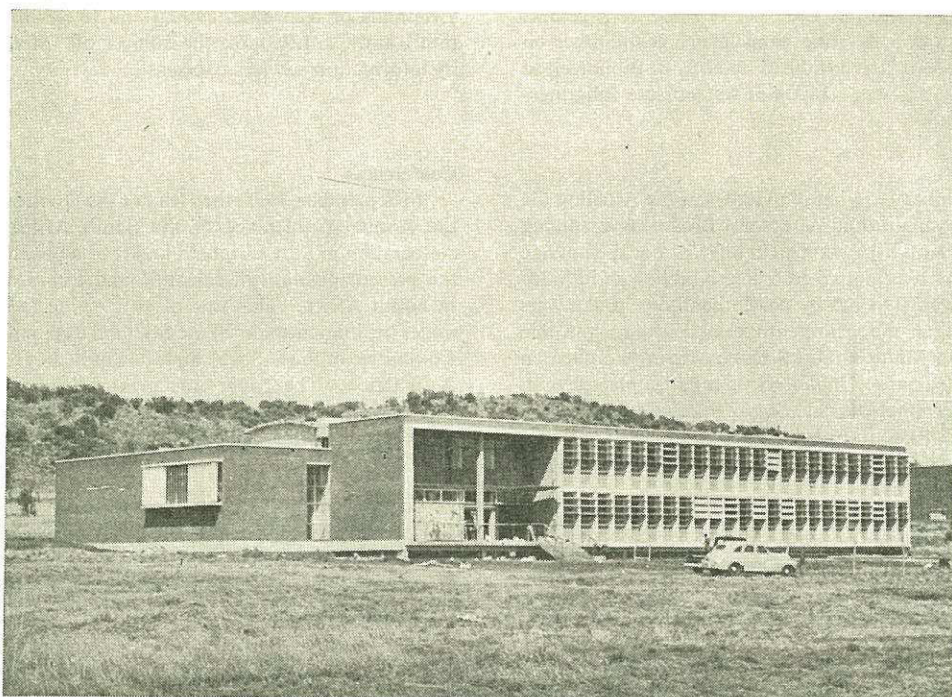
GENERAL

New Building

As the work on the new Library building is nearing completion, it is hoped that the Division will be able to move in towards the end of 1956.

Atomic Energy Library

It was agreed that the collection of books and reports on atomic energy, presented by the American government, should become the permanent property of the C.S.I.R. These publications, including many in the form of



Die nuwe biblioteek in aanbou. Die hoofbiblioteek sal hopelik nog voor die einde van 1956 na hierdie gebou oorgeplaas word.

A view of the new library building under construction at the C.S.I.R.'s new site. It is planned to transfer the main library from the old site to this building before the end of 1956.

aantal in die vorm van mikrokaarte is, sal berei en by ander atoomenergie-materiaal in die katalogus geïnkorporeer word: die Afdeling beskik reeds oor 'n aansienlike versameling van dergelike publikasies. In die nuwe gebou sal daar genoegsame ruimte wees om die versameling beskikbaar te stel vir raadpleging deur wetenskaplikes in Suid-Afrika.

Wetenskaplike Dokumentasie-Groep

Hierdie Afdeling het onlangs 'n klein groepie mense byeengeroep vir bestudering van die nuutste tegnieke van wetenskaplike dokumentasie. Daar is gevoel dat so 'n studiegroep 'n leemte kan aanvul in Suid-Afrika se kontakte met die snelle ontwikkelings oorsee wat betref die organisasie en inwinning van wetenskaplike, tegniese en mediese inligting. Die eerste vergadering van hierdie groep het op 29 Junie 1956 plaasgevind, en is bygewoon deur die Inligtingsbeampte van die African Explosives and Chemical Industries Ltd., die Bibliotekaresse van die Witwatersrandse Mediese Biblioteek, die Hoof van hierdie Afdeling, en die Inligtingsbeampte van hierdie Afdeling se Inligtingsdiens. Daar is besluit om twee onderwerpe uit die enorme veld van wetenskaplike en tegniese dokumentasie te kies, om te dien as 'n aanvangspunt vir so 'n studie. Die Inligtingspersoneel van African Explosives

microcards, will be processed and incorporated in the Library's catalogue with the considerable amount of atomic energy material already in the possession of the Division. In the new building there will be space for the collection to be made available for consultation by scientists in South Africa.

Scientific Documentation Group

The Division recently convened a small group for studying the latest techniques in scientific documentation. It was felt that such a study group would fill a gap in South Africa's contacts with the fast-growing developments overseas in the organization and retrieval of scientific, technical and medical information. The first meeting of this group took place on 29th June, 1956, attended by the Intelligence Officer of African Explosives and Chemical Industries, Ltd., the Librarian of the Witwatersrand Medical Library, the Head of C.S.I.R. Library and Information Division, and the Information Officer-in-Charge of the Information Section of the Division. It was decided to choose two topics from the huge field of scientific and technical documentation as a beginning of the studies. The African Explosives and Chemical Industries Ltd. Intelligence staff took the subject

and Chemical Industries Ltd., het as onderwerp gekies: „Metodes waarop inligting aangeteken, gekodifiseer en herwin kan word”, terwyl die W.N.N.R. se Biblioteek se onderwerp handel oor „Metodes wat oorsese Inligtingsdienste gebruik”.

Konferensies

In September 1956 het die Hoof van die Afdeling die Jaarkongres van die Suid-Afrikaanse Biblioteekvereniging in Port Elizabeth bygewoon en 'n referaat oor die huidige posisie van wetenskaplike en tegniese biblioteke in Suid-Afrika gelewer. Dit het by geleentheid van 'n aandvergadering onder die gesamentlike beskerming van die W.N.N.R. se Middellandse Streeknavorsingskomitee en die Suid-Afrikaanse Biblioteekvereniging plaasgevind. Hierdie referaat het later in „Suid-Afrikaanse Biblioteke”, van Januarie 1956, in Engels verskyn, terwyl 'n verkorte Afrikaanse vertaling in „Navorsingsoorsig” van Maart 1956 gepubliseer is.

In November 1955, het die hoof van die Afdeling per vliegtuig na Londen gereis om die eerste Internasionale Kongres in verband met die Dokumentasie van toegepaste Skeikunde en die daaropvolgende Gemenebeskonferensie oor Samewerking in Inligtingsdienste by te woon.

Skenkings

Gedurende die jaar het die Afdeling twee belangrike skenkings ontvang, die een was bovermelde Atoomenergieversameling van die Verenigde State van Amerika, en die ander die Biblioteek van wyle dr. S. Annecke, 'n deskundige op die gebied van malaria. Dit is besluit om dié boeke van dr. Annecke te behou wat van gespesialiseerde aard is; terwyl die orige publikasies aan Suid-Afrikaanse mediese inrigtings gestuur is. Die meeste van die handboeke is aan die nuwe Durbanse Mediese Fakulteit gestuur.

Soos in die verlede, het die Biblioteek gereeld uiters nuttige publikasies in groot getalle van die Britse Wetenskaplike en Nywerheidsnavorsingsdepartement en sy verwante navorsingsinrigtings ontvang.

“Methods of recording, coding and retrieving information”, and C.S.I.R. took the subject of “Methods used by information services overseas”.

Conferences

In September, 1955, the Head of the Division attended the Annual Conference of the South African Library Association in Port Elizabeth and read a paper surveying the present position of scientific and technical libraries in South Africa. This was at an evening meeting held under the joint auspices of the Midland Regional Research Committee of the C.S.I.R. and the South African Library Association. The paper was printed in *South African Libraries*, in English, in January, 1956, and a shortened Afrikaans version appeared in *Research Review*, of March, 1956.

In November, 1955, the Head of the Division flew to London to attend the First International Congress on Documentation of Applied Chemistry and the subsequent Commonwealth Conference on Co-operation in Information Services.

Gifts

During the year, the Division received two notable gifts, one being the United States Atomic Energy collection mentioned above, and the other the library of the late Dr. S. Annecke, the malaria specialist. It was decided to retain those of Dr. Annecke's books which were of a specialist nature, the rest were passed on to medical institutions in this country, most of the text-books being sent to the new Medical School in Durban.

As usual, the Library continued to receive large numbers of very useful publications from the British Department of Scientific and Industrial Research and its affiliated research institutions.

Nasionale Chemiese Navorsingslaboratorium

Direkteur: DR. W. S. RAPSON

Die toename in navorsingswerk ten behoeve van die nywerheid, staatsdepartemente en ander organisasies het voortgeduur. Aanvrae vir dienste van die Prosesontwikkelings- en Waterafdelings was veral baie groot, met die gevolg dat bykans die volle aandag van hierdie afdelings aan ondersteunde en gedeeltelik-ondersteunde projekte bestee is. Dit is gelukkig en van belang dat meeste van die ondersteunde navorsing 'n voortsetting is van werk wat reeds, in uitvoering van die laboratorium se goedgekeurde navorsingsprogram, aan die gang is. Die gevolg is dat die bedrywighede van die betrokke afdelings eerder versterk as gestrem was.

Die hoof-doelstelling van die Afdeling Prosesontwikkeling was dus, soos voorheen, om elektrodialitiese toerusting vir waterontsouting te ontwikkel. Die rigting en tempo van die werk is egter bepaal deur die dringende behoefte van die goudmynbedryf in die Oranje-Vrystaat vir 'n ekonomiese metode vir suiwering van ondergrondse brakwater wat gedurende mynoperasies uitgedomp word. Hierdie behoefte het tot gevolg gehad dat die projek die volgehoue ondersteuning van die goudmynbedryf geniet het, maar die snelle uitbreiding van die werk vir die myne het die ontwikkeling van eenhede vir plaasgebruik vertraag.

In die Waterafdeling het die toenemende industriële, stedelike en landboukundige ontwikkeling tot so 'n vinnige toename in die aantal aanvrae vir ondersoekwerk gelei dat die arbeidskragte van hierdie afdeling aan voortdurende spanning onderwerp is. As gevolg van die nuwe Waterbewaringswet van 1956 wat 'n samevatting en wysiging is van die ou wette met betrekking tot die beheer, bewaring en gebruik van water vir huishoudelike, landbou-, stedelike en nywerheidsdoeleindes, kan dit verwag word dat aanvrae om hulp verder sal toeneem en dat die hele organisasie van die Afdeling hersien sal moet word in die lig van die wetlike verantwoordelikhede wat dit in die toekoms sal moet dra.

In Suidwes-Afrika is die laboratorium van die Afdeling se streekseenheid in Windhoek nou deur die Departement van Werke voltooi. Ooreenkomstig die kontrak met die Administrasie, verskaf die laboratorium die personeel vir die ondersoek van waterprobleme.

Die Provinsiale Administrasie van Natal het 'n aansienlike skenking gemaak vir die opbou van 'n streekseenheid van die Waterafdeling in Natal om plaaslike ondersoekwerk vir die Administrasie en vir die Natalse

National Chemical Research Laboratory

Director: DR. W. S. RAPSON

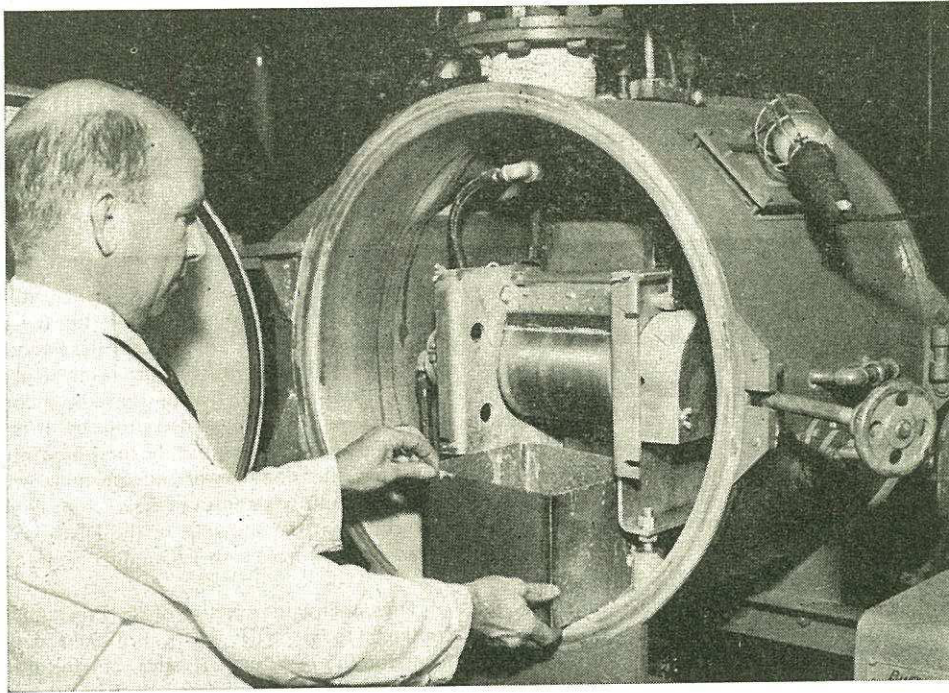
The steady increase in the volume of work carried out for Industry, Government Departments and for other organizations has continued. Calls for the services of the Process and Water Divisions of the Laboratory have been particularly heavy, with the result that almost the full resources of these Divisions have been committed to sponsored or partly-sponsored projects. It is significant and fortunate that the bulk of the sponsored investigations have been extensions of work already under way in terms of the Laboratory's approved research programme, with the result that the activities of the Divisions concerned have been reinforced rather than disorganized.

Thus, the main objective of the Process Division has continued to be the development of electro-dialytic equipment for the desalting of water, but the direction and tempo of the work have been determined by the urgent need of the Gold Mining Industry in the Orange Free State to evolve an economic method for the purification of the brackish water pumped from underground during mining operations. This need has resulted in continued support of the project by the Gold Mining Industry, but the rapid development of the work for the mines has delayed work on the development of units for farm use.

In the Water Division, the impact of increasing industrial, urban and agricultural development has led to such a rapid increase in the number of requests for investigational work that the resources of the Division have been under continuous strain. As a result of the passing in 1956 of the act to consolidate and amend the laws in force in the Union relating to the control, conservation and use of water for domestic, agricultural, urban and industrial purposes, it can be expected that requests for assistance will increase further and that the whole organization of the Division will have to be reviewed in the light of the statutory responsibilities which it will have to carry in future.

In South West Africa, the laboratory for a regional unit of the Division in Windhoek has been completed by the Department of Works and, in terms of the contract with the Administration, the laboratory has been staffed and equipped for the investigation of water problems.

In addition, the Natal Provincial Administration has



Die ontwatering van melk in 'n roterende vakuumdroër voordat met die ekstraheer van fosfolipiede begin kan word.

Drying milk in a rotary vacuum drier prior to the extraction of phospholipids.

nywerhede te onderneem. Hierdie skenking is 'n toevoeging tot die Administrasie se ondersteuning vir die Natalse Dorps- en Streeksbeplanningskommissie van die Riviernavorsingsprojek wat vir 'n verdere tydperk van drie jaar verleng is.

Met die Skakelafdeling van die W.N.N.R. is ooreengekom dat een van die beamptes van die streekseenheid van die Waterafdeling in Natal die verantwoordelikheid sal oorneem vir industriële skakelwerk in hierdie gebied. Dit is in ooreenstemming met die reëling in die Kaapprovinsie, waar die beampte van die streekseenheid van die Organiese Afdeling ook verantwoordelik is vir industriële skakelwerk.

Die Nasionale Kankervereniging van Suid-Afrika het fondse beskikbaar gestel vir die indiensneming gedurende die jaar van twee navorsingsbeamptes op die gebied van kankernavorsing. Verder is nog 'n beursooreenkoms met 'n industriële firma aangegaan, waarvolgens 'n beursohouer in diens geneem sal word om navorsings- en ontwikkelingsprojekte, waarin die firma geïnteresseerd is, te bestudeer.

made a substantial grant towards the building up of a regional unit of the Water Division in Natal, which could undertake investigational work for it and for Natal industries on the spot. This grant is in addition to its support via the Natal Town and Regional Planning Commission of the Natal Rivers Research Fellowship, which has been extended for a further period of three years.

By arrangement with the C.S.I.R. Liaison Division one of the officers assigned to the regional unit of the Water Division in Natal has taken over responsibility for industrial liaison activities in the area. This arrangement is similar to that for liaison in the Cape, where the officer in charge of a regional unit of the Organic Division is also in charge of industrial liaison.

The National Cancer Association of South Africa has made funds available for the employment of two research officers on cancer research during the year, and in addition a further fellowship agreement has been entered into with an industrial firm, on the basis of which a research fellow will be employed to study research and development projects in which this firm is interested.

Akkomodasiemoelikhede het gedurende die jaar voortgeduur, en daar was vertraging in die opstel van planne vir die permanente geboue op die nuwe terrein. Met die akkomodasie wat beskikbaar sal word as gevolg van die verhuising van die Nasionale Fisiese Navorsingslaboratorium na die nuwe geboue aan die einde van 1956, sal die huidige posisie egter in 'n mate verlig word.

MINERAALPRODUKTE

Klei

In die vorige verslag is melding gemaak van 'n stelselmatige opname van klei- en skaliesoorte wat gebruik word vir die vervaardiging van boustene in Suid-Afrika. 'n Onderzoek van 'n groot aantal monsters is afgehandel waarvan die meerderheid uit Transvaal en enkele uit die omgewing van Port Elizabeth afkomstig is.

'n Aantal monsters betonaggregaat, wat vermoedelik vir betonkrimp verantwoordelik is, is in samewerking met die Nasionale Bounavorsingsinstituut ondersoek. Met behulp van geskikte fraksionering en voorbereiding vir röntgen-ondersoek, is montmorilloniet in al die monsters aangetoon.

Fosfate

Heelwat aandag is gedurende die jaar geskenk aan die moontlikheid om kalsium- en natriumfosfaat uit natuurlike aluminium-ysterfosfaaterts te produseer. Proefwerk is op twee metodes onderneem: een wat handel oor die bytsodaverteringsproses, en die ander oor 'n droë proses.

Vanadium in Chromiet

Die vanadiuminhoud van Transvaalse chromiet is stelselmatig ondersoek, en 'n verslag daarvoor opgestel. Die persentasie vanadium is oor die algemeen klein, naamlik 0.2 persent, hoewel hierdie syfer hoër is as die normale vanadiuminhoud van oorsese chromiete. Dit blyk dat die vanadiuminhoud direk eweredig met die totale ysterinhoud varieer. In 'n vorige studie wat enige jare gelede op chromiet onderneem is, is vanadium nie bepaal nie en dus is dit nodig om die waardes wat destyds vir die chroominhoud aangegee is, nou te korrigeer.

Piriet-as

Met die oog op die moontlike benutting van piriet-as, wat by die vervaardiging van swawelsuur ontstaan, is die seleen- en germaniuminhoud van 'n aantal monsters uit 'n paar fabriekke bepaal. Daar is egter geen aanduiding van ekonomiese ontginbare persentasies van hierdie elemente gevind nie.

Olie uit Steenkool

Soos in die vorige Jaarverslag gemeld, is 'n ondersoek na sekere fundamentele probleme wat betrekking het tot die Fischer-Tropschproses, aangevoer. Dit sluit in 'n studie van die promotorwerking in Fischer-Tropsch- en aan-

Accommodation difficulties have continued during the year, and there have been delays in the drawing up of plans for the permanent buildings on the new site. With the accommodation made available as a result of the moving of the National Physical Research Laboratory to its new buildings at the end of 1956, however, the present position will be eased in some measure.

MINERAL PRODUCTS

Clays

In the last report, the initiation of a systematic survey of clays and shales used for building bricks in South Africa was described. Work was rounded off on a large group of samples, which were obtained mainly from the Transvaal, but which included a few from the Port Elizabeth area.

In collaboration with the National Building Research Institute, a number of samples of concrete aggregates suspected of giving rise to shrinkage in concrete were examined. In all cases, by suitably fractionating and preparing the samples for X-ray examination, evidence was obtained of the presence of montmorillonite.

Phosphates

The possibility of production of calcium and sodium phosphates from naturally-occurring aluminium and iron phosphates has been given a considerable amount of attention in the past year. Experimental work was undertaken on two methods, one involving digestion with caustic soda, the other a dry process.

Vanadium in Chromite

A systematic examination of vanadium content of Transvaal chromites has been completed and reported. The percentage is generally small, about 0.2%—although this figure is higher than the normal vanadium content of overseas chromites. It appears that the vanadium content varies in direct proportion to total iron content. In an earlier study of chromites, made some years ago, vanadium was not estimated, and it is therefore necessary to correct the previously reported values for chromium.

Pyrites Cinders

With a view to finding possible uses for pyrites cinders resulting from sulphuric acid manufacture, selenium and germanium were determined for representative samples obtained from a number of factories. No indication of economically useful percentages of either element has been found.

Oil from Coal

As discussed in last year's report, certain fundamental studies with a bearing on the Fischer-Tropsch process have been initiated. These include studies of promoter action in Fischer-Tropsch and related catalysts, and

verwante katalisatore, sowel as 'n studie van die outoksidasië van minvertakte langkettingkoolwaterstowwe, soos dié wat gedurende sintese in die wasfraksie voorkom.

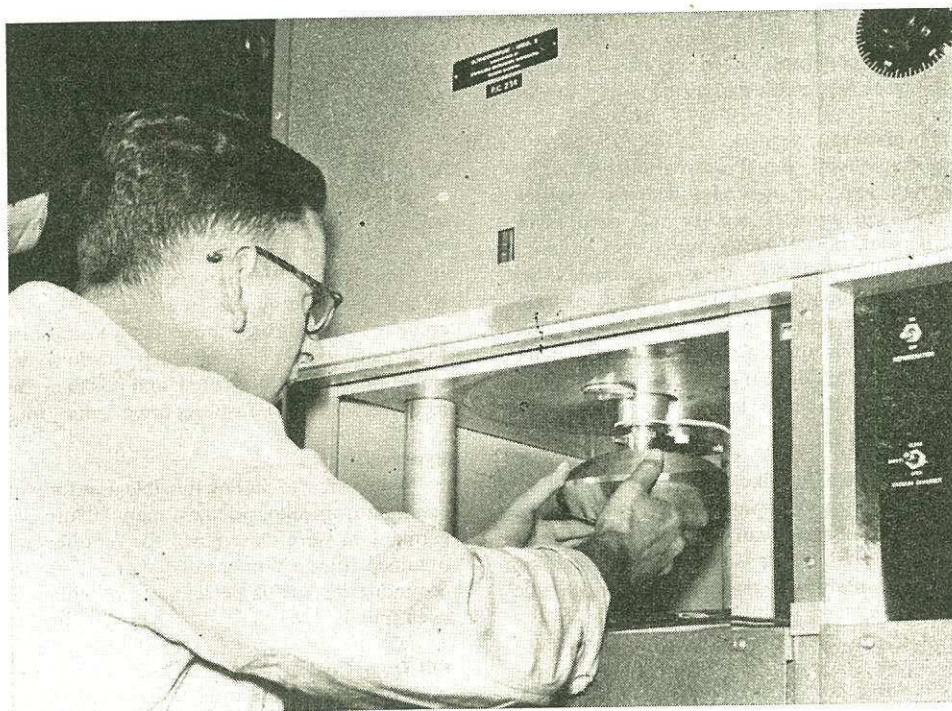
Die katalisator-studies is begin met die bereiding van hoogs rein, Fe_2O_3 -bevattende spinelle, waaruit yster in intieme vermenging met verskeie oksiede of metale deur reduksie verkry kan word. Spinelle (ferriete) met MgO , ZnO , CdO , CuO en Li_2O is reeds berei, asook rein Fe_3O_4 vir suiwer ysterkatalisatore; laasgenoemde materiaal is berei deur Fe_2O_3 met mengsels van waterstof en waterdamp te reduseer. Fisiese adsorpsie en chemisorpsie eienskappe is bestudeer.

Slegs beperkte vordering is met die outoksidasiestudie van die Fischer-Tropsch modelkoolwaterstof, 5-metiel-nonaan, gemaak. 'n Hoeveelheid van hierdie nuwer koolwaterstof is gesintetiseer. Verder is daar met die ontwikkeling van ontledingsmetodes vir die outoksidasië-produkte gevorder. Afgesien van die gewone metodes, word die moontlikheid ondersoek om gaskromatografie en massaspektrometriese analise aan te wend. Fasiliteite vir gespesialiseerde massaspektrometrie is beperk, en dit dien vermeld te word dat die Shell Co., V.S.A., goedgegunstiglik onderneem het om die massaspektrometriese ontleding van 'n aantal outoksidasiëprodukte uit te voer. 'n Posing word ook aangewend om die kinetika van die outoksidasië van die koolwaterstof in die gasfase te volg.

studies of autoxidation of slightly branched long chain hydrocarbons such as are produced in the wax fraction during synthesis.

For catalysts, attention was first directed to production of very pure Fe_2O_3 -containing spinels, from which iron could be produced by reduction in very intimate admixture with various oxides or metals. Spinels (ferrites) with MgO , ZnO , CdO , CuO , Li_2O have been prepared, and also pure Fe_3O_4 , by reduction of Fe_2O_3 with hydrogen/water vapour mixtures, for pure iron catalysts. Physical adsorption and chemisorption properties were studied.

Only limited progress was made on studies of autoxidation of the model Fischer-Tropsch hydrocarbon, 5-methyl-nonane. Quantities of the pure hydrocarbon have been synthesized and progress has been made in the development of analytical methods for the autoxidation products. Apart from regular methods, possibilities of using gas chromatography and mass spectrometry are being assessed. Facilities for specialized mass spectrometry are limited, and it is to be recorded that research laboratories of the Shell Oil Co., U.S.A., have kindly agreed to carry out mass-spectrometric analysis of some derived autoxidation products. An attempt has been made to follow kinetics of autoxidation of the hydrocarbon in the gas phase.



Die rotor word aan die ultrasentrifuge gekoppel vir die ondersoek van groente-proteïene.

The rotor is attached in the ultracentrifuge during an investigation of vegetable proteins.

DIERLIKE PRODUKTE

Die Chemie van Wolvesels

Hierdie werk is deur 'n beursskenking van die Suid-Afrikaanse Wolraad moontlik gemaak. Verlede jaar is vermeld dat 'n nuwe metode ontwikkel is vir die bepaling van sulfhidriël-groepe in wolvesels. Die studie van hierdie groepe het nou gelei tot 'n teorie oor hul uitwerking op sistienverbindinge om sodoende die stadige elastiese uitrekking van wolvesels te verklaar.

Die program vir die vergelyking van normale wol met wol van skape wat ly aan 'n kopertekort, is voortgesit en alle aandag is toegespits op die bepaling van N-terminale aminosuurreste in die twee genoemde wolsoorte. Dit het gelei tot die gevolgtrekking dat wol van skape wat aan 'n kopertekort ly, omtrent viermaal soveel N-terminale glisien en tweemaal soveel N-terminale alanien bevat as gewone wol. Soms bevat dit meer N-terminale glutamien-suur en serien, maar dit bevat dieselfde hoeveelheid N-terminale treonien en valien. Die gevolgtrekking hieruit is dat wol afkomstig van skape met 'n kopergebrek, aansienlik korter kettlinglengte het as normale wol, en hierdie verskynsel is heelwaarskynlik verwant aan die swakker meganiese eienskappe.

'n Studie van Wolwas

'n Vergelykende analise van wolwas wat verkry is van die buitenste derde en van die binneste derde van die wolvesels, het getoon dat wolwas uitgebreide outoksidasie ondergaan by blootstelling van skape aan die weer. As gevolg van die groot verskeidenheid outoksidasieprodukte in die was afkomstig van die buitekantste vesels, was dit nie moontlik om 'n volledige analise hiervan te maak nie. 'n Feitlik volledige analise is egter gemaak van die was uit die binneste vesels, wat betreklik onveranderd gebly het na afskeiding.

Om die aard van die verweringsprodukte van wolwas te ondersoek, is 'n studie gemaak van die outoksidasie van dihidrolanosterolasetaat en hierdeur is die verloop van die primêre verandering met 'n groot mate van sekerheid vasgestel. Hierdie resultate, tesame met inligting verkry by die oksidasie van cholesterol in ander laboratoria, verskaf 'n duidelike insig in die aard van die veranderinge wat wolwas ondergaan by blootstelling aan die weer. Ook gee dit sekerheid oor die aard van die outoksidasieprodukte wat in kommersiële wolwas voorkom.

Dierlike Fosfolipiede

Voortvloeiend uit die studie van die vergalstering van botter gedurende bewaring, word die aanwesige fosfolipiede ondersoek. Die fosfolipiede in die bloedsêrum van die bobbejaan is tans ook onder die soeklig (sien hieronder).

Visolies

Die studie van visolies is voortgesit met finansiële steun deur Marine Oil Refiners of Africa. 'n Dokosahek-

ANIMAL PRODUCTS

Wool Fibre Chemistry

This work has been carried out under a Fellowship sponsored by the Wool Board. It was reported last year that a new method had been developed for estimation of sulphhydryl groups in wool. Studies of these groups have now led to a theory of their interaction with cystine linkages to explain slow, elastic stretching of wool fibres.

The programme on comparison of normal wool with wool from copper-deficient sheep has been continued, and attention has been concentrated on measurement of the N-terminal amino-acid residues in wool from normal and copper-deficient sheep. This has led to the conclusion that wool from copper-deficient sheep contains about four times as much N-terminal glycine and twice as much N-terminal alanine as normal wool. It sometimes contains more N-terminal glutamic acid and serine, but it has the same amount of N-terminal threonine and valine. The conclusion is that copper-deficient wool has an appreciably shorter chain length than normal wool and this is probably connected with its poorer mechanical properties.

Wool Wax Studies

A comparative analysis of wool wax extracted from the inner third of wool fibres with that from the outer third has shown that wool wax undergoes extensive autoxidation when sheep are exposed to the weather. It was not found possible to analyse completely the wax from the outer fleece because of the multiplicity of autoxidation products, but an almost complete analysis of the inner fleece wax, which was relatively unchanged after secretion, was achieved.

In order to find out the nature of the products formed in the weathering of the wax, a study has been made of the autoxidation of dihydrolanosterol acetate and the nature of the primary changes taking place has been elucidated. This work, together with similar work in other laboratories on the autoxidation of cholesterol, gives a good picture of the changes which occur when wool wax is exposed to the weather, and of the nature of the autoxidation products present in the commercial wax.

Animal Phospholipids

Arising from the study of the deterioration of butter during storage, the phospholipids present are under examination. The phospholipids in the blood serum of the baboon are also under study (see below).

Marine Oils

Studies of marine oils have continued under the sponsorship of Messrs. Marine Oil Refiners of Africa.

saeenoësuur is verkry van sardiensolie deur gebruik te maak van tegnieke wat alreeds toegepas is. Hierdie suur is nie so suiwer as die heksadekatetraenoë- en eikosapentaenoësuur nie wat alreeds berei is. Verdere suiweringstegnieke word ondersoek.

Termiese Polimerisasie van Olies

As voortsetting van vorige werk op termiese polimerisasieprodukte van metiel beta-eleosteraat, word aandag geskenk aan die hitte-veranderde monomeer, wat by 'n betreklik lae temperatuur berei word (180°). Dit is getoon dat ringsluiting al langs die ketting voorkom met die totstandkoming van verskeie strukturele vorms, insluitende die 1:2-dialkiel-3:5-sikloheksadiene as die waarskynlike primêre produk.

Isomerisasie van Diëne deur Alkalië

Dr. B. de Surville van die Centre National de la Recherche Scientifique in Parys, beurshouer onder die uitruilstelsel tussen die Franse en Suid-Afrikaanse Regerings, werk tans op bogenoemde onderwerp. 'n Etileen-onderbreekte diënsuur (geheel-en-al *cis* trideka-5:8-dieenoësuur) word gesintetiseer. Deur behandeling met alkali sal dit dan getoets word of in sulke strukture dubbelbandomskakeling na gekonjugeerde dubbelbindings kan plaasvind. Hierdie kennis is van belang in die bepaling van die strukture van visolies.

A docosahexaenic acid has now been obtained from pilchard oil using the previously applied techniques. The acid is not as pure as the hexadecatetraenoic and eicosapentaenoic acids already obtained. Further purification techniques are being explored.

Thermal Polymerisation of Oils

In continuation of previous work on the structures produced during the thermal polymerisation of methyl betaealeostearate, attention was given to the heat-altered monomer prepared at a comparatively low temperature (180 degrees). It was shown that cyclization along the chain occurs with the formation of various structural types including the 1:2-dialkyl-3:5-cyclohexadiene as the probable primary product.

Alkali Isomerisation of Dienes

Dr. B. de Surville of the Centre National de la Recherche Scientifique, Paris, bursar under the exchange system between the French and South African Governments, is working on the above subject. An ethylene-interrupted diene acid (all *cis* tridec-5:8-dienoic acid) is being synthesized for treatment with alkali in order to see if double bond rearrangement to conjugated dienes can occur in such structures. This information is important for structural diagnosis in marine oils.



Die isolering van ensiemes in 'n studie van die bitterstof in komkommers.

The isolation of enzymes in a study of bitter principles from cucumbers.

PLANTPRODUKTE

Lupiensaadproteïene

Die globuliene van geel lupiene (*Lupinus luteus*) is gekarakteriseer. Verder is die suiwer globuliene van blou lupiene (*L. angustifolius*) en geel lupiene op 'n voldoende groot skaal berei vir ontleding van aminosure volgens die Moore en Stein-metode. Dit het duidelik aangetoon dat die verskillende globuliene in 'n gegewe lupien van verskillende samestelling is. Van meer belang is dat dit aandui hoe gevaarlik dit is om 'n algemene naam te gee aan globuliene wat soortgelyke fisiese eienskappe besit, byvoorbeeld visilien en legumien in die Leguminosae. Die fisiese eienskappe van die globuliene wat dissosieer en wat die hoofbestanddele van blou en geel lupiene uitmaak, is baie eenders, maar hulle toon kenmerkende verskille in aminosuursamestelling.

Die proteïene van saad van wit lupiene (*L. albus*) is geskei in die individuele globuliene wat gekarakteriseer is. Aangesien daar twee proteïene voorkom wat omkeerbaar dissosieer in halfmolekule, was die proefskeding van die twee proteïene baie moeilik. Beide het eenderse molekulêrgewigte wanneer geassosieer, maar terwyl die een as 'n hoofkomponent voorkom, kom die ander alleen in klein hoeveelhede voor.

Kasteroliesaad-proteïene

Alhoewel 'n volledige studie gemaak is van die toksiese proteïen, risien, wat in klein hoeveelhede voorkom, is daar nog niks op die vernaamste bestanddeel gedoen nie. Dit is gevind dat kasteroliesaad hoofsaaklik 'n enkel globulien bevat wat suiwer berei en gekarakteriseer is.

Boontjie-proteïene

Proteïene afkomstig van agt variëteite van die spesies (*Phaseolus vulgaris*) is in die ultrasentrifuge ondersoek en geen kenmerkende verskille is in die sedimentasiediagramme gevind nie. 'n Soortgelyke diagram is ook gegee deur Johnson se Lima-boontjie (*Phaseolus lunatus*), maar boerboontjies het 'n verskillende groep proteïene aangetoon. Geeneen van bogenoemde het proteïene bevat wat dissosieer nie. Die proteïene van twee kafferboontjievariëteite en ook die van Kentucky Wonderboontjie het komponente bevat wat dissosieer. Tot dusver is nog geeneen van bogenoemde in suiwer komponente geskei vir karakterisering nie.

Elaterase

Hierdie beta-glukosidase hidroliseer bitterstof-glikosiede (sien hieronder) baie vinnig. Verder word 'n verskeidenheid van ander glukosiede, waaronder vier hartgifglikosiede, teen 'n redelike snelheid gehidroliseer, altyd met die verlies van slegs een molekule glukose. Van vrugte van *Cucumis myriocarpus* is 'n hoeveelheid onsuier ensiem verkry, maar nadat dit deeglik gesuiwer is, het die finale produk wat 60 persent van die aktiwiteit van die onsuier bereiding bevat het en wat homogeen in die ultrasentrifuge was, heterogeen geblyk te wees na ondersoek in die elektroforese-apparaat.

PLANT PRODUCTS

Lupin Seed Proteins

The globulins of yellow lupin (*Lupinus luteus*) were characterized. In addition, the pure globulins of blue lupin (*L. angustifolius*) and of yellow lupin were separated on a large enough scale to carry out amino-acid analyses by the Moore and Stein method. This shows clearly that the different globulins in a given lupin are of different composition. More important, it shows the danger of giving a common name to globulins which have similar physical properties in a group of closely related plants, e.g., vicilin and legumin in the Leguminosae. The dissociating globulins which form the major constituent of blue and of yellow lupins are very similar in physical properties, but they show significant differences in amino-acid composition.

White lupin (*L. albus*) seed protein was separated into individual globulins and these have been characterized. Experimentally, the separation was most difficult, since there are two proteins which dissociate reversibly into half-molecules. Both have similar molecular weights when associated, but one is a major constituent and the other a minor constituent.

Castor Bean Proteins

Though the toxic protein, ricin, which is a minor constituent, has been well studied, the major constituents have not. It was found that the seed protein consists mainly of a single globulin which has been separated pure, and characterized.

Bean Proteins

Protein fractions obtained from eight varieties of the species *Phaseolus vulgaris* were examined in the ultracentrifuge and found to show no significant difference in sedimentation pattern. A similar pattern was also given by Johnson's Lima bean (*Phaseolus lunatus*); but broad bean (*Vicia faba*) showed a different group of proteins. None of the above showed evidence of dissociating proteins. The proteins from two cow pea varieties and also from Kentucky Wonder bean contained dissociating proteins. Thus far, none of the above has been separated into pure protein fractions for characterization.

Elaterase

This beta-glucosidase hydrolyses bitter principle glycosides (see below) very rapidly. In addition, a variety of other glycosides including four cardiac glycosides are readily hydrolyzed, always with a loss of only a molecule of glucose. From fruits of *Cucumis myriocarpus* a quantity of crude enzyme was obtained but, when this was subjected to stringent purification, the final product containing 60 per cent. of the activity of the crude preparation, although homogeneous in the ultracentrifuge, was still heterogeneous when examined electrophoretically.

Kafferkoring

Soos reeds in die vorige jaarverslag vermeld, is 'n beurs deur die Instituut van Administrateurs vir Nie-blanke Aangeleenthede beskikbaar gestel om meer personeel vir hierdie werk te verskaf. As gevolg van die aanstelling van 'n beurshouer en vier assistente is die tempo van die werk aansienlik versnel. Verskeie brouers en moutmakers het vir kort periodes by die Nasionale Chemiese Navorsingslaboratorium gewerk om die metodes van mout-ontleding aan te leer.

Meeste van die werk oor die mout van kafferkoring is uitgevoer op die kort rooikorrel-variëteit. Die uitwerking van verskillende weekmetodes en ontkiemingstemperatuur op die versuikeringsvermoë van die mout is in die laboratorium ondersoek. 'n Gekombineerde moutingsproef is gereël waarin 'n aantal kommersiële en munisipale moutmakers 'n eenvormige monster kort, rooi-kafferkoring gemout het om die resultate wat met verskillende moutingsmetodes in die praktyk verkry kan word, te vergelyk met dié van die laboratoriumproewe. Daar is ook ingegaan op die mouting van witkafferkoring, mielies, nyati en rapoko. Dit was nie moontlik om 'n mout met 'n hoë versuikeringsvermoë van mielies te verkry nie, nóg op groot skaal nóg in die laboratorium. Alhoewel die kommersiële nyati- en rapokomoute wat ondersoek is, baie lae versuikeringsvermoë getoon het, was dit nietemin moontlik om uitstekende moute eksperimenteel te verkry. Die suikers teenwoordig in kafferkoringgraan en die veranderinge wat dit ondergaan gedurende mouting word op die oomblik ondersoek.

Die rol van die mout in die brouproses word bestudeer om sodoende vas te stel wat die eienskappe van 'n goeie mout is, en op watter wyse daarvan doeltreffend gebruik gemaak kan word. Die invloed van temperatuur en pH op suikerproduksie gedurende die maisproses is vasgestel en die uitwerking van verskillende maisomstandighede op die viskositeit van die bier word nou ondersoek. Dit word vertrou dat hierdie ondersoeke die tyd benodig vir die brou van bier sal verkort, die opbrengs sal vermeerder en tegelykertyd die kwaliteit van die bier sal verbeter. As agtergrond vir hierdie werk word die amilases van kafferkoring bestudeer.

Die aminosuursamestelling van verskeie variëteite kafferkoringgraan en mout word bepaal as deel van die studie van die voedingskarakteristiek van kafferkoring en sy produkte.

Dank is verskuldig aan die Landboukollege Potchefstroom en die Afdeling Tuinbou van die Departement van Landbou vir hul hulp met sekere aspekte van hierdie projek.

Kenaf („Stokroos” of *Hibiscus cannabinus*)

Die invloed van oestyd op die opbrengs en kwaliteit van vesels van verskillende variëteite Kenaf word bestudeer in samewerking met die Afdeling Akkerbou en Weiding van die Departement van Landbou. Om genoegsame hoeveelhede vesel vir kwaliteitsbepalings te verkry,

Kaffircorn

As mentioned in last year's report, a Fellowship has been established by the Institute of Administrators of Non-European Affairs to provide extra staff for this work. With the appointment of a Research Fellow and four assistants it has been possible to speed up the work considerably. Several brewers and commercial maltsters have also worked at the National Chemical Research Laboratory for short periods to learn the methods of malt analysis.

Most work on the malting of kaffircorn was done with a short red variety of grain. The effect of steeping conditions and germination temperature on the diastatic power of the malt was investigated under laboratory conditions. A collaborative test on the malting of a uniform batch of grain by a number of commercial and municipal maltsters was arranged to compare the results obtained under different conditions in practice with those obtained in the laboratory. Some work was also done on the malting of white kaffircorn, maize, nyati and rapoko. It was not possible to produce a malt with a high diastatic power from maize, either on a large scale, or in the laboratory. On the other hand, although the commercial nyati and rapoko malts examined had very low diastatic powers, it was possible to produce excellent malts experimentally. A study of the sugars in kaffircorn grain and the changes they undergo during malting, is in progress.

The role of the malt in the brewing process is being studied to find out what makes a good malt and how to use it most efficiently. The effect of temperature and pH on sugar production during mashing was determined and the effect of mashing conditions on the "body" of the beer is now being investigated. It is hoped that this work will make it possible to reduce the time needed for brewing and increase the yield of beer while improving the quality. As a background to this work, a fundamental study of the amylases of kaffircorn is being undertaken.

The amino-acid composition of a number of varieties of kaffircorn grain and malt is being determined as part of the study of the nutritional characteristics of kaffircorn and derived products.

Assistance on this project from the College of Agriculture at Potchefstroom, and from the Division of Horticulture of the Department of Agriculture is gratefully acknowledged.

Kenaf („Stokroos” or *Hibiscus cannabinus*)

The effect of time of harvesting on the yield and quality of fibre from different varieties of kenaf is being studied in collaboration with the Division of Crops and Pastures of the Department of Agriculture. In order to get sufficient fibre for quality evaluation, five thermostatically



Toets van die kwaliteit van ontfluoorde water afkomstig van 'n proefaanleg wat deur die Waternavorsingsafdeling opgerig is.

Testing the quality of water from an experimental defluoridation unit developed by the Water Research Division.

is vyf elektries-verhitte rotingstenks in die laboratorium opgestel. Die tenks het 'n kapasiteit van 105 gallon en kan 50 lb. droë of 75 lb. groen lint per keer verwerk. 'n Reeks voorlopige proewe op hierdie laboratoriumskaal is deurgevoer om optimale rotingsomstandighede te bepaal. Die roting van lint afkomstig van verskillende variëteite wat op verskillende groeistadiums geoes is, is tans aan die gang.

controlled retting tanks were set up in the laboratory. Each has a capacity of 105 gallons and is capable of taking 50 lb. of dried ribbons or 75 lb. of green ribbons. A number of preliminary runs were done to find the optimum conditions for retting on this scale. Retting of the batches of ribbon of the different varieties harvested at various stages of growth is now in progress.

Suid-Afrikaanse Pepermentolie

Die laboratorium is versoek om die mentolgehalte te bepaal van pepermentolie wat in Suid-Afrika vervaardig word van *Mentha arvensis*. 'n Verbetering is aangebring in die bereiding van 'n standaard pepermentolie-monster waarvan die mentol gedeeltelik verwyder is. Hierdeur is 'n eenvoudige en vinnige viskosimetriese metode ontwerp om mentol in die olie direk te bepaal.

South African Peppermint Oil

The laboratory was requested to determine the menthol content of peppermint oil produced in South Africa from *Mentha arvensis*. An improvement was effected in the preparation of a standard dementholised peppermint oil sample and this enabled a simple and rapid viscosimetric method to be directly applied for the determination of menthol in the oil.

Ondersoeke op Giftige Plante

In samewerking met die Afdelings Veeartsenydiens en Plantkunde van die Departement van Landbou, is 'n studie gemaak van die saponiene van die plant (*Tribulus terrestris*) wat verantwoordelik is vir geeldikkopsiekte in skape in Suid-Afrika.

Investigations of Poisonous Plants

In collaboration with the Divisions of Veterinary Services and Botany of the Department of Agriculture, a study was made of the saponins of *Tribulus terrestris*, the plant responsible for Geeldikkop (Yellow thick head) disease in sheep in South Africa.

'n Soortgelyke gesamentlike ondersoek oor die skeikunde van vermeerbos (*Geigeria africana*) wat vermeer-

A similar collaborate investigation of the chemistry of the vermeerbos (*Geigeria africana*) which causes

siekte in skape in Suid-Afrika veroorsaak, het aangetoon dat die totale toksiese fraksie 'n meer ingewikkelde mengsel is as wat aanvanklik vermoed is.

Die noue samewerking met die Afdeling Tuinbou van die Departement van Landbou in die ondersoek van die bitterstowwe wat soms in die *Cucurbitaceae* (komkommerfamilie) voorkom, word voortgesit. Verskeie nuwe bitterstowwe in die groep is afgeskei, en die ensiem, elaterase (sien hierbo), is uit verskillende plante geïsoleer. Die aard en onderlinge posisies van die funksionele groepe aanwesig, word bepaal deur middel van chemiese en spektroskopiese metodes.

Seegrasse

Dit is nou vasgestel dat die polisakkaried wat van die rooi seegras *Porphyra capensis* geïsoleer is, en waarvan in 'n vorige Jaarverslag melding gemaak is, uit *D*- en *L*-galaktose, 6-*O*-metiel-*D*-galaktose en 3,6-anhidro-*L*-galaktose opgebou is.

Suikerrietwas

Monsters gesuiwerde was, pik en olie, afkomstig van 'n proefaanleg van 'n Natalse suikerraffinadery wat hom toespits op die herwinning van was, is ontleed en vergelyk met wasmonsters wat eksperimenteel verkry is van twee verskillende soorte suikerriet.

Laasgenoemde twee monsters is in fyner besonderhede bestudeer, en dit is vasgestel dat hulle saamgestel is uit twee hooffraksies. Die een fraksie bestaan uit verbindings met betreklik lae molekulêrgewig—min of meer soos dié van die gewone wasse—terwyl die ander fraksie saamgestel is uit verbindings van veel hoër molekulêrgewig. Later is vasgestel dat die laagmolekulêre fraksie saamgestel is uit koolwaterstowwe van die orde C_{27} — C_{31} , alkohole waarvan oktakosanol die hoofbestanddeel is, en kleiner hoeveelhede versadigde en onversadigde ketone. Die hoogmolekulêre fraksie wat in een van die twee soorte suikerriet in groter mate voorkom as die laagmolekulêre fraksie, word tans ondersoek.

Houtpap vir Vervaardiging van Rayon

'n Beampte van die Organiese Afdeling het nege maande as besoekende werker by die Britse Rayonnavorsingsvereniging se laboratoriums naby Manchester deurgebring. Die projek wat bestudeer is, was deel van 'n wyer ondersoek na die betrokke meganisme en die oorsaak van die verlies in alfa-sellulose wat ondervind word by die bereiding van hoë-graad rayon uit houtpap, wanneer laasgenoemde met verdunde alkalië by verhoogde temperatuur geraffineer word.

Die Hemi-sellulose van Wattlehout

Hierdie projek is 'n uitbreiding van vroeër studies in verband met die skeikunde van wattlehout. Die koolhidraatbestanddele van swart wattlehout word bestudeer met besondere aandag aan die hemi-sellulose. Materiaal soortgelyk aan die ontbaste afvalhout, beskikbaar by houtpampeulens, is vir die doel verkry.

vomiting disease in sheep in South Africa, has shown that the total toxic fraction is a more complicated mixture than previously believed.

Close collaboration with the Division of Horticulture of the Department of Agriculture has continued on the project of bitter principles of the *Cucurbitaceae*, (the cucumber family). Several more bitter principles in this group were discovered and the enzyme elaterase (see above) isolated from several different plants. The nature and juxtaposition of the functional groups present is being established by spectroscopic and chemical methods.

Seaweeds

It has now been determined that the polysaccharide separated from the red seaweed *Porphyra capensis*, and of which mention was made in the previous annual report, is built up of *D*- and *L*-galactose, 6-*O*-methyl-*D*-galactose and 3,6-anhydro-*L*-galactose.

Cane Wax

Samples of refined wax, pitch and oil from a pilot plant operated by a sugar milling firm in Natal for the recovery of cane wax, were analysed and compared with waxes obtained experimentally from the surface of two cane varieties.

The latter samples were studied in more detail and were found to be composed of two main fractions, the one composed of relatively low molecular weight compounds in the common wax range and the other composed of much higher molecular weight substances. The low molecular weight fraction was shown to contain hydrocarbons, in the C_{27} — C_{31} range, alcohols, of which octacosanol was the main component, and smaller quantities of saturated and unsaturated ketones. The high molecular weight fraction, which in one variety was present in greater proportion than the low molecular weight fraction, is still being investigated.

Pulp for Rayon Manufacture

An officer of the Organic Division spent nine months as a guest worker at the British Rayon Association's Laboratories near Manchester. The project undertaken was part of a wider investigation of the mechanism and causes of loss in alpha-cellulose experienced during the industrial preparation of high tenacity rayon from wood pulp, when the latter is refined with dilute alkali at elevated temperatures.

Wattle Wood Hemicelluloses

This project is an extension of previous studies on the chemistry of wattle wood. The carbohydrate constituents of black wattle wood are under study with particular reference to the hemicelluloses. Material similar to the de-barked waste wood available to pulp mills has been obtained for the purpose.

MEDIESE BIOCHEMIE

Lipoproteïene en Aterosklerose

In samewerking met die S.A. Instituut vir Mediese Navorsing is 'n program van werk op aterosklerose begin. Voorlopige werk is in hierdie laboratorium gedoen om die lipoproteïene van bloedserum te skei.

Kanker

Deur middel van 'n beurs wat toegeken is deur die Nasionale Kankervereniging van Suid-Afrika, word 'n werksprogram onderneem in samewerking met die W.N.N.R. se Voedingnavorsingseenheid by die Universiteit van die Witwatersrand. Hierdie eenheid het alreeds die kankervormende uitwerking van die kleurstof, tripanblou, bestudeer en die doel van die teenswoordige studie is 'n fisies-chemiese ondersoek van die manier van vervoer van tripanblou in die bloedstroom.

Die Aard van die Lepromien-reaksie

Lepromien is 'n preparaat berei van lepromateuse weefsel en word vir prognostiese reaksie van lepra-lyers gebruik. Subkutane inspuiting gee 'n positiewe reaksie na 24 uur en na 28 dae in bepaalde lepra-tipes. Die preparate wat tot dusver gebruik is, was baie onsuiver en daar was min bekend aangaande die aard van die aktiewe stof, asook van die reaksie as sodanig. Die probleem is ondersoek in samewerking met die Lepra-Instituut te Westfort. Dit is ontdek dat die sogenaamde lepromienreaksie verkry kan word deur ekstrakte van normale weefsel sowel as van ekstrakte van lepromateuse weefsel waarvan die suurvastheid van die leprabacilli wat daarin teenwoordig was, deur alkohol-ekstraksie vernietig is. Die aktiwiteit van die preparate kan gevolglik nie toegeskrywe word aan die teenwoordigheid van leprabacilli nie, soos deur vroeër ondersoekers vermoed is. Verdere ondersoek het tot die gevolgtrekking gelei dat die sogenaamde lepromien-reaksie slegs 'n reaksie as gevolg van vreemde liggame is en verwek kan word deur enige partikels wat moeilik absorbeerbaar is, insluitende leprabacilli.

Vitamiën A-metabolisme en Dierlike Vette

Hierdie gesamentlike projek met die Voedingnavorsingseenheid aan die Universiteit van die Witwatersrand is voortgesit. Die poging om radio-aktiewe vitamien A te vervaardig is geslaagd en dit word gebruik in spoorstudies om die vervoer van vitamien A in die bloedserum lipoproteïene van lewendige diere te bepaal.

Die Werking van Insulien

Personeel wat aan die Laboratorium deur Prof. J. Gillman se Voedingnavorsingseenheid geleen is, het ook vir 'n geruime tyd aan hierdie onderwerp saamgewerk.

Dit is bevind dat wanneer natrium pirovaat-2-C¹⁴ in

MEDICAL BIOCHEMISTRY

Lipoproteins and Atherosclerosis

In collaboration with the S.A. Institute for Medical Research, a programme of work on atherosclerosis has been started. Preliminary work was carried out on the separation of lipoproteins in blood serum.

Cancer

Financed by a grant from the Cancer Research Association, a programme has been undertaken in collaboration with the C.S.I.R. Nutrition Research Unit at the University of the Witwatersrand. This Unit has studied cancer-producing effects of the dye, trypan blue, and the present objective is a physico-chemical study of its mode of transport in the bloodstream.

The Nature of the Lepromin Reaction

Lepromin is a preparation made from lepromatous tissue and is used as a prognostic test on leprosy patients. Injected under the skin it gives a positive skin reaction after 24 hours and after 28 days in certain types of leprosy. Up to now the preparations used have been very crude and practically nothing was known about the nature of the active material or its mode of action. The problem was studied in collaboration with the Westfort Leper Institution. It was discovered that a positive lepromin reaction could be elicited by an extract of normal tissue and also by an extract of lepromatous tissue which had been alcohol extracted so as to destroy the acid fastness of the bacteria present. Thus the activity of the preparations could not be due to lepra bacilli, as has been postulated by some workers. Further work led to the conclusion that the lepromin reaction is simply a foreign body reaction which can be caused by any particles which are absorbed with difficulty, including lepra bacilli.

Metabolism of Vitamin A and Animal Fats

This joint project with the Nutrition Research Unit of the University of the Witwatersrand has been continued. The attempt to produce radioactive Vitamin A has been successful, and it is being used in tracer studies of the transport of Vitamin A in the blood serum lipoproteins in living animals.

The Mode of Action of Insulin

Staff seconded to the laboratory from Professor J. Gillman's Nutrition Research Unit have also spent some time collaborating on this project.

It was found that when sodium pyruvate-2-C¹⁴ is

die bloed van insulien-gebrekkige bobbejane, waarvan die pankreas verwyder is, ingespuut is, die aktiwiteit by voorkeur voorkom in die fosfolipiede van die bloedserum lipiede. Daar word voortgegaan met eksperimente met normaal en insulienbehandelde bobbejane waarvan die pankreas verwyder is. (Sien ook verder onder „Voedings-eenheid” in die Mediese Navorsingsafdeling van hierdie verslag).

MIKROBIOLOGIESE CHEMIE

Omsetting van Swawelbindings deur Bakterië

Voortspruitend uit studies van die korrosie van beton in rioolstelsels, en in opvolging van die ondersoekes waarvoor verlede jaar verslag gedoen is, is die tiosulfaat- en tiosianaatmetabolisme van verskeie *Thiobacilli* onder anaërobiese omstandighede in die teenwoordigheid van nitraat bestudeer. *Thio. Bacillus denitrificans*, *Thio. thioparus* en *Thio. thiocyanoxidans* kon onder hierdie omstandighede beide tiosulfaat en tiosianaat feitlik kwantitatief omsit in sulfaat en vry swavel. In hierdie proses reduseer *Thio. denitrificans* nitriet feitlik kwantitatief na vry stikstof. Alleen spore van nitriet en laggas kon aangetoon word. Andersyds, in die geval van *Thio. thiocyanoxidans*, is 85 persent of meer van die nitraat tot nitriet gereduseer waarvoor die organisme 'n buitengewone nitriet-toleransie getoon het. Die gedrag van *Thio. thioparus* neem 'n intermediêre posisie in. Die verbruik van tiosulfaat en tiosianaat onder aërobiese omstandighede word tans bestudeer.

Pekeluitjies

Veranderinge in die soutgehalte, pH en mikroflora in die pekel gedurende die pekelproses is ondersoek. 'n Vaste medium wat uie-ekstrak bevat, is ontwikkel. Wanneer hierdie medium geënt is met die besmette pekelvog van swaar aangetaste uie, kon omsetting verkry word, analoog met wat in die uie optree. Die hoop bestaan om met behulp van hierdie medium die organisme verantwoordelik vir die geel vlekke in reinkultuur te isoleer en nader te bestudeer.

Pogings om die ontwikkeling van die geel vlekke te onderdruk deur toevoeging van preserveermiddels, byvoorbeeld metabisulfit, salisielsuur, miersuur en sorbiensuur aan die pekel, het geen bevredigende resultate gelewer nie.

Tandkaries

Die giste geassosieer met karies is in samewerking met die Mond- en Tandheelkundige Hospitaal van die Universiteit van Pretoria bestudeer, en dit is bevind dat die voorkoms van giste aansienlik hoër was in die tande van blankes as in dié van nie-blankes. Hierdie verskynsel is moontlik verwant aan die hoër suikergehalte van die dieet van eersgenoemde groep. Terwyl *Candida albicans* die volopste spesies is in beide groepe, was die voorkoms van

injected into the blood of insulin-deficient pancreatectomised baboons, activity appears preferentially in the phospholipids of the blood serum lipids. Further experiments using normal and insulin-treated pancreatectomised baboons are in progress. (See also under Nutrition Unit in the Medical research section of this report).

MICROBIOLOGICAL CHEMISTRY

Metabolism of Sulphur Compounds by Bacteria

Arising from earlier studies of the corrosion of concrete sewers and in confirmation of the work reported last year, a study was made of the metabolism of thio-sulphate and thiocyanate by various species of *Thiobacilli* under anaerobic conditions in a medium containing nitrate. *Thiobacillus denitrificans*, *Thio. thioparus* and *Thio. thiocyanoxidans* all converted both thiosulphate and thiocyanate, practically quantitatively, to sulphate plus elemental sulphur. In doing so, *Thio. denitrificans* reduced nitrite almost quantitatively to nitrogen. Only traces of nitrite and nitrous oxide could be detected. With *Thio. thiocyanoxidans*, on the other hand, 85 per cent. or more of the nitrate was reduced to nitrite for which the organism showed an unusual tolerance. The behaviour of *Thio. thioparus* lay between these two. The utilization of thiosulphate and thiocyanate under aerobic conditions is now being studied.

Pickled Onions

Changes in the salt concentration, pH and microflora of the pickle during the pickling of onions were determined. A solid medium containing onion extract was developed. When this was inoculated with an infected pickling brine from a batch of badly affected onions, yellow spots, identical to those found in onions developed. With the aid of this medium it is hoped to be able to isolate the organisms responsible for the development of the yellow spots and identify them.

Attempts were made to suppress the development of yellow spots by adding various preservatives including metabisulphite, salicylic acid, formic acid and sorbic acid, to the pickle. None of these was completely satisfactory, however.

Dental Caries

The yeasts associated with dental caries were studied in collaboration with the Dental and Oral Hospital of the University of Pretoria. It was found that the incidence of yeasts was significantly higher in the teeth of Europeans than in those of non-Europeans. This may possibly be related to the higher sugar content of the diet of the first group. While *Candida albicans* was the most prevalent species encountered in both groups, the incidence of



Die neem van monsters tydens 'n rivieropname.

Taking samples in the course of a stream survey.

Saccharomyces cerevisiae aansienlik hoër by nie-blankes. Hierdie verskil kan moontlik toegeskryf word aan die gebruik van aktief-gistende voedsel en drank deur die nie-blanke.

Die Gisteflora van Suid-Afrikaanse Grondsoorte

Die studie van giste wat met Suid-Afrikaanse grondsoorte geassosieer is, het besonder belangwekkende resultate opgelewer. Nege nuwe spesies is ontdek, waarvan twee aan nuwe genera behoort. Nuwe lig is gewerp op die oorsprong en filogenetiese verband van die askosporogene giste.

Die Vertering by die Herkouer

In samewerking met die Veeartsenykundige navorsingslaboratorium op Onderstepoort is die ondersoek in verband met die mikrobiologiese en biochemiese aspekte van die vertering en metabolisme van die herkouer voortgesit.

Dit is aangetoon dat die mikroflora van die rumen 'n rol speel in die totstandkoming van „domsiekte” of swangerskaptoksemia. Wanneer die dieet van die skape skielik van 'n hoë tot 'n lae proteïengehalte verander is, het die verhouding van die propioonsuur tot bottersuur in die rumen aanvanklik gedaal, maar langsaam weer die normale waarde bereik namate die bakterieë by

Saccharomyces cerevisiae was significantly higher in non-Europeans than in Europeans. This is attributed to the consumption by the Bantu of actively fermenting beverages containing large numbers of this organism.

The Yeast Flora Associated with South African Soils

The study of the yeasts associated with South African soils proved a very fruitful field. Nine new species were isolated of which two belong to new genera. New light has been thrown on the origin and phylogenetic relationships of the ascosporegenous yeasts.

Ruminant Digestion and Metabolism

Collaboration with the Veterinary Research Institute at Onderstepoort in the study of the microbiology and biochemistry of ruminant digestion and metabolism has been continued.

It has been shown that the microflora of the rumen play a role in the development of „domsiekte” or pregnancy toxemia. When sheep were suddenly switched from a high protein to a low protein diet the ratio of propionic acid to butyric acid in the rumen fell at first but gradually returned to normal as the bacteria readapted themselves. A fall in the propionic/butyric acid ratio

die nuwe toestand aangepas raak. 'n Daling in die propioonsuur/bottersuur-verhouding kan 'n styging in die ketone in die bloed teweegbring—een van die simptome van domsiekte. Of dit gebeur of nie is deels afhanklik van die spoed waarmee die verhouding tussen die sure verander. Verder is daar vasgestel dat die ontstaan van ketosis ook deur die sekshormone beïnvloed word, wat daarop dui dat die intermedieë koolhidraatmetabolisme van die dier daarmee verbonde is. Hierdie ondersoek word voortgesit.

Die mikroflora van die rumen is in staat om eenvoudige stikstofhoudende verbindings, soos ureum, na mikrobiologiese proteïene op te bou, wat dan op sy beurt deur die skaap verteer en opgeneem kan word. As gevolg hiervan is dit moontlik om dunder plant- of dierproteïene vir aanvulling op swak weiding gedeeltelik te vervang met 'n goedkoop stikstofbron. Om gebruik van die ureum te kan maak, verlang die rumenmikroflora egter 'n bron van maklik beskikbare koolhidraat, soos melasse of setmeel, in die vorm van mielies. 'n Dieet van ureum en hooi word aangevul met verskillende koolhidrate, insluitende glukose, sukrose en setmeel. Die invloed van die verskillende koolhidrate op die vorming van mikrobiologiese proteïene word *in vitro* en *in vivo* ondersoek.

PROSESONTWIKKELING- EN PROEF- AANLEGWERK

Die meeste aandag is weer bestee aan waterontsouting deur elektrodialise, maar 'n aansienlike hoeveelheid werk is op ander gebiede onder kontrak verrig, en 'n groter mate van tegnologiese hulp is verleen aan ander afdelings binne die W.N.N.R.

Waterontsouting deur middel van Elektrodialise

Aansienlike voortuigang is gemaak. Die kontrak met 'n groep goudmynmaatskappye wat in die O.V.S. werksaam is, is voortgesit. Die proefaanleg vir die ont-souting van 24,000 gallon mynwater per dag, het eers klein aan die begin van die verslagjaar 'n aanvang geneem, maar is sedert Februarie 1956 in volle werking. Bemoedigende resultate word tans verkry, met die gevolg dat die ondersteuners nou aktief planne beraam vir een of meer grootskaalse installasies, terwyl die W.N.N.R. optree as tegniese raadgevers.

In Desember 1955 het die beampte in bevel van die Afdeling in Den Haag die vergadering bygewoon van die loodskomitee van die Organisasie vir Europese Ekonomiese Samewerking se ondersteunde groep vir Waterontsouting deur Elektrodialise (waarvan Suid-Afrika 'n lid is), en het samesprekings met die Hollandse werkers gevoer. Gevolglik het die wetenskaplike in bevel van hierdie werk in Holland later 'n besoek aan Suid-Afrika gebring. Een van die lede van die Prosesontwikkelingsafdeling is op die oomblik in Den Haag, waar hy saam-

could cause a rise in the ketone bodies in the blood, one of the symptoms of "domsiekte". Whether or not this did occur depended in part on the rate at which the ratio changed. Evidence was obtained that the development of ketosis was also influenced by the sex hormones, indicating that the intermediary carbohydrate metabolism of the animal is involved. These studies are continuing.

The microflora of the rumen are able to convert simple nitrogenous substances such as urea into microbial protein which can be utilized by the animal. This enables a cheap source of nitrogen to replace, partly, more expensive plant and animal protein concentrates in supplementing poor grazing. In order to utilize the urea, however, the rumen micro-organisms require a source of readily available carbohydrate, such as molasses or starch in the form of maize. A diet of urea plus hay is being supplemented with various carbohydrates including glucose, sucrose and starch and the effect on the synthesis of microbial protein is being examined *in vitro* and *in vivo*.

PROCESS DEVELOPMENT AND PILOT PLANT ACTIVITIES

Most attention was again devoted to water desalting by electro dialysis, but a considerable amount of work in other fields was done under contract, and increased technological assistance was given to other sections within the C.S.I.R.

Water Demineralization by Electrodialysis

Very considerable progress has been made. The contract with a group of gold mining companies operating in the Orange Free State was continued. The pilot plant for desalting 24,000 gallons of mine water per day started operation on a limited scale at the beginning of the period under review and has been in full operation since February, 1956. Encouraging results are being obtained, as a result of which the sponsors are actively engaged in plans for one or more large scale plants, with the C.S.I.R. acting as technical consultants.

In December, 1955, the officer in charge of the Division attended the Steering Committee meeting at The Hague, of the Organization for European Economic Co-operation-sponsored group on Water Desalting by Electro-dialysis (of which South Africa is a participant) and had discussions with the Dutch workers. As a result of this, a visit was later made to South Africa by the scientist in charge of this work in Holland. One of the members of the Process Development Division is at present working with the Dutch team at The Hague, collaborating in the

werk in die ontwerp van elektrodialisetoerusting en die uitruil van informasie.

Groot vordering is gemaak met die ontwikkeling van goedkoop ionselektiewe membrane vir die ontsouting van brakwater. Oorsese werkers en veral oorsese firmas wat op die gebied werksaam is, het 'n groot mate van belangstelling in hierdie membrane getoon.

Wolwas

Die werk in verband met die kalkverseping van wolwas is tot die stadium gebring waar 'n potensieel ekonomiese proses ontwikkel is. Proefhoeveelhede materiaal is beskikbaar gestel vir die waardering van die markwaarde. Aansoeke om patente is gedoen.

Suurvaste Tenkvoerings

Veldtoetse uitgevoer deur die ondersteuner, in samewerking met die W.N.N.R., het aangetoon dat daar aan die vereistes voldoen was, en dat 'n bevredigende voering ontwikkel is. Hierdie kontrak is dus suksesvol voltooi.

Reukondersoek

'n Kontrak met 'n nywerheidsfirma vir die uitskakeling van reuke is voortgesit. Bevredigende vordering is gemaak. Op versoek van die ondersteuner is 'n lid van die personeel na Kanada om met werkers op hierdie gebied samesprekings te voer.

'n Tweede kontrak is aangegaan op versoek van 'n munisipaliteit aan wie tans uitgebreide raadgewende dienste verskaf word.

Diverse Dienste aan Nywerhede

Dit het onder meer ingesluit: 'n studie van algemene metodes vir bestryding van reuke afkomstig van nywerhede, tegniese en ekonomiese waardasie van 'n metode vir die herwinning van hoëgraadse wasse uit rietsuikerperskoek, tegniese waardasie van 'n aanleg vir die herwinning van oplosmiddels, advies insake 'n metode vir die vervaardiging van nikotien-sulfaat, advies insake filtrasieprobleme en geskikte toerusting vir 'n verskeidenheid van industriële prosesse.

WATERNAVORSING

Suiwering van Rioolafloopwater

Die waarde van afloopwater van rioolwerke as moontlike voorraadsbron van water, geniet tans in Suid-Afrika vry algemene erkenning, en die ondersoek na metodes om hierdie water te stabiliseer en verder te suiwer, is voortgesit.

In die verdere behandeling van syfelbedding-afloopwaters in spesiaal vervaardigde plantbeddings, verouderingsdamme en algebeddings, is 'n baie hoër doeltreffendheid verkry waar behoorlik geoksideerde bedding-afloopwaters gebruik is en wanneer syfelbeddingslyk of „humus” verwyder is voor verdere behandeling. Al-

design of electro dialysis equipment and in the exchange of information.

Much progress was made with the development of low-cost permselective membranes for the desalting of brack waters. Considerable interest in these membranes has been shown by overseas workers, and in particular by overseas firms engaged in this field.

Wool Wax

The work on the lime saponification of wool wax was taken to the stage where a potentially economic process has been developed. Pilot scale quantities of material were provided for market evaluation. Patents have been applied for.

Acid-Resisting Tank Linings

Field tests carried out by the sponsor in collaboration with the C.S.I.R. showed that the requirements had been met and a satisfactory lining developed. This contract has therefore been successfully completed.

Odour Investigations

A contract with an industrial concern for the elimination of process odours has been continued. Satisfactory progress is being made. At the sponsor's request a member of the Division's staff is proceeding to Canada to consult workers in this field.

A second contract was initiated at the request of a municipality to which extended consultant services are being given.

Miscellaneous Services to Industry

These included a study of general methods of control of industrial odours, a technical and economical assessment of a method for recovery of high grade waxes from cane sugar press cake, technical assessment of a solvent recovery plant, advice on a method for the production of nicotine sulphate, advice on filtration problems and on suitable equipment for a variety of industrial operations.

WATER RESEARCH

Purification of Sewage Effluents

Sewage effluents are now widely recognized in South Africa as constituting sources of raw water supplies, and studies of methods for their stabilization and further purification were continued.

In the further treatment of biological filter effluents, in specially constructed experimental vegetation beds, maturation ponds and algal beds, greatly increased efficiencies were observed when properly oxidized filter effluents were employed and when biological filter sludge or "humus" was removed prior to the further treatment. Although the complete oxidation of ammonia was effected

hoewel die volledige oksidasie van ammoniak bewerkstellig is, en 'n baie hoë graad van bakteriologiese suiwering bereik is, was die verwydering van nitrate en die vermindering van die suurstofverbruiksyfer teleurstellend. Laasgenoemde word toegeskryf aan gesuspendeerde alge en die afskeiding van oplosbare organiese verbindings deur aktiewe algeselle.

'n Studie is begin oor syfelbeddingslyk as 'n middel vir die denitrifikasie van afloopwaters, en in 'n verwante ondersoek word gepoog om 'n geaktiveerde syfelbeddingslyk te gebruik as 'n middel vir die stabilisasie van afloopwaters. Dit is gevind dat die slyk, na aktivering, die ammoniak in die rioolafloopwater volledig oksideer tot nitraat, en dat dit die verwydering van kolloïdale en semi-kolloïdale stowwe verbeter, sodat 'n aansienlik gestabiliseerde afloopwater verkry word. Die resultate hiermee was so gunstig dat dit die oprigting regverdig het van 'n proefaanleg, wat binnekort in werking gestel word.

Rivieropnames

Die veldwerk vir die Tugela-ondersoek is voltooi. Die opname gee 'n beeld van die seisoensveranderings in die rivier en dui ook spesifieke rigtings aan waarlangs die ondersoek voortgesit moet word. In die volgende fase van die ondersoek sal veral aandag geskenk word aan besoedeling en aan die hoeveelheid slyk wat in die water afgevoer word.

Na aanleiding van die opname van dié riviere wat, van die Witwatersrand af, onderkant die Vaaldam in die Vaalrivier vloei, is 'n uitgebreide program van ondersoek in die Vaalbarragegebied van stapel gestuur. Die uitwerking van industriële besoedeling op die kwaliteit van die water in die opgaardam word bepaal en basiese data versamel waarop standaard-spesifikasies vir afloopwaters gebaseer kan word.

Aangesien daar tans 'n nuwe goudmynbedryf in die opvanggebied van die Vaaldam ontwikkel, en ook as gevolg van bestaande en potensiële industriële, koolmyn- en landboukundige ontwikkeling, het die beskerming teen besoedeling van die waters wat die Vaaldam voed, van die allergrootste belang geword. 'n Voorlopige opname van die opvanggebied is gedoen en 'n volledige verslag oor die huidige toestand is opgestel, tesame met 'n program van ondersoek. Die voorgestelde ondersoek is begin met finansiële en ander hulp van die Departement van Waterwese.

'n Beampte van die Transvaalse Provinsiale Administrasie wat volgens kontrak tydelik oorgeplaas is van die Afdeling Natuurbewaring, werk tans saam met beamptes van die Waternavorsingsafdeling in 'n ondersoek van die Jukskei-Krokodilrivierstelsel. Die hoofdoel is om besoedelingsindekse vas te lê, en om gegewens te verkry vir die formulering van standaarde vir afloopwaters.

and a very high degree of bacteriological purification was achieved, removal of nitrates and reduction in "oxygen absorbed" values were disappointing. The failure of the units to reduce "oxygen absorbed" values is attributed to secretion of soluble organic compounds by active algal cells.

A study of biological filter sludge as an agent for denitrification of effluents has been started and, in a related investigation, the possibility is being explored of using activated biological filter sludge as a means of effluent stabilization. The sludge on activation was found to oxidize ammonia in sewage effluent completely to nitrate and to improve the removal of colloidal and semi-colloidal material so as to yield a much stabilized effluent. The results obtained were sufficiently encouraging to justify the erection of a pilot plant which will shortly be ready for operation.

Stream Surveys

The field work of the survey of the Tugela river was completed. The survey provided a picture of the seasonal changes in the river as well as specific lines of investigation which should be pursued. In the next phase of the survey, emphasis will be given to pollution and silt load studies.

Following on the survey of streams draining the Witwatersrand area into the Vaal River below the Vaal Dam, an extensive investigation of the Vaal Barrage area has been started in order to assess the effects of pollution from industrial activity on the quality of the water in the Barrage, and to collect basic data on which standard specifications for the discharge of effluents can be based.

In view of the establishment of the new gold mines in the catchment area of the Vaal Dam and because of existing and potential industrial, coal mining and agricultural activity, protection of the waters of the Vaal Dam from pollution has become of considerable importance. A preliminary survey of the catchment area was undertaken, and a detailed report on the present situation was drawn up together with a programme of investigation.

With financial and other assistance from the Department of Irrigation, the proposed investigation has been started.

An officer seconded from the Department of Nature Conservation of the Transvaal Provincial Administration, in terms of a contract agreement, is collaborating with officers of the Water Research Division on a study of the Jukskei-Crocodile River system. The main objects of the investigation are the establishment of indices of pollution and the collection of data for the formulation of standards for the discharge of effluents.

Watervoorsiening

Die opname en ondersoek van die samestelling en fisiologiese uitwerking van gemineraliseerde waters is voortgesit. Gegewens oor die maksimum konsentrasies van verskillende soute wat beeste en skape in hul drinkwater kan verdra, word benodig veral vir die studies wat tot doel het die ontwikkeling van elektrodialitiese eenhede vir die suiwering van brakwater op plase.

Proewe oor die verwydering van fluoriëde uit water deur middel van die proses van selektiewe ioon-uitruiling, in vorige verslae beskrywe, word voortgesit op 'n proefaanleg-skaal. 'n Proefaanleg is opgerig in samewerking met die Departement van Openbare Werke, en tans word van 10,000 tot 20,000 gallon water per dag ontflooor by die Rooideplaat-Tuinbounavorsingstasie naby Pretoria. Die proewe het waardevol geblyk vir 'n uitbreiding van die ondervinding wat vroeër met die proses opgedoen is. Die ondersoek duur voort.

Aërobiese Behandeling van Afloopwaters

Verskeie suurstofverskaffende en suurstofeisende faktore wat in biologiese sytelbeddings fungeer, is ondersoek. Die belangrikste suurstofeisende faktore is die biologiese aktiwiteite van die mikrobiota, en die chemiese oksidasie van onversadigde of reduserende verbindings in die organiese afloopwater. Die studie van suurstofverskaffende faktore het die volgende behels: die effektiewe oppervlakte van die medium in 'n sytelbedding, die belugting van die medium, en die graad van onversadiging van die vloeistof wat deur die bedding sytel.

Anaërobiese Suiwering

Dit is proefondervindelik vasgestel dat koper 'n bepaalde toksiese uitwerking het op die anaërobiese verteringsproses van rioolslyk. Die vergiftigingskonsentrasie lê tussen 4,100 en 13,000 d.p.m. koper, bereken op 'n vastestofbasis.

Proefwerk in verband met die anaërobiese vertering van nagvuil is uitgevoer en aandag geskenk aan die osmotiese invloed van die hoë konsentrasies soute in die nagvuil. Deur laasgenoemde met water te verdun, is daarin geslaag om aktiewe vertering te verkry.

'n Paar verskillende nywerheidsafloopwaters is by wyse van kontrak ondersoek om vas te stel hoe vatbaar dit is vir anaërobiese vertering. Die afloop van 'n glukose-styselafabriek is met welslae verteer met 'n verblyftyd van drie dae, en die suurstofverbruik is daardeur verminder van oor die 2,000 d.p.m. na minder as 200 d.p.m. Reëlins is getref om hierdie ondersoek op groter skaal voort te sit. Die afloopwater van 'n houtverwerkingsfabriek is ook met goeie resultate in 'n verteringsproses van sewe dae gesuiwer en die suurstofverbruiksyfer is met oor die 90 persent verminder.

Water Supplies

The survey of the composition and physiological effects of mineralized waters has continued. Data and the limiting concentrations of different salts which cattle and sheep respectively can tolerate in their drinking water are required, particularly for the studies aimed at the development of electrodialytic desalting units for the purification of brackish waters on farms.

Experiments on the removal of fluorides from water by the process of selective ion exchange, described in earlier reports, have continued on a pilot plant scale. A pilot plant was erected in collaboration with the Department of Public Works and is defluoridating 10,000–20,000 gallons of water per day for the Rooideplaat Horticultural Research Station near Pretoria. The operations have been valuable in extending experience of the process gained earlier and are still continuing.

Aerobic Treatment of Effluents

Various oxygenating and oxygen-consuming factors which operate in biological filters were studied. The most important oxygen consuming factors studied were the biological activity of the microbiota and the chemical oxidation of unsaturated or reducing compounds in the organic waste. The study of oxygenating factors included the surface area of the filter medium, ventilation in the filter and the degree of unsaturation of the liquid percolating through the filter.

Anaerobic Treatment

It was found experimentally that copper exerted a definite toxic effect on the anaerobic digestion of sewage sludge. The toxic concentration range was 4,100 to 13,000 p.p.m. copper, expressed on the basis of the solid phase.

Experiments were carried out in connection with the problem of night-soil digestion and particular attention was given to the osmotic effects of the highly concentrated salts in the night-soil. It was possible to establish active digestion after dilution of the night-soil with water.

Arising from contract investigations, the amenability of a few selected industrial effluents to anaerobic digestion was studied. Glucose-starch factory effluent was digested effectively at a retention period of less than three days and the "oxygen absorbed" value of the waste was reduced from over 2,000 p.p.m. to less than 200 p.p.m. Arrangements have been made to extend the work to large-scale studies. The effluent from a wood-processing factory was also digested successfully at a retention period of seven days and the "oxygen absorbed" value of the effluent was reduced by over 90 per cent.

Munisipale Afvalstowwe en Komposproduksie

In samewerking met die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese is goeie vordering gemaak met die ondersoek na metodes vir grootskaalse komposproduksie. Meganisasie van die proses is van eersterangse belang vir ekonomiese produksie van kompos. Na oorweging van verskeie alternatiewe metodes, is daar tot die slotsom geraak dat 'n roterende dromeenheid met kunsmatige belugting die doeltreffendste oplossing vir die probleem is.

Tegniese Dienste

Die bou van die Streekslaboratorium in Windhoek is deur die Departement van Werke voltooi, en werk word vir die Administrasie van Suidwes-Afrika uitgevoer volgens 'n navorsingsprogram wat klem lê op spesifieke en dringende watervoorsieningsprobleme in hierdie gebied. Besondere aandag word gewy aan die hergebruik van die afloopwaters van rioolwerke, aan waterbronne van hoë soutinhoud, en aan die vraagstuk van nitrate en fluoriede in watervoorrade. Ook word raadgevende hulp aan die Administrasie verleen met die beplanning van rioolwerke en watersuiweringsinstallasies.

Die Natalse Provinsiale Administrasie het 'n toekenning van £2,500 gemaak as bydrae tot die koste van oprigting en bediening van 'n streekslaboratorium. Hierdie eenheid van die Afdeling Waternavorsing sal dienste lewer in verband met watervoorsiening, suiwing van rioolwater en nywerheidsafloop, en besoedelingsprobleme. 'n Groot aantal ondersoekte is gedurende die afgelope jaar aangepak vir die Provinsiale Wateringenieur en vir plaaslike owerhede. Die meeste van hierdie ondersoekte het in verband gestaan met die ontwerp van watersuiweringswerke en met probleme wat voortspruit uit die behandeling van nywerheidsafloopwaters.

Die Afdeling Waternavorsing het sowel tegniese as raadgevende dienste aan verskillende plaaslike owerhede gelewer in verband met die suiwing van riool- en nywerheidsafloopwaters, asook met die ontwerp van watersuiweringswerke. 'n Aantal munisipaliteite het aansoek gedoen om gereelde raadgevende en tegniese dienste in verband met die suiwing van rioolwater, fabriekswaters en water vir huishoudelike doeleindes, en ook in verband met die behandeling van water vir kragentrales. Hierdie dienste word tans onder kontrak gelewer.

Hoe om nywerheidsafloopwaters te behandel, of daarvan ontslae te raak, bly steeds 'n uiters lastige vraagstuk in Suid-Afrika, nie net vir bestaande nywerhede nie, maar ook vir dié wat hulle hier wil kom vestig. 'n Groot aantal probleme wat uit nywerheidsafloopwaters voortspruit, is ondersoek vir die nywerhede self, of vir plaaslike owerhede en Staatsdepartemente. Hierdie ondersoekte het ingesluit: afloopwaters van 'n papier- en houtpapierfabriek, plantoliefabriek, 'n glukose- en styselabriek, houtverwerkingsfabriek, wynstookafval, tekstielabriek en mynwaters.

Municipal Waste Utilization and Compost Production

In collaboration with the National Mechanical Engineering Research Institute, work on the large scale production of compost has progressed very considerably. For the economic success of compost production, mechanisation proved of paramount importance. After consideration of many alternatives, it was concluded that a rotating drum cylinder unit with air inlet would be the successful answer to the problem.

Technical Services

The building of the Regional Laboratory in Windhoek has been completed by the Department of Works, and work is being carried out for the South West Africa Administration, on a programme of investigations which places emphasis on specific and urgent water supply problems in the Territory. Particular attention is being given to the re-use of sewage effluents, mineralized waters and the problem of nitrates and fluorides in water supplies. The Administration is also being provided with advisory services in connection with the planning of sewage and water purification plants.

The Natal Provincial Administration made a grant of £2,500 towards the costs of setting up and operating a regional laboratory in Natal. This regional unit of the Water Research Division will provide services in connection with water supply, sewage and industrial effluent disposal and pollution problems. During the past year, a large number of investigations was carried out on behalf of the Provincial Water Engineer and local authorities. Most of these studies related to the design of water purification plants and industrial effluent disposal problems.

The Water Research Division provided both technical and advisory services to many local authorities in connection with sewage and industrial effluent disposal and the design of water purification plants. A number of municipalities have requested regular advisory and technical services in connection with sewage and industrial effluent disposal, water purification, and water conditioning for power stations. This service is being supplied under contract agreement.

The treatment and disposal of industrial effluents in the Union present very difficult problems, not only for existing firms but also for those wishing to establish themselves here. A large number of industrial effluent problems were investigated, either for firms themselves, or for local authorities and government departments. These investigations included paper and pulp factory effluents, vegetable oil factory wastes, glucose-starch factory effluent, wood processing effluents, wine distillery wastes, effluents from textile factories and mine waters.

FISIËSE EN ANALITIESE CHEMIE

Diffusie in Vaste Stowwe

In opvolging van vorige werk in hierdie laboratorium in verband met die uitwisseling tussen gemerkte koolstofdioksiedgas en kalsiet, is 'n studie van die uitwisseling tussen gemerkte suurstofgas en sekere oksiede onderneem. 'n Eerste doelwit was die bereiding van 'n oksied in 'n fynverdeelde maar goed-gedefinieerde vorm, byvoorbeeld as kubieke enkelkristalle. Hierdie doelwit is bereik, maar in die loop van 'n diffusie-eksperiment het 'n moeilikheid voorgekom as gevolg van die sintering van die deeltjies, met 'n ooreenkomstige afname in hul oppervlakte, selfs na langdurige, voorafgaande uitglouing. 'n Verdere moeilikheid is uitwisseling met die wande van die houer. Alumina is baie beter as silika in hierdie opsig. Uitwisseling met silika was so sterk dat 'n poging aangewend sal word om die self-diffusie van suurstof in silika te meet.

Amalgaamskeikunde

Werk in verband met die struktuur van Mn_2Hg_5 is voortgesit. Heelwat moeilikheid is ondervind om naaldvormige kristalle te laat groei wat volmaak genoeg is vir die studie van enkel kristalle. Stadige groei oor 'n tydperk van twee maande het gelei tot geskikte naalde. Die oplosbaarheid van mangaan in kwik is ook gemeet, maar die reproduseerbaarheid is nie bevredigend nie.

Radioskeikunde

Soos in vorige jare, was die radioskeikunde-seksie weer besig gehou met hulpverkaffing aan ander groepe. Verskaffing van gemerkte superfosfaat en die meting van die opneem daarvan deur tabakplante is in die afgelope jaar voortgesit. Bepaling van C^{14} in baie lae konsentrasies is bestudeer sodat hulp verleen kan word met die navorsing oor metabolisme, byvoorbeeld in suikersiekte, en in die opname van vitamien A, soos elders in hierdie verslag beskryf.

Die skeiding van draer-vry isotope uit siklotronskywe ontvang tans aandag. 'n Metode is uitgewerk vir die skeiding van niobium en sirkonium wat slegs 45 minute duur vanaf die ontvangs van die skyf totdat die draer-vry niobium in 'n betastraalspektrometer geplaas word. Ander skeidings wat proefondervindelik bestudeer is, is silwer-palladium, met die gebruik van uitwisseling tussen silwer in oplossing en silwer-jodied, indium-kadmium en antimoon-tin.

Metodes word tans uitgewerk vir die suiwering van groot hoeveelhede uraan, wat oorspronklik as die kommersiële oksied verkry word.

Chemiese skeidingsmetodes wat toepasbaar is vir radioaktiewe neerslag uit die atmosfeer word ontwikkel.

Korrosie

Goeie vordering is gemaak met navorsingswerk oor die korrosie van staal in versterkte beton, waarvoor 'n studiebeurs deur die S.A. Instituut van Siviele Ingenieurs

PHYSICAL AND ANALYTICAL CHEMISTRY

Diffusion in Solids

Following previous work in this laboratory on exchange between labelled carbon dioxide gas and calcite, a study of exchange between labelled oxygen gas and certain oxides was undertaken. A first objective was to prepare an oxide in a finely divided but well-defined form, e.g., as cubic single crystals. This was achieved but, in the course of a diffusion experiment, a difficulty resulted from sintering of the particles, with a corresponding reduction of their surface, even after prolonged, preliminary annealing. Another difficulty is exchange with walls of the container. Alumina is much better than silica in this respect. Exchange with silica was so large that an attempt will be made to measure self-diffusion of oxygen in silica.

Amalgam Chemistry

Work on the crystal structure of Mn_2Hg_5 has continued. Much difficulty was experienced in growing the needle-shaped crystals perfect enough for single crystal studies. Slow growth over a period of two months produced needles which are satisfactory. Solubility of manganese in mercury was also measured, but reproducibility is not satisfactory.

Radiochemistry

As has been usual in past years, the radiochemical section was primarily occupied in providing assistance to other groups. Provision of labelled superphosphate and measurement of its uptake by tobacco plants was continued in the past year. Determination of C^{14} in very low concentrations was studied, in order to assist investigations on metabolism, e.g., in diabetes, in vitamin A uptake, described elsewhere in this report.

Separations of carrier-free isotopes from cyclotron targets is receiving attention. A method was worked out for separation of niobium from zirconium which takes only 45 minutes from receipt of the target to introduction of carrier-free niobium in a beta-ray spectrometer. Other separations studied experimentally were silver-palladium, using exchange between silver in solution and silver iodide, indium-cadmium and antimony-tin.

Methods are being worked out for purification of large quantities of uranium, obtained initially as commercial oxide.

Chemical methods of separation applicable to radioactive fallout from the atmosphere are being developed.

Corrosion

Work under a Fellowship sponsored by the S.A. Institute of Civil Engineers for corrosion of steel in reinforced concrete has progressed well in the last year.

geskenk is. Ook is 'n deeglike studie gemaak van die polariteit en self-polarisasie-eienskappe van galvaniese selle wat in versterkte beton gevorm kan word. Onder die veranderlike faktore wat bestudeer is, is veranderinge in die natriumchloried-konsentrasie, die uitwerking van suurstof en die uitwerking van versadiging met kalk. Verder is 'n studie gemaak van die moontlikheid om staalstrukture katodies te beskerm. Tot dusver is, as gevolg van die elektriese weerstand van beton, geen doeltreffende manier gevind om 'n beskermende stroom oor 'n groot oppervlakte toe te pas nie.

Toetse word uitgevoer waarin versterkende standaardstawe in klein toetsstukke van standaardgrootte plaas word. Pleister en beton van verskillende samestelling en tekstuur word as omhulsel gebruik. Hierdie stukke word in 'n soutsprei-kabinet blootgestel, en monsters uit soortgelyke stelle word van tyd tot tyd geneem vir ondersoek. Reëlins is getref om groot toetsstukke by die kus bloot te stel in 'n natuurlike maar baie aggressiewe omgewing.

Werk is ook gedoen in verband met 'n vergelyking tussen die korrosie-weerstande-eienskappe van gegalvaniseerde yster wat vervaardig word deur die gewone warmdipproses, en die van 'n nuwe aaneenlopende warmdipproses. Blootstellingsrakke is by die kus en in die binneland opgerig, en proewe word uitgevoer.

Daar is weer 'n groot aantal navrae en klein kontrakondersoeke van verskillende aard afgehandel.

Ioonselektiewe Membrane

Membrane van hierdie tipe word gemaak vir die ont-souting van water deur elektrodialise, soos elders in hierdie verslag beskryf. Fisies-chemiese studies van sodanige membrane word gemaak om beter metodes vir hul karakterisering te ontwikkel.

ANALITIESE LABORATORIUM

Afgesien van die gebruiklike verskeidenheid van ontledings vir die verskillende afdelings van die laboratoriums, is 'n aantal spesiale ondersoeke uitgevoer. Onder andere is aandag aan die volgende geskenk: die bepaling van swaweldioksied en swaweltrioksied afsonderlik in die atmosfeer in verband met die lugbesoedelingsonderzoek; die meet van merkaptane en ander slegruikende stowwe in die lug naby 'n fabriek, die ondersoek van metodes waardeur baie klein hoeveelhede spoorelemente gekonsentreer kan word tot 'n konsentrasie wat spektroskopies kwantitatief bepaal kan word. 'n Groot aantal mikro-analitiese en infrarooi-ontledings is uitgevoer.

A careful study was made of the polarity and self-polarization characteristics of galvanic cells which can be formed in reinforced concrete. Amongst variables studied were variations of sodium chloride concentration, the effect of oxygen and effect of saturation with lime. In addition, a study was made of the possibility of cathodic protection for steel structures. Thus far, owing to the electrical resistance of concrete, no effective way of applying a protective current over an extensive area has been found.

Tests are being carried out in which standard reinforcing bars are placed in small test-pieces of standard size, using mortars and concretes of various compositions and texture as cover. These are exposed in a salt-spray cabinet and specimens are drawn from replicated sets from time to time for examination. Arrangements have been made for large test-pieces to be exposed at the coast under a natural, but very aggressive environment.

Work was also carried out on a comparison between the corrosion-resisting properties of galvanised iron produced by the regular hot-dipping process and by the newer method of continuous hot-dipping. Exposure racks have been set up at the coast and inland, and tests are under way.

As in past years, a large number of enquiries and small contract investigations of varied types were dealt with.

Permselective Membranes

Membranes of this type are being made for the demineralization of water by electrodialysis, described elsewhere in this report. Physico-chemical studies of such membranes are being made in order to develop better methods for their characterization.

ANALYTICAL LABORATORY

Apart from the usual diversity of analyses for other divisions of the laboratory, a number of special investigations were carried out. Amongst others, the following received attention: determining the SO_2 and SO_3 , separately in the atmosphere, in connection with air pollution research, measuring mercaptans and other malodorous air pollutants near a factory, and methods for concentrating very small percentages of trace elements to the point where they can be assessed quantitatively by spectroscopic method.

A large number of micro-analytical and infra-red determinations were carried out.

Nasionale Fisiese Laboratorium

Direkteur: DR. E. J. MARAIS

Die Biofisikagebou, die derde van die reeks geboue vir die Nasionale Fisiese Laboratorium, is gedurende die jaar in gebruik geneem. Die hoofgebou nader tans voltooiing en sal vroeg in 1957 gereed wees. Die gebrek aan voldoende ruimte het baie stremmend gewerk op die ontwikkeling van die Laboratorium.

Die navorsingspersoneel is aangesterk deur die aanstelling van 'n aantal goed gekwalifiseerde en ervare Suid-Afrikaanse en buitelandse fisici en wiskundiges. Die Laboratorium het egter 'n gevoelige terugslag gekry deur die bedanking van vier senior personeellede.

Die inwyding van die siklotron deur sy Edele, dr. A. J. R. van Rhijn op 26 Januarie 1956, was 'n hoogtepunt in die ontwikkeling, nie alleen van wetenskap nie, maar ook van die tegniek in Suid-Afrika. Die personeel wat belas was met die siklotronprojek, en die nywerheids-ondernemings wat meegewerk het, verdien lof vir die suksesvolle ingebruikstelling van die apparaat. Waardering word ook betuig aan die buitelandse inrigtings wat

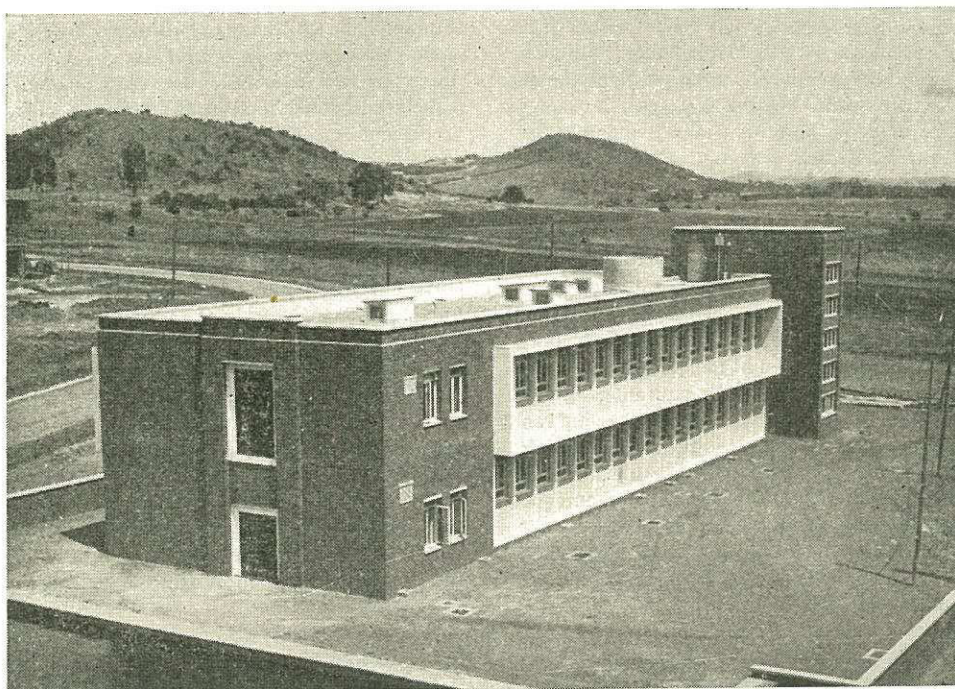
National Physical Laboratory

Director: DR. E. J. MARAIS

The Biophysics Building, the third of the series of buildings for the National Physical Laboratory, became available for occupation during the year. The main building is now nearing completion and will be ready for occupation early in 1957. The lack of sufficient accommodation has greatly hampered the laboratory's development.

The research staff has been strengthened by the appointment of a number of suitably qualified and experienced South African and overseas physicists and mathematicians. The Laboratory has, however, suffered a serious setback through the resignation of four senior staff members.

The official inauguration of the Cyclotron by the Hon. Dr. A. J. R. van Rhijn on January 26th, 1956, was a highlight in the development not only of science but also of technology in South Africa. The staff engaged on the cyclotron project, and the industrial concerns who assisted them in this work, deserve all the credit for the



Die nuwe Biofisikagebou wat gedurende die jaar betrek is.

The new Biophysics Building occupied during the year.

behelpsaam was met die opleiding van personeel vir die ontwerp en konstruksieprogram. Onder hulle moet die volgende Institute spesiaal genoem word: Massachusetts Institute of Technology, Nobel Institutet för Fysik, en die Nuffield Physics Laboratory van die Universiteit van Birmingham.

Op 1 Julie 1956 is 'n Biometriese Eenheid saamgestel in die Afdeling Wiskunde. Hierdie Eenheid wat in Johannesburg gevestig is sal statistiese werk ten behoeve van die Navorsingseenheid vir Pneumokoniose onderneem.

Die verslag wat hier volg, word sover moontlik saamgevat onder die verskillende navorsingsrigtings waarin gewerk word, en nie onder tegniese hoofde nie, soos in die verlede die geval was.

KERNFISIKA

Navorsing met Behulp van Kernemulsies

'n Personeelid van die Onderafdeling Kernspektroskopie het die grootste gedeelte van die jaar navorsingswerk gedoen aan die Universiteit van Bristol, in verband met die eienskappe van fundamentele deeltjies. In hierdie werk is gebruik gemaak van die kernemulsietegniek. Ongeveer honderd tau-mesone is uitgemeet en op grond van die energie-verspreiding van die sekondêre pi-mesone kon vasgestel word dat hierdie deeltjies, met 'n gemiddelde leeftyd van 'n honderdmiljoenste van 'n sekonde, spin nul en onewe pariteit besit. Verdere ondersoek was toegespits op die wisselwerkings van kappa-mesone met atoomkerne. Altesaam 44 van hierdie uiters seldsame voorvalle is waargeneem en belangrike gevolgtrekkings kon daaruit gemaak word. Hierdie werk speel 'n belangrike rol in die moderne kernfisika in verband met die verklaring van verskynsels wat optree wanneer hoë energiedeeltjies deur materie gaan.

Die W.N.N.R.-Siklotron

Toe die siklotron op 26 Januarie ingewy is, kon 'n bundel van drie mikro-ampère by die volle ontwerpenergie van 16 miljoen elektronvolt bereik word. By laer energieë kon baie hoë bundelstrome bereik word, byvoorbeeld 500 mikro-ampère by agt miljoen elektronvolt. As gevolg van die groot aanvraag vir bestralings by agt Mev., is daar besluit om tydelik verdere ontwikkeling van die siklotron te staak en eers aan die eksperimentele behoeftes te voldoen. In 'n periode van drie maande, wat 65 werksdae ingesluit het, kon bestralings gedurende 35 dae uitgevoer word. Dit kan as uitstekende werkverrigting vir 'n nuwe siklotron beskou word. Gedurende hierdie tyd is waardevolle ondervinding opgedoen in verband met die gedrag van die siklotron.

Nuwe projekte tans onder oorweging, verg dat die bundel van die siklotron uit die instrument uitgehaal en in 'n ander kamer langsaan gefokuseer moet word. Werk op hierdie skema het in April 1956 begin en lui 'n nuwe ontwikkelingsperiode in.

successful launching of this apparatus. Acknowledgement is also due to the various overseas institutions for their assistance with the training of the personnel responsible for the design and construction programme. Among these, the following Institutes are worthy of special mention: Massachusetts Institute of Technology, Nobel Institutet för Fysik, and the Nuffield Physics Laboratory of the University of Birmingham.

On 1st July, 1956, a Biometric Unit was set up for the Mathematics Division. This Unit which has been stationed in Johannesburg will undertake statistical work for the Pneumoconiosis Research Unit.

The report which follows, has been grouped as far as possible according to research activities in different directions, instead of under technical headings, as was done in the past.

NUCLEAR PHYSICS

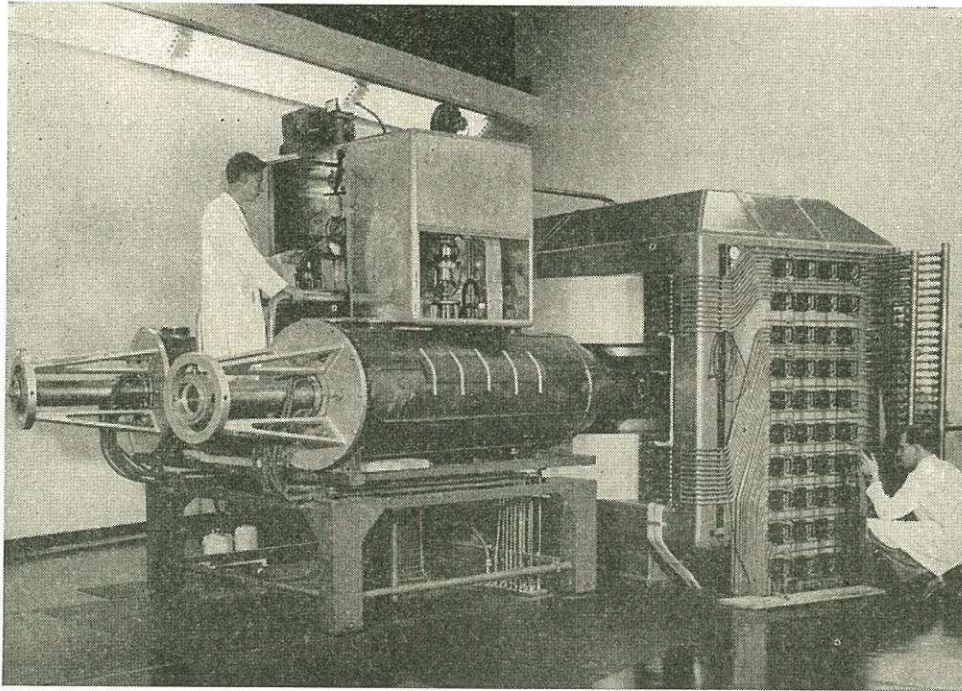
Research with Nuclear Emulsions

A member of the Nuclear Spectroscopy Sub-division spent the greater part of the year at the University of Bristol on research work in connection with the properties of fundamental particles. The nuclear emulsion technique was used in this work. About 100 tau-mesons were measured and it was possible to determine that these particles with a mean life of one-hundred-millionth of a second have spin zero and uneven parity. This was based on the energy distribution of secondary pi-mesons. Further research was mainly directed towards the interaction of kappa-mesons with nuclei. Altogether 44 of these very rare occurrences were observed, and important conclusions could be deduced. This type of work has an important bearing on the field of modern nuclear physics, connected with the elucidation of the effects produced by high energy particles passing through matter.

The C.S.I.R. Cyclotron

When the cyclotron was inaugurated on January 26th, 1956, a beam of 3 micro-ampères at the full-design energy of 16 million electron volts could be obtained. At lower energy, very high currents could be obtained, e.g. 500 micro-ampère at 8 million electron volts. Owing to the great demand for irradiations at 8 Mev. it was decided to stop further development work on the cyclotron temporarily, in order to satisfy the experimental needs. During a period of three months, which included 65 working days, irradiations could be performed on 35 days. This can be regarded as an outstanding performance for a new cyclotron. During this period, valuable experience was gained in connection with the general behaviour of the cyclotron.

New projects now under consideration require that the cyclotron beam be extracted from the machine and focussed in an adjacent room. Work on this scheme commenced during April, 1956, inaugurating a new phase of development.



'n Syaansig van die siklotron wat teen die einde van 1955 in werking gestel is.

A side view of the cyclotron which was brought into operation at the end of 1955.

Nasionale Sentrum vir Fundamentele Kernfisiese Navorsing en Opleiding

In die vorige jaarverslag is klem gelê op die noodsaaklikheid dat Suid-Afrika in toenemende mate sy eie kernwetenskaplikes moet oplei. As 'n bydrae in hierdie rigting, word die fasiliteite van die Onderafdeling Kernspektroskopie in 'n groot mate beskikbaar gestel vir die opleiding van 'n aantal gevorderde studente wat, met behulp van beurse van die Raad op Atoomkrag, besig is met gevorderde studie in die kernfisika. Vyf sulke studente werk tans in die Onderafdeling, en lesings van gevorderde gehalte word aan hulle gegee.

Hierdie studente is by verskillende Suid-Afrikaanse Universiteite ingeskryf vir doktorsgrade, en behalwe vir die lesings wat hulle volg, is elkeen ook besig met 'n geskikte navorsingsprobleem.

Isotoopafskeier

Aangesien die kernfisika hom besig hou met die studie van die eienskappe en gedrag van atoomkerne, en elke skeikundige element bestaan uit atome met verskillende atoomkerne (isotope), is 'n instrument om die verskillende isotope van 'n betrokke element van mekaar te skei, noodsaaklik vir kernfisiese ondersoek. Vir dié doel is 'n elektromagnetiese isotoopafskeier deur die Onderafdeling

National Centre for Fundamental Nuclear Research and Training

In the previous report, stress was laid on the necessity for South Africa to train its own nuclear scientists to an increasing extent. As a contribution in this direction the facilities of the Nuclear Spectroscopy Sub-division are to a large extent devoted to the training of a number of students who, assisted by bursaries granted by the Atomic Energy Board, are pursuing advanced studies in nuclear physics. Five such students are at present working in the Sub-division, and lectures of an advanced nature are given to them.

These students are registered at various South African universities for doctors' degrees and, in addition to these lectures, each of them is engaged on a suitable research project.

Isotope Separator

As nuclear physics entails the study of the properties and behaviour of nuclei, and as each chemical element consists of atoms with different nuclei (isotopes), an instrument for separating the different isotopes of the element concerned is essential for nuclear research. For this purpose an electro-magnetic isotope separator has been designed by the Nuclear Spectroscopy Sub-division.

Kernspektroskopie ontwerp. Gebruik word gemaak van nuwe fokuseringsbeginsels wat sal verseker dat die instrument aansienlike verbetering toon bo dergelike instrumente wat reeds in die buiteland bestaan. Die ontwerpwerk is in so 'n mate voltooi dat oorgegaan kon word tot die vervaardiging van verskillende onderdele daarvan. Die Suid-Afrikaanse isotoopafskeier sal hom daarin onderskei dat die instrument by uitstek geskik sal wees vir die skeiding van stowwe in die vaste toestand. Met behulp van hierdie instrument sal dit moontlik wees om skeiding te weeg te bring tussen verskillende radioaktiewe isotope wat in die siklotron gelyktydig vervaardig word met een enkele bestraling.

Kernteorie

Die atoomkern is 'n ingewikkelde sisteem, bestaande uit 'n aansienlike getal klein deeltjies. Tot dusver bestaan daar geen teorie wat die gedrag van die atoomkern volledig kan beskryf nie. Daar is egter etlike sogenaamde kernmodelle opgestel wat elkeen 'n gedeelte van die kerneienskappe verklaar. Hierdie kernmodelle kan verdeel word in twee groepe, naamlik enkeldeeltjie-modelle en kollektiewe modelle. Albei groepe modelle het in hul onderskeie geldigheidsgebiede aanmerklike sukses behaal met die verklaring van waargenome verskynsels.

Die twee groepe modelle berus egter op oënskynlik teenstrydige aannames, naamlik swak wisselwerking tussen die deeltjies in die geval van enkeldeeltjie-modelle en baie sterk wisselwerking in die geval van kollektiewe modelle. In 'n poging om hierdie teenstrydigheid op te klaar, is 'n fenomenologiese nukleonkernwisselwerking opgestel deur 'n personeellid van die Onderafdeling Kernspektroskopie. Hiermee was dit moontlik om belangrike vordering te maak in verband met die probleem om die enkeldeeltjie- en kollektiewe modelle te versoen.

Meting van Radioaktiwiteit

Radioaktiewe standaarde is van belang in verband met al die toepassings van radioisotope in navorsing en die nywerheid, en ook met die yking van die instrumente wat by sodanige toepassing gebruik word.

Die metode van standaardisasie met behulp van die 4-pi-teller is nou sover ontwikkel dat dit met vertroue toegepas kan word vir die absolute standaardisering van 'n hele aantal isotope. Ook is 'n begin gemaak met die kombinerings van die 4-pi-telbuis met 'n sintillasiesteller in 'n koïnsidensie-opstelling ten einde die toepasbaarheid van die metode verder uit te brei.

Die tegniek van vloeistofsintillasiestellers is verder ontwikkel en suksesvol toegepas vir die standaardisasie van alfa- sowel as beta-stralers. 'n Hoë noukeurigheid kon bereik word in die geval van alfa-stralers en 'n redelike noukeurigheid in die geval van beta-stralende isotope.

New focussing principles are used in order to ensure that this instrument will be a marked improvement on any of its kind in existence abroad. The work on the design has advanced to such a degree, that it has been possible to make a start with the manufacture of a number of its components. The South African isotope separator will be characterized by the fact that the instrument will be pre-eminently suitable for separating materials in the solid state. With the assistance of this instrument it will be possible to separate different radioactive isotopes, which are produced simultaneously by the cyclotron in the course of a single irradiation.

Nuclear Theory

The nucleus is a complicated system, consisting of considerable numbers of small particles. At present no theory exists which completely describes its behaviour. Several so-called nuclear models, each of which explains part of the properties of the nucleus have, however, been devised. These nuclear models can be divided into two groups: single-particle models and collective models. Both groups have attained considerable success in explaining observed phenomena in their particular spheres of validity.

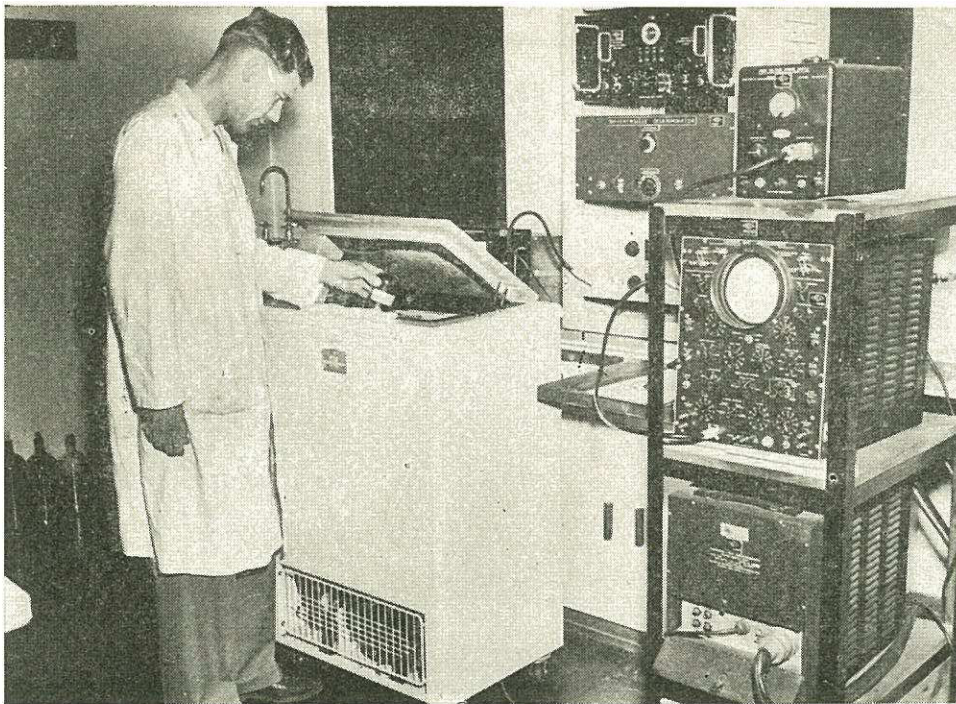
The two groups of models are, however, based on apparently contradictory assumptions, viz. weak interaction between the particles in the case of the single-particle models, and very strong interaction in the case of the collective models. In an effort to explain this contradiction, a member of the staff of the Nuclear Spectroscopy Sub-division suggested a phenomenological interaction between the nucleon and nucleus. This has made possible considerable progress towards reconciling the single particle with the collective-particle models.

Measurement of Radioactivity

Standards of radioactivity are of importance in connection with all applications of radioisotopes in research and industry, and in the calibration of instruments used in such applications.

The method of standardization by means of a 4-pi-counter has now been developed to such an extent that it can be applied with confidence for the absolute standardization of a whole range of isotopes. Furthermore, a start has been made with the combination of a 4-pi-counter and a scintillation counter in a coincidence set-up, with a view to extending the applicability of the method.

The technique of liquid scintillation counters has been further developed and successfully applied in the standardization of both alpha and beta emitters. A high degree of accuracy was obtained in the case of alpha emitters and a reasonable accuracy in the case of beta-emitting isotopes.



Standaardisasie van radioaktiewe isotope met 'n vloeistofsintillasielometer wat in 'n koelkas gehou word.

Standardization of radioactive isotopes with a liquid scintillation counter kept inside a refrigerator.

KERNSPEKTROSKOPIE

Beta-spektrometers

By die ondersoek van die vervalpatrone van radioaktiewe stowwe gedurende hul desintegrasië is 'n beta-spektrometer onontbeerlik, aangesien dit die energie-bepalings van die verskillende uitstralings noukeurig verrig. Die tussenbeeld-lensspektrometer is in werking gestel en sy eienskappe bepaal. Die instrument het 'n oplosvermoë van 1.5 persent getoon wat as uiters bevredigend beskou kan word.

Die instrument is dadelik gebruik in verband met die bepaling van die reaksiedeursneë van sekere isotope met deutrone wat deur die siklotron versnel word. Eksperimente met isotope van tin, indium, kadmium en silwer is reeds begin.

Alhoewel uraan so 'n belangrike rol in die wêreld speel, en dit van die grootste belang is om presies te weet hoe sekere van die vervalprodukte van uraan, naamlik Uraan X₁, Uraan X₂ en Uraan Z verval alvorens radiometriele metodes vir die meting van uraan tot 'n finale stadium van noukeurigheid ontwikkel kan word, bestaan daar teenstrydighede in die gepubliseerde gegewens oor hierdie saak. 'n Ondersoek is gevolglik begin om hierdie teenstrydighede te probeer opklaar.

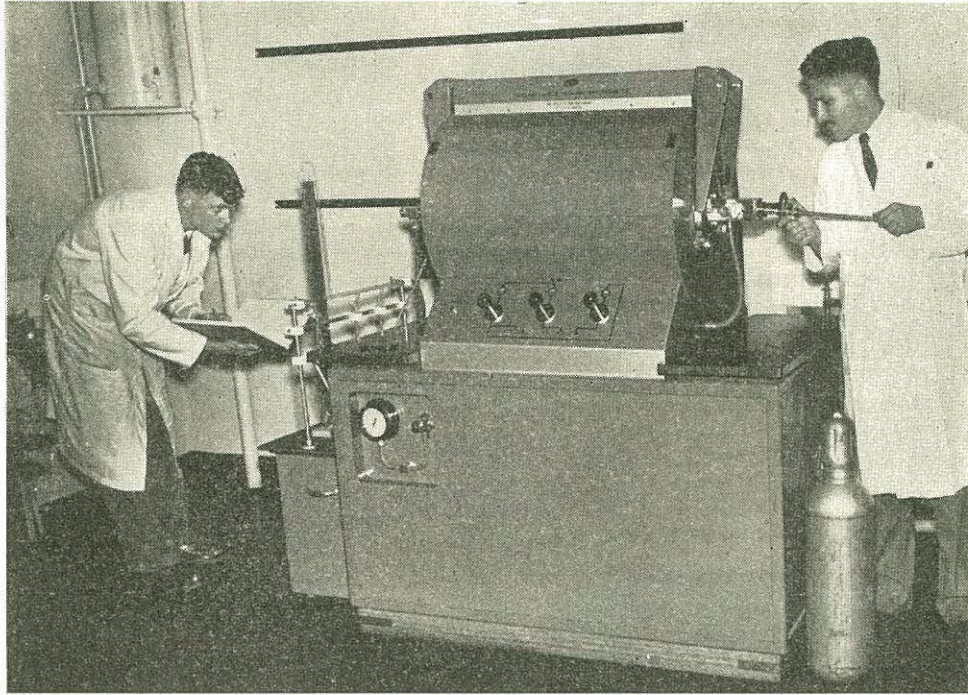
NUCLEAR SPECTROSCOPY

Beta-Spectrometers

A beta-spectrometer is essential for the investigation of the decay patterns of radioactive materials during their disintegration, as it enables the accurate determination of the energies of the various rays emitted. The intermediate image lens spectrometer was brought into operation and its characteristics determined. The instrument showed a resolving power of 1.5 per cent., which is most satisfactory.

Immediate use was made of the instrument in determining the reaction cross sections of certain isotopes with deuterons accelerated by the cyclotron. Experiments have already been started with isotopes of tin, indium, cadmium and silver.

Although uranium is of such importance to the world, and it is of the utmost importance to know exactly how some of uranium's daughter isotopes, such as UX₁, UX₂ and UZ, decay before it will be possible to reach the ultimate accuracy in the radiometric determination of uranium, contradictions still exist in the published data in this field. An investigation with the aim of clearing up these contradictions has been started.



Die tussenbeeld-lensspektrometer word gebruik om die energie-spektrum van 'n betastraler te meet.

The intermediate image spectrometer being used for measuring the energy spectrum of a beta ray emitter.

BIOFISIKA

In samewerking met die Mediese Fakulteit van die Universiteit van die Witwatersrand, is verdere opnames gemaak van elektriese spannings wat met die werking van die baarmoeder in verband staan. Apparaat is ook ontwikkel om die weerstand teen uitsetting van die cervix van die uterus te meet.

SPEKTROSKOPIE

Sekere elektroniese oorgange wat in die CO-molekuul voorkom, ten spyte van die feit dat hulle deur die kwantum-teorie „verbied” word, is bestudeer in 'n poging om meer inligting oor hierdie tipes verbode oorgange te verkry. Eksperimentele gegewens op drie tipes verbode oorgange is verkry in die laboratorium van die „National Research Council of Canada”, waar een van die beamptes van die Raad 'n beurshouer was. Die verwerking van die resultate op twee oorgange is in Kanada gedoen en die derde se resultate word nou in Pretoria verder verwerk.

Verdere eksperimentele gegewens wat oor die belangrike grondtoestand van AIF in die vakuum-ultraviolet verkry is, word nou verwerk.

BIOPHYSICS

In co-operation with the Medical Faculty of the University of the Witwatersrand, further measurements have been made of the electrical potentials associated with the activity of the human uterus. Apparatus has also been developed for the measurement of the resistance of the cervix to dilation.

SPECTROSCOPY

Certain electronic transitions which occur in the CO molecule, in spite of the fact that they are “forbidden” by the quantum theory, were studied in an attempt to gain additional information which might help to elucidate this phenomenon. Experimental data on three types of forbidden transitions were obtained in the laboratory of the National Research Council of Canada, where one of the officers of the Council held a Fellowship. The study of the results on the third are being studied in Pretoria.

Further experimental data on the important ground state of the AIF molecule were obtained in the vacuum ultraviolet and are being studied.

CHEMIESE FISIKA

Reaksie-Kinetika

In kinetiese ondersoek kan die verloop van 'n reaksie gevolg word, eerstens deur die verandering in 'n bepaalde fisiese eienskap, byvoorbeeld druk (by gasse) of optiese aktiwiteit, te meet. Tweedens kan dit gevolg word deur na bepaalde tye die reaksie tot stilstand te bring, 'n monster te neem en te ontleed. So 'n ontleding kan chemies, spektrometries of massaspektrometries geskied. Die massaspektrometriese metodes wat hier aangewend word is die geskikste metode, aangesien die reaksiemengsel nie deur die byvoeging van reagense gesteur word nie.

Die termiese ontbinding van di(terisiere butiel) peroksied is reeds volgens hierdie metode bestudeer. Die werk is in samewerking met die Universiteit van Pretoria uitgevoer, en alle ontledings in dié verband word op een van die Nasionale Fisiese Laboratorium se massaspektrometers gedoen.

Massaspektrometermetodes

Die massaspektrometer word steeds in toenemende mate as 'n ontledings- en navorsingsinstrument gebruik. Byvoorbeeld, 'n monster gas wat 'n mengsel was van koolstofmonoksied en waterstof, is ontleed vir spore van koolwaterstowwe, en 'n verdere aantal gasse is ontleed vir stikstof, suurstof, koolstofmonoksied, koolstofdoksied en stikstofoksied; ook is 150 stikstofisotoopontledings, in verband met navorsing oor bemestingstowwe, ten behoeve van die Departement van Landbou onderneem. Die instrument is ook gebruik om isotoopverhoudings te bepaal in verband met die diffusie van suurstof in metaaloksiede.

X-straal en Elektronmikroskopiese Werk

X-straal en elektronmikroskopiese tegnieke is oor die afgelope jaar in steeds toenemende mate aangewend op identifikasie- en ontledingsprobleme afkomstig van nywerhede en ander organisasies en laboratoriums. So is 'n X-straalmetode uitgewerk waarvolgens die vrye yster-, ysterkARBied- en magnetiet-inhoud van Fischer-Tropsch-kataliste vinnig en redelik akkuraat bepaal kan word; 'n groot aantal monsters bousand, uit gebiede waar kraking in fundamente voorgekom het, is ondersoek en hul kwarts-, veldspaat- en klei-inhoud is vergelyk; neerslae en korrosieprodukte wat op yster- en tinplate tydens vervaardiging voorkom, is ontleed en hul samestelling is vasgestel; 'n groot aantal sintetiese koolwaterstofverbindings is met X-straalmetodes ondersoek, en uit die diffraksiepatrone is die aantal koolstofatome in hierdie lang-kettingverbindings vasgestel; 'n aantal mineraal-ertse, slakke, steenkoolasmonsters is ontleed en hul hoofbestandele vasgestel.

Die elektronmikroskoop is gebruik om die partikelgrootte en vorm te bepaal van stofmonsters, kataliste, rubberemulsies, kleimonsters, ens. 'n Aantal bakterieë en virusse is ook met hierdie instrument by hoë vergrotings ondersoek.

CHEMICAL PHYSICS

Reaction Kinetics

In kinetic investigations a reaction can be studied by two methods. In the first, the change in a certain physical property of the reaction mixture such as the pressure (of gasses) or optical activity can be measured. In the second, the reaction can be followed by stopping it after a specified time, and then analyzing a sample of the mixture. Such an analysis can be done chemically, spectrometrically or mass-spectrometrically. The mass-spectrometric methods which are used here, are perhaps the most convenient, as the reaction mixture is not disturbed by the addition of reagents.

This method was used in a study of the thermal decomposition of di(tertiary butyl)peroxide. The work was carried out in collaboration with the University of Pretoria, and all the analyses were done on one of the mass spectrometers of the National Physical Laboratory.

Mass Spectrometric Methods

The use of the mass spectrometer as a research and analytical instrument is steadily increasing, e.g. a gas mixture containing chiefly carbonmonoxide and hydrogen was analysed for traces of hydrocarbons. A number of samples were analysed for oxygen, carbon monoxide, carbon dioxide and nitrogen oxides. One hundred and fifty nitrogen isotope ratio determinations, in connection with fertilizer studies, were also carried out on behalf of the Department of Agriculture. The instrument has further been used for the determination of isotope ratios in connection with the diffusion of oxygen in metal oxides.

X-ray and Electronmicroscopic Investigations

During the past year, X-ray and electron-microscope techniques were applied to an ever increasing extent to identification and other analytical problems submitted by industrial and other organizations and laboratories. For example, a rapid and fairly accurate method was developed for the determination of free iron, iron carbide and magnetite in Fischer-Tropsch catalysts; a large number of building sands—obtained from regions where foundation troubles were experienced—were analyzed and their quartz, feldspar and clay-mineral content compared; deposits and corrosion products on samples of iron and tin plate were identified; many synthetic hydrocarbon compounds were examined by X-ray methods, and the number of carbon atoms in these long-chain compounds computed from the diffraction patterns; a number of mineral ores, scales and coal deposits were analyzed for their major constituents.

The electron microscope was used to determine the particle size and shape of dust samples, catalysts, rubber emulsions, clay samples, etc. A number of bacteria and viruses were also examined under high magnification.

Spektrochemiese Werk

Die noukeurigheid van spektrochemiese ontledings word hoofsaaklik bepaal deur die noukeurigheid waarmee die spektra in die ligbron opgewek kan word. Om die spektrochemiese ontledingsresultate te probeer verbeter, word daar 'n studie van die eienskappe van die opwekkings-eienskappe van elektriese boë en vonke gemaak. Vir hierdie doel is 'n elektriese apparaat ontwikkel wat in staat is om die belangrikste parameters van elektriese vonke en boë te meet. Hierdie apparaat sal die studie van die spektrochemiese ligbronne baie bespoedig, aangesien dit die uitwerk van die draaispieëlspektrogramme in meeste gevalle onnodig maak.

'n Aantal roetine-ontledings is ten behoeve van die nywerheid uitgevoer, waarvan die volgende vermelding verdien: bepaling van die samestelling van brokstukke van 'n gebreekte waaierskroef; ontleding van 'n korrosieprodukt van 'n hoëspanning elektriese kabel; ontleding van 'n platinumkonsentraat, en van 'n groep mynerts-monsters vir maandelikse toksiese elemente in verband met uraan-herwinning.

Navorsing oor Sporelemente

Die ontwikkeling van spektrochemiese metodes vir die ontleding van plantmateriale en gronde ten behoeve van die Departement van Landbou, vorder bevredigend.

'n Spektrochemiese metode is ontwikkel vir die elemente wat direk op die plant-as bepaal kan word. Die elemente is: kalium, natrium, kalsium, magnesium, barium, strontium, mangaan, yster, aluminium en koper. Die gelyktydige bepaling van kalium, natrium en kalsium, tesame met magnesium, yster, ens., op dieselfde monster plant-as, maak die vlamfotometriese bepaling van kalsium, kalium en natrium alleen 'n noodsaaklikheid in gevalle waar baie noukeurige ontledingsresultate vir hierdie drie elemente verlang word.

METAALFISIKA

Witroes op Sinkplate

Uitgebreide X-straal en elektronmikroskopiese ondersoek is uitgevoer op twee tipes plaaslik vervaardigde sinkplate met die doel om meer lig te werp op die ongewenste korrosieproses wat bekend staan as „witroes”. Daar is bevind dat die twee plaattipes groot verskille toon in die oriëntasie van die dekkende laag sinkkristalle. Die plaat wat die vinnigste roes, bevat baie meer kristalle met 'n spesifieke oriëntasie as die plaat wat meer bestand is teen korrosie. Laboratoriumtoetse het ook getoon dat sinkkristalle met hierdie spesifieke oriëntasie vinniger roes as kristalle met ander oriëntasies. Die verband tussen die korrosiesnelheid en die oriëntasie van die sinkkristalle word tans ondersoek.

Elektronmikroskopiese ondersoek het ook getoon dat die oppervlakte van sinkplate wat die vinnigste roes, bedek is met klein gaatjies van omtrent een mikron deur-

Spectrochemistry

The accuracy of spectrochemical analyses is mainly determined by the accuracy with which spectra can be excited in the light source. In an attempt to improve the spectrochemical analytical results, a study is being made of the excitation characteristics of electric arcs and sparks. For this purpose an electrical apparatus has been developed with which the most important parameters of electric sparks and arcs can be measured. This apparatus will appreciably speed up the investigation of spectrochemical light sources, since the critical measurements of rotating-mirror spectrograms are, in most cases, rendered unnecessary.

A number of routine analyses were again done on behalf of Industry. The following important analyses are worthy of mention: the determination of the composition of parts of a broken fan blade; the analysis of the corrosion products of a high-tension electric cable; the analysis of a platinum concentrate, and of a group of mine-ore samples for possible toxic elements in connection with uranium recovery.

Trace Element Research

The development of spectrochemical methods for the analysis of plant materials and soils on behalf of the Department of Agriculture is progressing satisfactorily.

A spectrochemical method has been developed for the elements which can be determined directly on the ash. These elements are potassium, sodium, calcium, magnesium, barium, strontium, manganese, iron, aluminium and copper. The simultaneous determination of potassium, sodium and calcium, together with magnesium, iron, etc. on the same plant-ash sample, makes the flame photometric determination of potassium, sodium and calcium only necessary in cases where very accurate analytical results are a primary requisite.

METAL PHYSICS

White Rust on Galvanized Iron

Extensive X-ray and electron-microscope investigations were made on two types of locally manufactured galvanized sheets, in a study of the undesirable corrosion process known as “white rust”. It was found that the two types of sheets had large differences in the crystal orientation of the covering zinc layer. The sheet which corroded at the faster rate contained many more crystals with a specific orientation than the more corrosion-resistant sheet. Laboratory tests showed further that zinc crystals with this specific orientation corroded faster than crystals with other orientations. The connection between corrosion rate and orientation of the zinc crystals is now being investigated.

Electron-microscope investigations also revealed that the surface of the faster corroding type of sheet was covered with tiny holes or depressions of a diameter of

snee, terwyl dit nie die geval is by plate wat teen korrosie bestand is nie. Vermoedelik dien hierdie submikroskopiese gaatjies as korrosie-sentra waar witroes begin, en dan verder uitbrei na die res van die plaatoppervlakte. Verdere ondersoeke in verband met hierdie verskynsel is aan die gang.

Plasties-ervormde Metale

Om bestaande teorieë in verband met plastiese vorming by metale verder eksperimenteel te bestudeer, is die oppervlaktestruktuur van alfa-geelkoper elektronmikroskopies ondersoek. Hierdie legering toon by verdieper afskuiwingsbande as wat by suiwer metale voorkom, en is dus besonder geskik vir studies aangaande fundamentele prosesse wat in werking tree by plastiese vorming. Vyf verskillende metodes het onweerlegbaar bewys dat in hierdie geval groot afskuiwings plaasvind langs relatief min enkelatoomvlakke wat betreklik ver uitmekaar geleë is. Hierdie resultaat is teenstrydig met voorstelle van sommige navorsers op hierdie gebied wat vermoed het, dat die vorming plaasvind deur afskuiwings van atoomdimensies langs opeenvolgende atoomvlakke.

Transformatorstaal

Sekere soorte staalplaat wat in transformatore gebruik word, is elektronmikroskopies ondersoek om die faktore wat hul elektriese eienskappe beïnvloed te probeer vasstel. Hiervoor is onder andere 'n nuwe afdruk-tegniek ontwikkel wat dit moontlik maak om herhaalde afdrucke vanaf dieselfde oppervlakte te verkry, voor en ook na die monsters geëts is.

Roosterdistorsieverskynsels in Koudbewerkte Metale

Studies van die fundamentele meganismes van plastiese vorming van metale en hul invloed op die kristalrooster is met X-straal-diffraksietegniese voortgesit. Vir hierdie doel is suiwer tantalum-metaal koudbewerk, deur dit te vyl; die X-straalpatroon van die gevormde metaal is dan krities bestudeer. Tantalum, wat 6.5 atoompersent waterstof bevat, is ook ondersoek en dit is vasgestel dat hierdie drastiese vormingsproses die gevolg het dat die oorspronklike metaalgreintjies opgebreek word in sub-greintjies van die grootte-orde 100Å en dat dit lei tot inwendige spannings wat in die metaalrooster bly. 'n Berekening van die spannings-distribusie in die geval van tantalum wat waterstof bevat, het aangetoon dat die waterstofatome nie volgens vermoede egalig deur die kristalrooster versprei is nie, maar dat die atome skynbaar gekonsentreer is in die omgewing van ontwingings.

Orientasie van Dun Metaallagies

Studies van dun metaallagies het in die laaste tyd heelwat belangstelling gewek, hoofsaaklik omrede die interessante en soms onverwagte eienskappe wat hulle vertoon. Ondersoeke is op dunsilwerlagies uitgevoer

about one micron while this was not the case with the more resistant type of sheet. It is thought that these submicroscopic depressions may act as corrosion centres where white rust starts and then extends outwards over the rest of the surface of the sheet. Further investigations in connection with this phenomenon are in progress.

Plastic Deformation of Metals

As a further experimental test of existing theories concerning the plastic deformation of metals, a detailed electron-microscopic study of the surface structure of alpha-brass was undertaken. When plastically deformed, this alloy exhibits deeper slip bands than found with pure metals, so that it is ideally suited for studying the fundamental processes which come into operation during plastic deformation. Five different methods all showed unequivocally that slip in this case proceeded in large steps along relatively few widely separated single atomic planes and not in steps of atomic dimensions on successive atomic planes, as some workers in this field postulated.

Transformer Steel

Samples of steel sheet used in transformers were studied electron microscopically, in an effort to determine the factors which influence their electrical properties. For this investigation a new replica technique was developed. This makes it possible to obtain repeated replicas from the same surface area, both before and after the etching of the samples.

Lattice Distortion Phenomena in Cold-worked Metals

Studies on the fundamental mechanisms of the plastic deformation of metals and their influence on the crystal lattice, were continued by X-ray diffraction methods. For this purpose pure tantalum metal was cold-worked by filing, and the X-ray diffraction pattern of the deformed metal studied critically. Tantalum containing 6.5 atomic per cent. of hydrogen was also examined. It was found that the drastic deformation caused by filing led to fracture of the original grains into particles of size about 100Å and that internal strains remained in the crystal lattice. Calculations of the stress distribution in the case of tantalum containing hydrogen showed that the hydrogen atoms were not distributed uniformly throughout the crystal lattice, as was anticipated, but that they were instead concentrated in the neighbourhood of dislocations.

Orientation of Thin Metallic Layers

Studies of thin metallic films have in recent years evoked considerable interest, mainly on account of the interesting and at times unexpected properties which they reveal. Experiments were carried out with thin silver

met behulp van elektrondiffraksie-tegnieke, met die doel om vas te stel in watter mate die silwerlagies, met 'n dikte van ongeveer een-honderdste mikron, georiënteer is wanneer die neerslaantemperatuur bo die herkristallasie-temperatuur van die metaal is. Daar is verskille in oriëntasievoorkoms by verskillende temperature waarneem.

KRISTALSTRUKTUURBEPALINGS

Weens gebrek aan berekeningsfasiliteite, is besluit om hierdie ondersoek toe te spits op kristalle met eenvoudige strukture, waaruit resultate van direkte skeikundige belang mag volg. Kristalle wat vir hierdie doel gekies is, is 1:2:4:5 tetrabromobensien en difeniel. Die eenheidselle en ruimtegroepe van dié kristalle is reeds bepaal en 'n begin is gemaak met die noukeurige bepaling van die intensiteite van die X-straalspektra. Die hoofdoel van die ondersoek is om die vervormings binne die molekules weens die aanwesigheid van oorgrote gesubstitueerde groepe vas te stel.

GEOFISIKA

Ten einde die hittevloei in die aardkors te bepaal, is dit nodig om die temperatuurgradiënt en die termiese geleidingsvermoë daarvan te meet. In die afgelope jaar is temperatuurmetings in verskeie diep boorgate gedoen, en die geleidingsvermoë van monsters van boorgatkerne bepaal.

Baie aandag is geskenk aan die opbou van 'n geskikte apparaat vir bepaling van warmte-geleidingsvermoë op rotsmonsters onder druk van 2,000 tot 3,000 lb. per vierkante duim wat oppervlakte-invloede verminder en ongeveer gelykstaan aan toestande waaronder die rotsmonsters in hul natuurlike staat verkeer. Die apparaat is met sukses voltooi en werk bevredigend. Bepalings op sowat tien monsters kan op 'n dag uitgevoer word.

GEOCHRONOLOGIE

Ouderdomsbepalings op Gesteentes

Daar is toenemende belangstelling in geologiese ouderdomsbepalings as hulpmiddel vir geologiese navorsing.

Direkte ouderdomsbepalings op stollingsgesteentes was tot onlangs onmoontlik as gevolg van die lae uraan- en thorium-konsentrasies in hierdie tipe gesteente. Hul ouderdomme kon tot dusver slegs by benadering bepaal word met behulp van die gegewens oor mineraalneerslae in die stollingsgesteente. Met behulp van die nuwe hoogs gevoelige massaspektrometer, en toepassing van die isotoopverduunningstegnieke, is dit nou moontlik om ouderdomsbepalings direk op 'n stollingsgesteente uit te voer. Altesaam agt ouderdomsbepalings is uitgevoer, waarvan twee deur buiteliggame aangevra is.

films, using electron diffraction techniques, in order to determine to what extent films about one hundredth of a micron thick are oriented when the temperature of deposition is kept above the recrystallization temperature of the metal. Differences in the mode of orientation at different temperature were observed.

CRYSTAL STRUCTURE DETERMINATIONS

In the absence of computing facilities, it was decided to limit these investigations to crystals having simple structures from which useful chemical information can however be obtained. Crystals chosen for this purpose were 1:2:4:5 tetrabromobenzene and diphenyl. Unit cell dimensions and the space-groups of these crystals have already been determined, and a start has been made with intensity measurements of the X-ray spectra. The main purpose of this investigation is to determine the distortions within the molecules because of the overcrowding of the bulky substituent groups.

GEOPHYSICS

In order to determine the heat flow in the Earth's crust, it is necessary to measure the temperature gradient and its thermal conductivity. During the past year, temperature measurements were made in a number of deep boreholes and conductivity of the associated borehole cores was determined.

Much attention was given to the construction of apparatus suitable for thermal conductivity determinations on rock samples under pressures of 2,000 to 3,000 lb. per square inch which minimize surface effects, and approximate the condition of the rock *in situ*. The apparatus has been completed and is working satisfactorily. With it approximately ten samples can be measured per day.

GEOCHRONOLOGY

Age Determinations on Minerals

The interest in geologic age determinations as an aid to geologic research is steadily increasing.

Since low concentrations of uranium and thorium in igneous rocks have precluded direct age measurements on them, their ages have hitherto been inferred from the data obtained from ore deposits within the igneous structure. By using the new ultra-sensitive mass spectrometer and isotope dilution techniques, it is now possible to conduct age determinations directly on igneous rocks. Eight age determinations were made, two of which were requested by outside concerns.

Isotoopverhoudings van „Gewone Lood”

Ten einde te korrigeer vir nie-radiogene loodkontaminasie in minerale, word die isotoopverhoudings van die lood, in loodglans van die onmiddellike omgewing van die mineraal, gebruik. Isotoopontledings op loodglans is dus van groot belang in die geochronologie. Agt sulke monsters is verkry en ontleed.

Bereiding van 'n Thorium-230 Spoorder

Gedurende die verval van uraan 238 word thorium 230 gevorm, met 'n halveringstyd van 8×10^4 jaar. Aangesien natuurlike thorium mono-isotopies is in thorium 232, kan hierdie vervalprodukt van uraan 238 dien as 'n spoorder in die konsentrasiebepalings van thorium in ertse. Die thoriumspoorder is verkry deur die afskeiding van die thorium uit 'n 600 miljoen jaar oue uraniniet wat baie min natuurlike thorium bevat en afkomstig is van Katanga, Belgiese Kongo; 7 mg. thoriumspoorder is verkry met 'n isotoopverhouding van thorium 230/thorium 232 = 0.259.

PALEOGMAGNETISME

Magnetiese studies op rotsmonsters uit die Pilansberggange in voortgesit. Die ondersoek is veral toegespits op monsters wat geneem is op plekke waar ses sulke gange deur die Witwatersrandse goudmyne blootgelê is. Op hierdie monsters is die rigting en die intensiteit van die oorblywende magnetisme in die monsters bepaal. Monsters uit vyf van die gange het konsekwente resultate gegee. Op die veronderstelling dat die oorblywende magnetisme van hierdie rotse te wyte is aan 'n geosentriese dipoolveld, toon die resultate op 'n magnetiese noordpool in Oos-Abessinië tydens die totstandkoming van hierdie gange.

Ongeveer honderd dun seksies van rotsmonsters, wat reeds magnetometries ondersoek is, is voorberei vir 'n petrografiese ondersoek van die gange in die Witwatersrandse goudmyne. Hierdie studie, tesame met die magnetiese studie van die monsters, sal heelwat lig werp op die vroeër geskiedenis van die formasies.

ATMOSFERIESE FISIKA

Vriespunt van Waterdruppels

Hierdie ondersoek wat basiese inligting verskaf oor die vorming van reëndruppels in wolke, is nou afgerond. Dis bevind dat skoon waterdruppels met deursnee van 0.1 tot 0.01 millimeter eers in die nabyheid van -40°C . vries. Die invloed van die grootte van die druppel, die snelheid van verkoeling en die aard van die oppervlak waarop hy rus op die vriespunt van die waterdruppel, is vasgestel.

Moontlike Invloed van Meteorietstof op Reënval

Gedurende Januarie 1956 is daaglikse metings geneem van die konsentrasie van „vrieskerne” by 'n hoogte van

Isotopic Constitution of “Common Lead”

In order to correct for non-radiogenic or “primary” lead contamination, the isotopic constitution of lead in galena in the immediate vicinity of the mineral under investigation is used. Isotope analysis of lead is thus of great importance in geochronology. Eight such samples were analyzed.

Preparation of Thorium-230 Carrier

In the course of the decay of uranium 238 an intermediate member, thorium 230 with a half-life of 8×10^4 years, is formed. Since natural thorium consists mainly of Th 232, this decay-product of uranium 238 can serve as a tracer for determining the concentration of thorium in ores. This tracer was prepared by separating the thorium from a 600 million years old uraninite, from Katanga, Belgium Congo, in which the natural thorium concentration was exceedingly low. Seven milligrams of thorium carrier were obtained, with a thorium 230/thorium 232 ratio of 0.259.

PALEOMAGNETISM

Magnetic studies on rock samples taken from the Pilansberg dykes have been continued. The investigation was focused on samples taken from places where six such dykes are intersected by the Witwatersrand gold mines. The direction of magnetization and intensity of the residual magnetism of these samples were measured and samples from five of the dykes gave consistent results. On the assumption that the residual magnetism of these rocks is due to a geoconcentric dipole field, the results indicate the presence of a magnetic north pole in Eastern Abyssinia at the time of formation of these dykes.

Approximately one hundred thin sections of rocks, on which magnetic measurements had already been made, were prepared for a petrographic study of dykes in the Witwatersrand gold mines. This study, together with its magnetic counterpart, should throw much light on the earlier history of these formations.

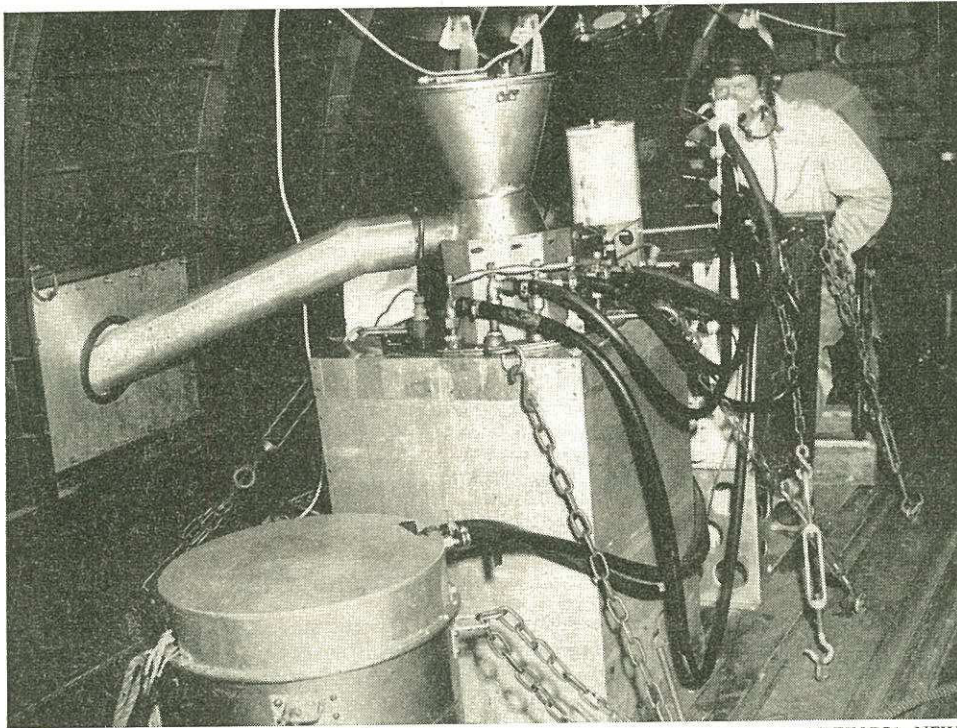
ATMOSPHERIC PHYSICS

Freezing Point of Water Drops

This investigation, which provides basic information on the formation of rain drops in clouds, has now been completed. It was found that droplets of pure water, of diameters 0.1 to 0.01 mm., freeze in the vicinity of -40°C . The influence upon the freezing point of droplet size, rate of cooling and the nature of the surface upon which the droplet rests, was also investigated.

Possible Influence of Meteorite dust upon Rainfall

During January, 1956, daily measurements of the concentration of “freezing nuclei” in die atmosphere were



PRETORIA NEWS

Die apparaat wat in 'n vliegtuig gebruik word vir 'n beraming van die hoeveelheid meteorstof in verband met 'n nuwe teorie oor die ontstaan van reën.

The apparatus used in an aircraft for estimating the amount of meteoric dust in connection with a new theory on the cause of rain.

20,000 vt. in die lug; dit wil sê, van die aantal soliede deeltjies wat in staat is om waterdruppels in wolke te laat vries en die reënproses te laat begin. Dié metings is uitgevoer met 'n wolkekamer wat deur die Australiese C.S.I.R.O. geleen is, en met behulp van die Suid-Afrikaanse Lugmag. Die konsentrasie vrieskerne het op drie datums hoogtepunte bereik: twee van hierdie geleentehede stem ooreen met datums wat voorspel is op grond van 'n teorie waarvolgens stof van meteoriete 'n belangrike bron van vrieskerne is.

Snelhede van Windvlae

Sterk windvlae is 'n belangrike aangeleentheid wat lugverkeer in Suid-Afrika betref. Metings van die sterkte van windvlae word tans uitgevoer met behulp van instrumente wat in vliegtuie van die Lugmag en die Suid-Afrikaanse Lugdiens gemonteer is. Statistiek word tans versamel vir verskillende roetes, hoogtes en jaargetye.

Lugbesoedeling

Gedurende die jaar was daar 'n groot uitbreiding in die aantal plekke waar gereelde metings van lugbesoedeling geneem word. Benewens die vyf waarnemingsposte in Pretoria, wat deur die Nasionale Fisiese Laboratorium

made at a height of 20,000 ft., i.e. of the number of solid particles able to cause the freezing of supercooled water drops and so initiate the rain process. These observations were made with the help of the South African Air Force, using a cloud chamber lent by the Australian C.S.I.R.O. The concentration of freezing nuclei reached peaks on three dates, two of which coincide with dates predicted on the strength of a theory that meteorite dust might be an important source of freezing nuclei.

Speed of Gusts

Strong gusts have an important bearing on aviation in South Africa. Measurements of the strength of gusts are being carried out with the aid of instruments carried in two aircraft, one belonging to the South African Air Force and the other to South African Airways. A statistical analysis is being made of the incidence of gusts for different routes, heights and seasons.

Air Pollution

During the year there has been a considerable increase in the number of points where regular air pollution measurements are made. Besides the five measuring stations which are maintained in Pretoria by the C.S.I.R.,

in stand gehou word, is daar twee waarnemingsposte in Kaapstad en drie in Durban, en hierbenewens word nog tien in Oos-Londen opgebou. By die stasies weg van Pretoria af, neem die personeel van die betrokke munisipaliteite metings van die hoeveelheid swaeldioksied in die lug en die totale hoeveelheid soliede materiaal wat uitsak, terwyl die hoeveelheid koolstofrook bepaal word in medewerking met die Nasionale Fisiese Laboratorium. Alle resultate word in die laboratorium versamel. Op hierdie wyse sal 'n wetenskaplike oorsig van die hele lugbesoedelingsposisie in Suid-Afrika binne 'n paar jaar opgebou word.

Radioaktiwiteit in die Atmosfeer

Dwarsdeur die wêreld is daar 'n intense belangstelling in die moontlike uitwerking wat straling, waaraan bevolkings steeds meer blootgestel word, op die mens mag hê. Kernkraginstallasies en kernbomontploffings lewer 'n bydrae tot die radioaktiewe agtergrond wat in die atmosfeer waarneembaar is. Aangesien Suid-Afrika weens sy geografiese ligging 'n belangrike bydrae kan lewer tot die vermeerdering van kennis in verband met hierdie aangeleentheid, is gedurende die afgelope jaar 'n begin gemaak met die stelselmatige meting van radioaktiwiteit in die atmosfeer.

Hierdie radioaktiwiteit bestaan uit twee komponente — 'n natuurlike en 'n kunsmatige. 'n Spesiale apparaat is gebou vir die bepaling van die konsentrasie van hierdie natuurlike komponent wat grotendeels bestaan uit radon en sy vervalprodukte. Dit is ook moontlik om afsonderlik die bydrae van die kunsmatige komponent te bepaal. Stofmonsters word tans versamel en daaglik gemeet, terwyl reënwatermonsters gedurende alle reënbuie versamel word. Met hierdie metodes was dit moontlik om radioaktiwiteit afkomstig van die atoomontploffing wat in Mei 1956 in Australië plaasgevind het, agt dae na die gebeurtenis in Pretoria waar te neem. Dit moet egter benadruk word dat die waargenome radioaktiwiteit uiters gering is en geen gesondheidsgevaar inhou nie.

OPTIKA

Lesontwerp

'n Metode is ontwikkel om die eksentrisiteit van optiese elemente in 'n lens noukeurig te bepaal. Heelwat aandag is gegee aan die ontwerp van 'n objektief, wat vier kleure gekorrigeer is. Hierdie objektief sal gebruik word in die laboratorium se presisie-spektrometer.

Interferensie-metodes

Ontwikkelingswerk word gedoen om interferensie-filters van die „toebroodjie“-tipe te vervaardig. Ongelukkig is bevind dat hierdie filters vinnig verswak na blootstelling aan klam lug, en die aangeleentheid word verder ondersoek.

Interferensiemikroskoop-tegnieke is ontwikkel vir oppervlaktestudies op gedeformeerde alfa-geelkoper.

two have been set up in Cape Town, three are in action in Durban, while ten are being built in East London. At the Stations, away from Pretoria, officials of the municipalities concerned take measurements of the sulphur dioxide in the atmosphere and the monthly fall-out of solid particles, while the quantities of smoke are estimated with the assistance of the National Physical Laboratory. All the results are being collected in this laboratory. In this way a scientific appreciation of the air pollution position in the whole of South Africa will be built up in the course of a few years.

Radioactivity in the Atmosphere

Throughout the world there is a keen interest in the possible effects that radiation, to which populations are exposed to an increasing extent, may have on man. Nuclear power installations and atomic bomb explosions contribute to the radioactive background which can be observed in the atmosphere. As South Africa can, by virtue of its geographic position, make an important contribution to the increase of knowledge in this field, a start was made during the year with the systematic measurement of radioactivity in the atmosphere.

This radioactivity consists of two components, one natural and the other artificial. A special apparatus has been built for measuring the concentration of the natural component which consists mainly of radon and its decay products. It is also possible to determine the contribution of the artificial component separately. Dust samples are now collected and measured daily, while rain-water samples are collected during all showers. With these methods, it was possible to observe in Pretoria the radioactivity from the atom bomb explosion which took place in Australia during May, 1956, eight days after the event. It should, however, be stressed that the observed radioactivity is extremely small and represents no health hazard.

OPTICS

Lens Design

A method has been developed for the accurate determination of the eccentricity of an optical component in a lens system. A considerable amount of attention has been given to the design of an objective, corrected for four colours, to be used in the laboratory's precision spectrometer.

Interference Methods

Development work has been in progress on the construction of interference filters of the "sandwich" type. Unfortunately these filters have been found to deteriorate rapidly on exposure to damp air, and the matter is being investigated further.

Techniques with the interference microscope have been developed for studying the surface of deformed alpha-brass.

Fotometrie en Spektrofotometrie

'n Foto-elektriese fotometerkop is ontwikkel wat visuele fotometriese metodes onnodig gemaak het vir beide ligsterkte- en ligstroomstandaardisasie.

HITTE

Temperatuurstandaarde

By die noukeurigste temperatuurmetings word die Smith-brug gebruik om die weerstand van weerstands-termometers te meet. Die gevoeligheid van hierdie brug word nou verhoog deur gebruik te maak van 'n spesiale galvanometerversterker wat tans voltooiing nader.

'n Nuwe swaelbad waarin die druk beheer kan word om sodoende die vaste punt by 444,6°C. meer noukeurig te bepaal, is ontwerp en onderdeel is bestel.

Hittegeleiding

Die dinamiese hittevloeiemetode, wat veral geskik is vir die bepaling van die geleidingsvermoë van sulke materiale soos rotse en bakstene, is deeglik uitgetoets, en dit is bevind dat dit vinnig en noukeurig is. 'n Groter apparaat nader tans voltooiing om hierdie metode op isolasiestowwe toe te pas.

In medewerking met stadsraad-ingenieurs word tans 'n nuwe metode ondersoek om die geleidingsvermoë van grond te bepaal. Die grootte, en dus die koste van elektriese kables, word sterk beïnvloed deur die hittegeleidingsvermoë van die grond waarin die kables lê.

EIENSKAPPE VAN MATERIE

Soniese en Ultrasoniese Metodes

In verband met die ondersoek op rotsstortings in myne wat tans deur die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese gedoen word, (sien bladsy 78), is dit belangrik om die fisiese eienskappe van die rots in die omgewing van uitgrawings te kan bepaal sodat vasgestel kan word of daar 'n verband bestaan tussen 'n meetbare fisiese eienskap en 'n toestand wat gunstig vir rotsstortings is.

Elektroniese toerusting is ontwikkel vir die soniese bepaling van die vier fundamentele elastiese konstantes van klein rotsmonsters. Hierdie toerusting lewer baie noukeurige resultate en word tans vir ontledings in verband met die rotsstortingsprojek gebruik. Belowende resultate word ook gelewer deur elektroniese toerusting wat vir die bepaling ter plaatse van elastiese eienskappe van rotsmassas ontwikkel is.

Twee verskillende soniese metodes is ontwikkel om te bepaal of 'n rotswand „vergruis” is of nie. Een metode berus op klankpulsstransmissietydmetings loodreg in die rotswand en die ander op transmissietydmetings langs die

Photometry and Spectrophotometry

The use of visual photometric methods for intensity and flux standardization has been rendered unnecessary by the design and development of a photoelectric photometer head.

HEAT

Temperature Standards

For high-accuracy temperature measurement, a Smith bridge is used to measure the resistance of platinum-resistance thermometers. The sensitivity of this bridge will be increased by the use of a galvanometer amplifier now nearing completion.

A new sulphur bath in which the pressure can be controlled so that the fixed point at 444,6°C. can be more accurately determined, has been designed and parts for it have been ordered.

Thermal Conductivity

The dynamic heat-flow which is particularly suited to the determination of the conductivity of materials such as rocks and bricks was thoroughly tested and found to be rapid and accurate. A larger apparatus for applying this method to insulating materials is now being completed.

A new method of measuring the thermal conductivity of the ground is at present being investigated in collaboration with municipal engineers. The size, and therefore the cost, of electric cables is strongly influenced by the conductivity of the ground in which the cables lie.

PROPERTIES OF MATTER

Sonic and Ultrasonic Methods

In connection with the investigations of rock bursts in mines (see page 78) being carried out by the National Mechanical Engineering Research Institute, it is important to be able to determine the physical properties of the rock surrounding an excavation, in order to establish whether there is a relationship between a measurable physical property and a condition favourable to rock bursts.

Electronic equipment has been developed for the determination by sonic methods of the four fundamental elastic constants of small rock samples. This equipment gives very accurate results and is being used for analyses bearing on the rock-burst project. Promising results were also obtained with electronic equipment developed for the determination of the elastic properties of rock masses *in situ*.

Two different sonic methods have been developed to determine whether a rock wall is “crushed” or not. One method depends on transmission-time measurements of sound pulses in a direction perpendicular to the surface, and the other on similar measurements along the

rotswand. Voorlopige toetse dui aan dat die resultate met hierdie twee metodes verkry, taamlik goed ooreenkom.

'n Metode is ontwikkel om te bepaal of daar in rotsmonsters haarkrakies bestaan wat nie met die blote oog gesien kan word nie. Hierdie krakies is van belang by die ontspanning van rotsmassas. Beide die klankweerskaatsings vanaf, en tydvertraginge oor hierdie krakies is gemeet.

Ontspande Sones in Rotswande

Ultrasoniese golwe is al dikwels gebruik vir die opsporing van krake in metaalstukke. Omdat krake in rotse in die omgewing van mynuitgrawings in verband mag staan met die ontstaan van rotsstortings, word die moontlikheid ondersoek om ultrasoniese metodes in dié verband te gebruik.

Elektriese Eienskappe van Rotse

Omdat 'n kennis van diëlektriese konstantes en elektriese geleidingsvermoë van Suid-Afrikaanse rotse en ertse van belang in geofisiese opnames is, veral as elektriese metodes gebruik word, is hierdie ondersoek geloods.

Op 82 monsters is die diëlektriese konstantes en verlies by 6 verskillende frekwensies tussen 10 kilohertz en 100 megahertz gemeet. Die monsters is afkomstig uit vier verskillende boorgate waarvan sommige tot 6,000 vt. diep is, en hulle sluit onder andere kwartsiet, dolomiet, lawa, doleriet, leiklip, sandsteen en graniet in.

Fisiese Oseanografie

In verband met 'n fisiese oseanografiese navorsingsprojek, is 'n apparaat ontwikkel om die snelheid van klank, die temperatuur en druk in water te meet en dan outomaties 'n kurwe te trek van klanksnelheid en van temperatuur op enige diepte in die water. Die meetelemente word gehuisves in 'n geskikte geelkoperklok wat vanaf 'n skip in die see afsak, en die elektriese seine word deur geskermdes kables na die registreerapparaat op die skip gestuur. Die ontwikkeling en konstruksie van die apparaat is voltooi, en voorlopige toetse by die Hartebeespoortdamwal het getoon dat die snelheid van klank gemeet kan word tot 'n noukeurigheid van een deel in dertigduisend.

AKOESTIEK

Opname van Hofverrigtinge

Die sewe meganiese opnamestelsels wat reeds in die Johannesburgse magistratshoue in werking is, het bewys dat baie tyd en geld met hierdie tipe meganisering bespaar kan word, en dat noukeuriger resultate verkry word as met die konvensionele registrasiesistelsels. Heelwat werk is gedurende die afgelope jaar gedoen om hierdie stelsels te verbeter en uit te brei. Toerusting word ook

face of the wall. Preliminary tests indicate that the results of these two methods are in reasonable agreement.

A method has been developed to determine whether hair cracks, not evident to the naked eye, are present in rock samples. These fine cracks are of importance in the destressing of rock masses. Both the sound reflections from and the time delays through these cracks have been measured.

Destressed Zones in Rock-faces

Ultrasonic waves are frequently used for detecting flaws in metallic components. Since cracks in the rocks near mine excavations may be associated with the possibility of rockbursts, the feasibility of using ultrasonic methods to detect them are being investigated.

Electrical Characteristics of Rocks

Determinations of the dielectric constants and electrical conductivity of South African rocks and ores are being carried out because information of this kind is of importance in the conduct of geophysical surveys especially if electrical methods are used.

The dielectric constants and loss factors of 82 samples were measured at six different frequencies between 10 k.c. per second and 100 m.c. per second. The samples came from four different bore-holes, some of which were up to 6,000 ft. deep, and include amongst others, quartzite, dolomite, lavae, dolerite, slate, sand-stone and granite.

Physical Oceanography

In connection with a physical oceanographic research project an apparatus has been developed to measure the velocity of sound, the temperature and pressure in water. This apparatus records automatically the velocity of sound and temperature at any particular depth. The measuring apparatus is housed in a suitable bronze bell which is lowered into the sea from a ship, and electrical signals are transmitted by means of screened cables to the recording apparatus on the ship. The development and construction of the apparatus has been completed, and preliminary tests at the Hartebeespoort dam showed that the velocity of sound can be measured to an accuracy of 1 part in 30,000.

ACOUSTICS

Recording of Law Court Proceedings

The seven mechanical recording systems already in operation in the Johannesburg Magistrates' Courts have proved that a great saving of time and money can be effected with this type of mechanization, and that more accurate results are obtained than with the conventional methods of recording. A considerable amount of work was done during the year to improve and extend these

vir die Durbanse, Kaapstadse en Pretoriase magistraats-howe aangebou.

Lawaai en Vibrasies

Met die uitbreiding van meganiese installasies in fabriek en geboue word lawaai en vibrasies al meer en meer 'n probleem. Die Laboratorium is gedurende die afgelope jaar in 'n hele paar gevalle genader om aanbevelings te doen vir die voorkoming van lawaai en vibrasies in nuwe installasies, en vir die demping daarvan in bestaande installasies.

Verstaanbaarheid van Spraak

Die verstaanbaarheid van spraak in 'n auditorium is 'n gevolg van die interaksie van twee faktore: die menslike gehooreienskappe en die invloed van die auditorium op klankgolwe. As albei bekend is, moet dit moontlik wees om daaruit die verstaanbaarheid van spraak af te lei. Die eerste van die faktore wat in 'n groot mate afhang van die integrasie van klank deur die gehoorstelsel, en die subjektiewe maskering van weerkaatsings deur die direkte klank, is breedvoerig ondersoek.

Om meer gegewens oor die tweede faktor te versamel, word toerusting ontwikkel om vertraging en intensiteit van weerkaatsings in 'n auditorium te meet. Toerusting wat nou ontwikkel word, sal dit moontlik maak om 'n volledige rekord te verkry van die akoestiese energie wat op 'n bepaalde plek in 'n auditorium verskyn op verskillende tye na die aankoms van die direkte klank vanaf die klankbron. Die doel van hierdie werk is om dit moontlik te maak om die verstaanbaarheid van spraak in 'n auditorium af te lei met blote fisiese metings en die huidige tydrawende subjektiewe metings uit te skakel.

Akoestiek van Lughawegebou

'n Grondige studie is gemaak van die akoestiese toestande van die Jan Smuts-lughawegebou, met die doel om geskikte aanbevelings te maak vir verbetering van die aankondigingstelsel. Hierdie aanbevelings word tans uitgevoer, en voorlopige resultate in dié gedeeltes wat reeds volgens voorskrifte behandel is, is belowend.

Akoestiek van Radio-ateljee

Die nuwe S.A.U.K.-ateljees in Kaapstad is gedurende die afgelope jaar in gebruik geneem. Finale akoestiese toetse is met behulp van die mobiele laboratorium uitgevoer en 'n verslag hieroor is uitgebring. 'n Paar besoeke is sedertdien aan Kaapstad gebring om die funksionering van die ateljees na te gaan.

Akoestiek van Sale

Die laboratorium word in toenemende mate deur buiteorganisasies genader in verband met die akoestiese ontwerp en korreksie van auditoria, teaters, kerke, konferensiekamers, ens. 'n Groot hoeveelheid van hierdie soort werk is gedurende die jaar gedoen.

systems. Equipment is also being built for the Durban, Cape Town and Pretoria courts.

Noise and Vibrations

With the increase of mechanical equipment in factories and buildings, noise and vibration is becoming more and more of a problem. During the year, the laboratory was requested on quite a number of occasions to make recommendations for the prevention of noise and vibrations in new installations, and for the reduction thereof in existing installations.

Intelligibility of Speech

The intelligibility of speech in an auditorium is a result of the interaction of two factors, the characteristics of human-hearing and the effect of the auditorium on sound waves. When both are known, it should be possible to deduce the intelligibility of speech from them. The first of these factors which depends to a large extent on the integration of sound by the hearing system and the subjective masking of echoes by the direct sound has been investigated in detail.

To obtain more information on the second factor, equipment is being developed to measure the delay times and intensities of echoes in an auditorium. Equipment now being developed will make it possible to obtain a complete record of the acoustical energy present at a given position in an auditorium at different intervals after the arrival of the direct sound from the sound source. The purpose of this work is to make it possible to deduce the intelligibility of speech in an auditorium by purely physical measurements, thereby eliminating the present time-consuming, subjective measurements.

Acoustics of Airport Buildings

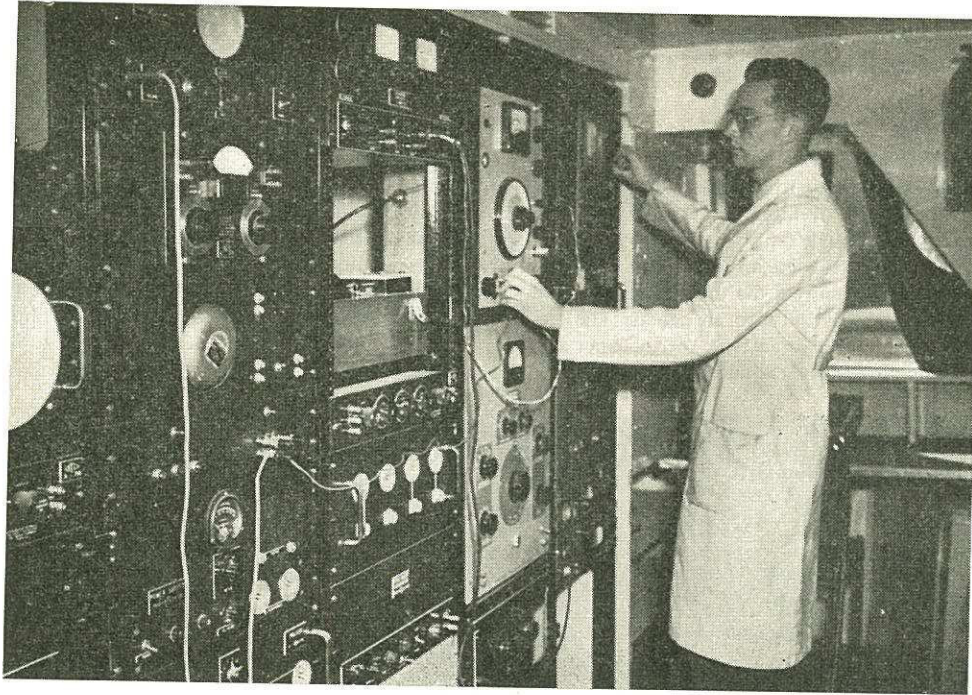
A thorough study was made of the acoustic conditions of the Jan Smuts Airport building with a view to recommending appropriate measures to improve the public address system. These recommendations are at present being carried out; preliminary results, obtained in those parts where the necessary treatment has already been completed, are promising.

Acoustics of Broadcasting Studios

The new S.A.B.C. studios in Cape Town were taken into use during the past year. Final acoustical tests were carried out with the mobile laboratory, and a report was subsequently submitted. Since then, a few visits have been paid to Cape Town to check the working of the studios.

Acoustics of Halls

Ever-increasing demands on the laboratory are being made by outside concerns in connection with the acoustical design and correction of auditoriums, theatres, churches, conference rooms, etc. A large amount of this type of work was done during the past year.



Die binnekant van die mobiele akoestiek-laboratorium wat gebruik word by die toetsing van die akoestiek van sale.

An interior view of the mobile acoustics van used in the study of the acoustics in halls.

ELEKTROTEGNOLOGIE

Hoogfrekwensie-eienskappe van Transistore

By gebrek aan literatuur oor die gedrag van transistore by hoogfrekwensie-kragossilators en -kragversterkers, is 'n ondersoek begin met betrekking tot die krag-uittree, doeltreffendheid en hoogfrekwensie-limiet van transistore. Die gedrag van die nuutste tipes transistore onder nie-liniêre toestande is ondersoek.

Roterende Histeresis

Die interne meganisme wat beheer uitoefen oor die gedrag van ferro-magnetiese materiaal wanneer die rigting van magnetisasie verander, word nog nie goed verstaan nie. 'n Kwalitatiewe ondersoek oor die vorm van histeresis-lusse wat ontstaan by die roterende magnetisasie van ferriet, is aangevoer.

Elektroniese Instrumentasie

Elektroniese toerusting speel tans 'n al hoe belangriker rol in navorsingswerk, en dit is dus te verwag dat die Afdeling Elektrotegnologie die ander W.N.N.R.-afdelings en buite-organisasies met die ontwerp en herstel van gespesialiseerde apparaat sal moet bystaan. Gedurende die jaar het die Afdeling 'n hele aantal apparate ont-

ELECTROTECHNOLOGY

High Frequency Characteristics of Transistors

Since no literature is available on the high-frequency behaviour of transistors in power oscillators and power amplifiers, an investigation of their power output, efficiency and high-frequency cut-off has been started. The behaviour of the newest types of transistors under non-linear operating conditions has been investigated.

Rotating Hysteresis

The internal mechanism which governs the behaviour of ferro-magnetic materials when the direction of magnetization is changed is not yet clearly understood. A qualitative investigation of the form of the hysteresis loops resulting from the rotating magnetization of ferrite has been started.

Electronic Instrumentation

Electronic equipment now plays an ever-increasing role in research work, and it is to be expected that the Electrotechnology Division will have to assist the other C.S.I.R. divisions and outside organizations in the design and repair of specialized apparatus. During the year this Division developed a great number of pieces of

wikkel, soos byvoorbeeld versterkers, 'n klankenergie-integrator, fotometers, 'n impulsie-eenheid en verskillende gespesialiseerde vakuumbuise.

OUTOMATISASIE

Servomeganismes

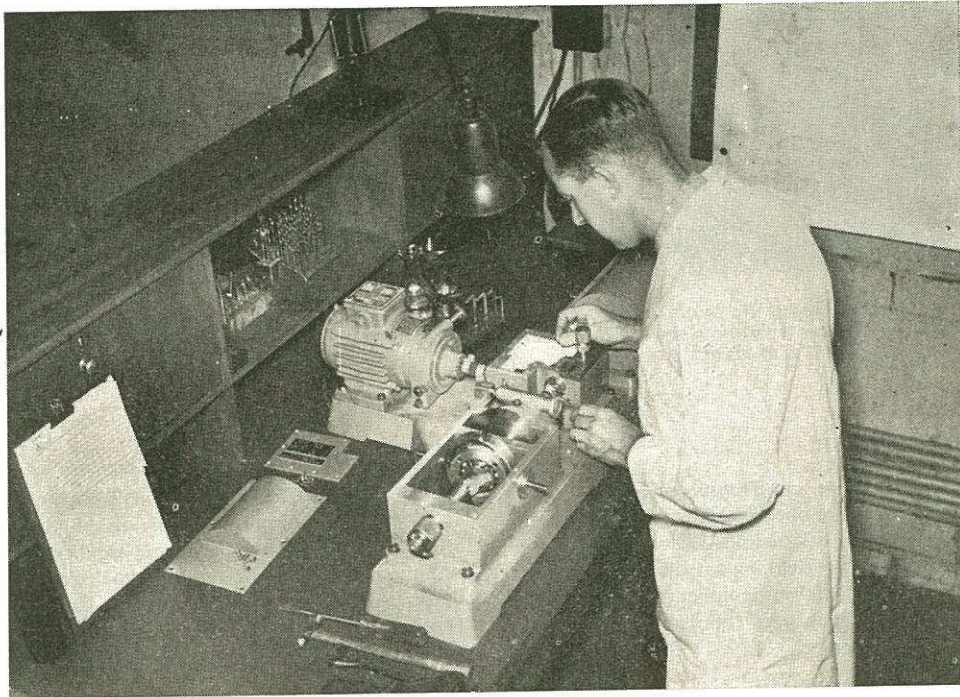
In die ontwikkeling van outomatiese beheerstelsels verskaf 'n studie van die frekwensieweergawe van so 'n stelsel 'n waardevolle metode om so 'n ontwerp te verkry. 'n Ontwikkelaar wat elektriese of meganiese steurings in 'n stelsel kan invoer en ook die uitreeweergawe van so 'n stelsel kan meet, is ontwerp en gebou. Die frekwensie-bereik van die apparaat is 1 periode per 300 sekondes tot 25 periodes per sekonde.

apparatus, such as amplifiers, a sound-energy integrator, photometers, a pulse unit, and various specialized vacuum tubes.

AUTOMATION

Servomechanisms

In the development of automatic control systems, a study of the frequency response of the system provides a valuable method of approach to the design. A generator which can introduce electrical or mechanical disturbances into the system and measure the resultant response has been designed and built. The frequency range of the apparatus is from 1 period per 300 seconds to 25 periods per second.



'n Sinusgolf-ontwikkelaar vir die studie van outomatiese beheerstelsels.

A sine wave generator for the study of automatic control systems.

'n Verbeterde tipe van 'n outomatiese weegmasjien is deur die laboratorium ontwerp met die doel om dit kommersieel te laat vervaardig. Die finale ontwerp is heelwat eenvoudiger as die oorspronklike en bevat outomatiese selfbeskerming teen oorbelasting.

Gedurende 'n ondersoek oor 'n verbeterde metode om die digtheid van steenkoolpulp te beheer, het die Laboratorium 'n meetapparaat ontwikkel. Die apparaat neem monsters van die pulp outomaties, meet die digtheid daarvan en was dan die bak skoon voordat die volgende monster geneem word. Die ondersoek duur voort.

An improved version of an automatic weighing machine developed by this Laboratory has been designed with an eye to having it produced commercially. The final design is much simpler than the original and embodies automatic protection against overloading.

During investigations on improving the control of the density of the pulp used in the beneficiation of coal the Laboratory developed an automatic sampling device. The apparatus samples the pulp automatically, determines its density and then rinses the cup before taking another sample. The investigation is proceeding.

Elektroniese Rekenmasjiene

Goeie vordering is gemaak met die ontwerp en opbou van die loodsmodel van die elektroniese differensiaal-ontleider „HEIDEN”. Dit bestaan uit vier integrators, agt summators, twee funksie-ontwikkelaars en een vermenigvuldiger. Van hierdie elemente moet nog net een funksie-ontwikkelaar en die vermenigvuldiger voltooi word. Reeds kan vierde-orde lineêre differensiaal-vergelykings opgelos word, en as die model klaar is, sal 'n beperkte aantal nie-lineêre faktore of terme in ag geneem word. Die uiteindelijke rekenmasjien sal uit 24 summators en 12 integrators bestaan. Dit sal byvoorbeeld die oplossing van drie gelyktydige vierde-orde differensiaalvergelykings moontlik maak.

Om die laboratorium se analoog-rekenfasiliteite verder uit te brei, word 'n analoog-rekenmasjien vir veldprobleme ontwikkel.

FISIËSE STANDAARDISASIE

Radioaktiewe Straling van Hoë Energie

In terapeutiese werk is dit belangrik om die dosisse van gamma- en Röntgenstraling noukeurig te meet. Navorsers het gedurende die afgelope paar jaar gevind dat die waardes wat deur verskillende buitelandse standaardisasie-institute vir die Röntgen verkry is, aanmerklik verskil. Dit het ook geblyk dat daar ernstige foute voorgekom het in die apparaat wat vir die metings gebruik word. Die saak is in so 'n ernstige lig beskou dat die vernaamste standaardisasie-inrigtings navorsingswerk op dié gebied begin het, en vandag word algemeen erken dat dit glad nie so maklik is om standaard-dosisse noukeurig te meet nie.

Aangesien die vryelug-ionisasiekamer wat in die laboratorium opgestel is ook sekere inherente tekortkominge openbaar het, is besluit om 'n nuwe parallelplaat-ionisasiekamer vir die absolute standaardisering van hoë-energiestraling te ontwerp en te bou. Die ontwerpe is voltooi en die kamer sal nou gebou word.

Elektriese Standaardisasie

Gedurende die afgelope jaar het die Onderafdeling Elektrotegnologie die nasionale standaarde van elektriese spanning en weerstand gehandhaaf.

Akoestiese Standaardisasie

Al is klankdrukstandaarde, soos byvoorbeeld twee Rayleigh-skyf buise en toerusting vir die wederkerigheidsyking van mikrofone 'n aantal jare gelede opgebou, kon hulle nie doeltreffend gebruik word nie omdat die nodige toetskamers nie beskikbaar was nie. Hierdie toerusting is nou weer opgeknep en mikrofone word daarmee vergelyk in die weerklankvrye kamer.

Electronic Computers

Good progress was made during the year with the design and construction of the pilot model of the electronic differential analyzer "HEIDEN". This consists of 4 integrators, 8 adders, 2 function generators and 1 multiplier. Of these elements, only one function generator and the multiplier have yet to be completed. Fourth-order linear differential equations can already be solved and, as soon as the model is completed, it will be possible to take a limited number of non-linear factors or terms into account. The final computer will consist of 24 adders and 12 integrators. This will make possible the solution of three sets of simultaneous differential equations of the fourth order.

To expand the analogue computer facilities of the Laboratory further, an analogue computer is being developed to solve field problems.

PHYSICAL STANDARDIZATION

Radioactive Radiation of High Energy

In therapeutic work it is important to determine the doses of gamma and X-radiation accurately. During the past few years, research workers have found that the values obtained for the Roentgen by the various foreign standardization institutes, differed considerably. It appeared, furthermore, that serious errors were present in the apparatus used for such measurements. This matter was considered in such a serious light that the most important standards organizations have undertaken research in this field, and today it is generally agreed that it is not so easy to measure standard doses accurately.

As the free-air chamber set up in this Laboratory also showed some inherent shortcomings, it was decided to design and build a new parallel plate ionization chamber for the absolute standardization of high-energy radiation. The designs have been completed and the chamber will now be constructed.

Electrical Standardization

The national standards of electrical voltage and resistance have been maintained by the Electrotechnical Sub-division during the past year.

Acoustical Standardization

Although sound-pressure standards such as the two Rayleigh disc tubes and equipment for the calibrating of microphones by the reciprocity method were constructed a number of years ago, they could not be used effectively, because suitable test rooms were not available. This equipment has now been overhauled and is being used for the calibration of microphones which are compared with each other in the anechoic chamber.

Lengte-standaardisasie

Die bou van die interferometer om lengtes tot by 50 sentimeter direk in terme van die golflengte van lig te meet, is amper klaar.

Die ontwerp van die 50-meter interferometer vir standaardisasie van byvoorbeeld landmetersmaatbande is nou voltooi.

Yking en Toetse

Die Laboratorium word in toenemende mate deur ander W.N.N.R.-laboratoriums en buiteliggame genader om 'n verskeidenheid van ykings van toerusting, bepalinge van fisiese eienskappe, en noukeurige metings uit te voer. Onder andere sluit hulle in: spektrofotometriese bepalinge, die optiese eienskappe van lense, klankabsorpsietoetse, hitte-geleidingsvermoë van isoleermateriale, en die yking van gewigte, barometers en termometers. 'n Standaardmonster loodmetaal, verkry van 'n buitelandse laboratorium, is ontleed met die oog op die yking van die Nasionale Fisiese Laboratorium se massaspektrometers. Die resultate was in baie goeie ooreenstemming met dié verkry in ses buitelandse laboratoriums.

ALGEMENE FISIESE DIENSTE

Stralingsbeskerming

Die filmwapendiens wat deur die Laboratorium onderhou word, is gedurende die jaar aansienlik verbeter. 'n Beter tipe filmwapen word tans uitgereik en die prosedure vir die yking en ontwikkeling van die films is ook aanmerklik verbeter. Stralingsdosisse kan gevolglik met groter noukeurigheid gemeet word. Die getal filmwapens wat gedurende die jaar uitgereik is, het 6,000 beloop—in vergelyking met 4,000 gedurende die vorige jaar.

Verskaffing van Radioisotope

Die toepassing van radioisotope neem steeds toe en beslaan ook 'n wyer gebied van aktiwiteite. 'n Aansienlike hoeveelheid tyd word bestee aan die verlening van advies in verband met die gebruik van radioisotope aan nywerhede, mediese praktisyns, staatsdepartemente en navorsingsinrigtings.

Om die nywerhede die geleentheid te bied om personeel te laat oplei in die tegnieke van radioaktiwiteit, is 'n isotope-kursus ingestel wat in die toekoms jaarliks herhaal sal word. Die opleiding is sowel fundamenteel as prakties.

Die hoeveelheid isotope wat ingevoer word, styg nog steeds en gedurende die afgelope jaar is isotope ter waarde van £8,200 in 168 besendinge ingevoer, teenoor £6,400 bestaande uit 147 besendinge die vorige jaar. Die aantal gemagtigde verbruikers van radioisotope het van 46 tot 52 gestyg.

Length Standardization

The construction of an interferometer for the measurement of lengths of up to 50 cm. directly in terms of the wave-length of light is nearly completed.

The design of the 50 metre interferometer for the standardization of surveyor's tapes has now been completed.

Calibration and Testing

Increasing demands are being made on this Laboratory by other C.S.I.R. laboratories and outside bodies for the calibration of various types of equipment, the determination of physical properties and accurate measurements. These include, *inter alia*, spectrophotometric determinations, the optical properties of lenses, sound-absorption tests, thermal conductivity of insulating materials, and the calibration of weights, barometers and thermometers. A standard lead sample, obtained from an overseas laboratory, was analyzed as a calibration check on the National Physical Laboratory's mass spectrometers. The results obtained were in good agreement with those obtained in six overseas laboratories.

GENERAL PHYSICAL SERVICES

Radiation Protection

The film-badge service which is operated by the Laboratory, has been considerably improved over the past year. A superior type of film badge is now issued and the procedure for the calibration and developing of the films has been appreciably improved. Radiation doses can, therefore, be measured with increased accuracy. The number of film badges issued over the past year was 6,000 as compared to 4,000 for the previous year.

Supply of Radioisotopes

The application of radioisotopes is still increasing and extends over a wider range of activities. An appreciable amount of time is spent in giving advice on the use of radioisotopes to industrial undertakings, medical practitioners, government departments and research institutes.

In order to give industry the opportunity of having personnel trained in the techniques of radioactivity, an isotope course was instituted and will be repeated annually in the future. The training is fundamental as well as practical.

The quantity of isotopes imported is still increasing, and during the past year isotopes to the value of £8,200 were imported in 168 consignments as compared to £6,400 in 147 consignments for the previous year. The number of authorized users of radioisotopes has increased from 46 to 52.

WISKUNDE

Suiwer Wiskunde

Basiese navorsing in funksieteorie is voortgesit, en besondere aandag is gegee aan meerveranderlike hipergeometriese funksies. Die eienskappe van hierdie funksies word gebruik by die bestudering van meerveranderlike diskrete kansfunksies.

Navorsing oor moderne maat- en integrasieteorie sowel as oor byna periodieke funksies is aan die gang.

Toegepaste Wiskunde

Gedurende die jaar is daar gewerk aan 'n verskeidenheid van toegepaste wiskundige probleme, die meeste waarvan betrekking het op navorsing wat in die laboratoria van die W.N.N.R. gedoen word. Hierdie probleme sluit onder andere in die oplossing van partiële differensiaalvergelykings, integraalvergelykings en differensiaalvergelykings.

Wiskundige Statistiek

Die navorsing oor kansfunksies en hul momente is voortgesit. In besonder is aandag gegee aan die negatiewe binomiaal en faktoriaal-binomiaalverdelings en hul uitbreidings as viervoudige, agtvoudige en hoër tipes. Algemene voorwaardes vir die identifikasie van regressietipes is afgelei.

Toegepaste Statistiek

Toegepaste statistiese probleme word in toenemende mate behandel. Die omvangrykste ondersoek wat in hierdie verband onderneem is, is die statistiese verwerking en toetsing van gegewens wat verkry is in verband met rotsstortings in myne en die toetsing van steekproefskommeling in tydreekses waarvoor die korrellogram bekend is, deurdat gebruik gemaak word van voorafopgestelde stogastiese reekse. Daar is 'n begin gemaak met biometriese navorsing ten behoeve van die Navorsingseenheid vir Pneumokoniose.

Algemene Wiskundige Dienste

Die Afdeling Wiskunde het voortgegaan met die vervulling van sy belangrike funksie om ander afdelings van die Nasionale Fisiese Laboratorium en ander laboratoria van die W.N.N.R. met hulp en advies te bedien by die oplossing van hul wiskundige en statistiese probleme. Talle navrae in verband met statistiek is ten behoeve van regeringsdepartemente en ander organisasies behandel.

MATHEMATICS

Pure Mathematics

Basic research into the theory of functions was continued, particular attention being paid to multivariate hypergeometric functions. The characteristics of the latter are used in the study of multivariate discrete probability functions. Research in modern measure and integration theory, as well as in almost periodic functions, is in progress.

Applied Mathematics

During the year work was done on a variety of applied mathematical problems most of which arose as a result of research being done in the laboratories of the C.S.I.R. These problems included the solution of partial differential equations, integral equations, and differential equations.

Mathematical Statistics

The research into probability functions and their moments was continued. In particular, the negative-binomial and factorial-binomial distributions, together with their extensions to fourfold, eightfold, and higher types, were dealt with. General conditions for the identification of regression types were deduced.

Applied Statistics

Many problems in applied statistics were dealt with. Among the more extensive investigations undertaken were the statistical treatment and testing of data arising from the investigation of rockbursts in mines, and the testing of sample variation in time series for which the correlogram is known from previously determined stochastic series. Biometrical research for the Pneumococcal Research Unit has been started.

General Mathematical Services

The Mathematical Section has continued to fulfil its important function of giving other sections of the National Physical Laboratory and other laboratories of the C.S.I.R. advice on, and assistance with, their mathematical and statistical problems. Numerous inquiries from government departments and other organizations have been dealt with.

Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese

Direkteur: DR. A. J. A. ROUX

Die Navorsingseenheid vir Meganiese Ingenieurswese is op 1 Oktober 1955 omskep in die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese, en sedertdien was daar snelle vooruitgang in die bedrywighede van die Instituut. In die eerste ses maande na hierdie omskepping het die Instituut 71 wetenskaplike en tegniese navrae behandel, in vergelyking met 36 gedurende die vorige ses maande van die Eenheid se werksaamhede. Ten spyte van die aansienlike uitbreiding in personeelsterkte, was dit nie moontlik om in die geheel te voldoen aan die toenemende aanvraag vir dienste van die Instituut nie. Die program vir die komende jaar is dus in hoofsaak gemik op die uitbreiding van laboratoriumgeriewe, veral wat betref die Sterkteleerlaboratorium, om op dié wyse te probeer voldoen aan die toenemende aanvraag vir ondersoekte van metaalvermoeidheid.

'n Hidromeganiese afdeling is onlangs in die lewe geroep, en sal in 'n lankgevoelde behoefte voorsien, aangesien baie belangrike hidromeganiese probleme alreeds na hierdie Instituut verwys is.

METAALKUNDE

Die toerusting van die metaalkundelaboratorium is gedurende die jaar uitgebrei. 'n Hoëtemperatuur-platinum-buisoond en 'n laboratoriummodel-smeltkroesoond is aangeskaf en in werking gestel. Eersgenoemde is geskik vir vakuum-smelting, terwyl albei oonde met edelgas-atmosfeer gebruik kan word. Dit is nou moontlik om die smelt van klein proefblokke van suiwer metale en legerings te onderneem.

Die Laboratorium is ook toegerus met 'n miniatuur-toetsmasjien. Hierdie apparaat kan op baie maniere gebruik word vir die meganiese toetsing van betreklik klein proefmonsters. Weens metallurgiese en/of materiaal-oorwegings is die grootte van proefmonsters dikwels beperk, soos in die geval waar onderdele van klein snitoppervlakte getoets moet word, in watter geval die gewone groot toetsmasjiene nie gebruik kan word nie.

Die hittebehandelingsfasiliteite van die metaalkundelaboratorium is feitlik voltyds in gebruik. Feitlik alle hittebehandelings wat uit die werk van die Sentrale Werkplaas voortspruit, word nou deur hierdie Laboratorium uitgevoer.

National Mechanical Engineering Research Institute

Director: DR. A. J. A. ROUX

The Mechanical Engineering Research Unit was transformed into the National Mechanical Engineering Research Institute on 1st October, 1955. Since then there has been a rapid growth in the activities of the Institute. In the first six months after this change the Institute dealt with 71 scientific and technical enquiries as against 36 during the previous six months of the Unit's activities. Despite a substantial increase in staff, it was not possible to cope with the increased demand for the services of the Institute. The programme for the coming year is, therefore, mainly directed towards the expansion of laboratory facilities, particularly with regard to the Strength of Materials Laboratory, in order to be able to meet satisfactorily the increasing demand for fatigue investigations.

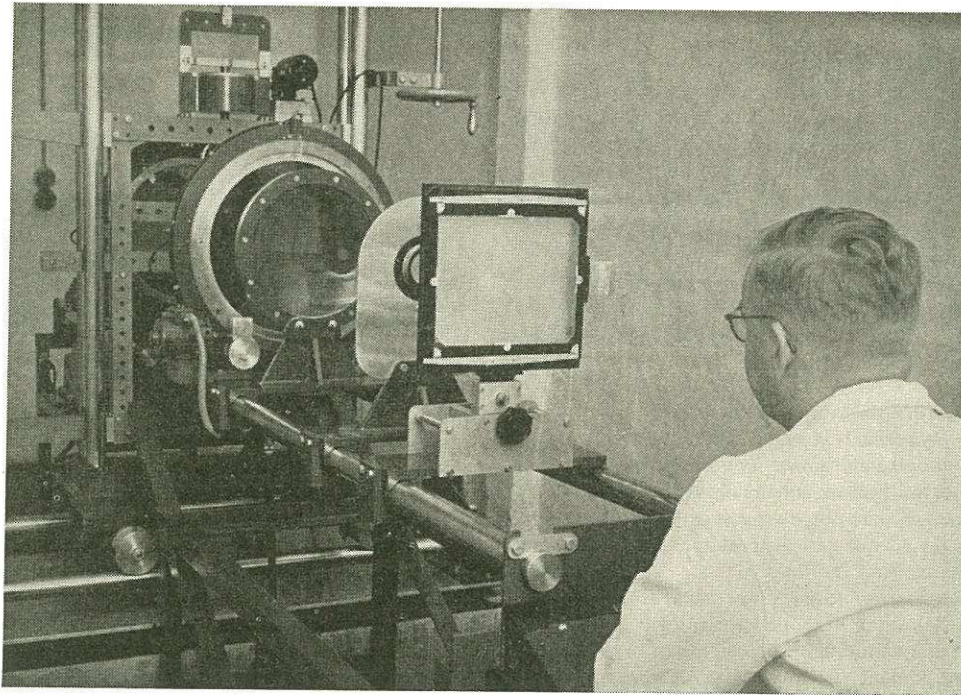
Recently a Hydromechanics Division was established and will undoubtedly fill a serious gap, as many important hydromechanical problems have already been referred to the Institute.

METALLURGY

During the past year the testing facilities of the metallurgical laboratory have been extended. A high-temperature platinum tube furnace and a laboratory-size electrically energized crucible furnace have been obtained and installed. The former may be adapted for vacuum melting, while both it and the crucible furnace may be used with inert atmosphere. It is now possible to melt small proof ingots of pure metals and alloys.

The Laboratory has also been equipped with a miniature universal testing machine. This apparatus can be employed extensively for the mechanical testing of relatively small test pieces. Metallurgical and/or material considerations often limit the size of the test specimens, for instance, when the components of small cross-sections have to be tested. In such cases the large-capacity testing machines cannot be employed.

The metallurgical laboratory's heat-treatment facilities are working almost full time. In fact all the heat treatments resulting from the work carried out by the Central Workshops are now being carried out by this Laboratory.



Die polaroskoop wat vir foto-elastiese navorsing deur die N.N.I.M.I. ontwerp en in die Sentrale Werkplaas gebou is.

The polaroscope designed by the N.M.E.R.I. and built in the Central Workshops for photo-elastic research.

Voorvervorming en Plastiese Eienskappe van Metale

Die invloed van voorvervorming op die plastiese eienskappe van metale is van algemene belang, aangesien die plastiese eienskappe 'n aansienlike invloed uitoefen op metaalvormingsprosesse soos koudwals en diepdruk. Die ondersoek word tans gerig op die invloed van voorvervorming op die plastiese eienskappe van metaal-enkelkristalle wat die eenvoudigste metaalstruktuur verteenwoordig. 'n Aantal enkelkristalle van sink van hoë suiwerheid is berei. Nadat hulle uitgegloeï was, is hulle onderwerp aan wisselende trek-druk-belasting, maar moeilikheid is ondervind deurdat die enkelkristalle geneig was om deur te buig onder 'n druk-belasting. Hierdie deurbuiging het ongelukkig die meganiese toetsresultate nutteloos gemaak. Alle pogings om hierdie deurbuiging te voorkom, het misluk. Gevolglik is besluit om die trek-druk-toetse te staak en 'n skuifbelastingsmetode aan te wend, want dit skakel die moeilikheid van deurbuiging uit en het die verdere voordeel dat dit komplikasies, afkomstig van onegalige spanningsverdeling op die kristalglipvlakke, tot 'n minimum beperk.

'n Aanvang is gemaak met die kweek van die sferiese enkelkristalle van sink wat aan skuifbelasting onderwerp sal word. 'n Apparaat is spesiaal ontwerp vir die spanningsvrye chemiese masjinerie van sulke enkelkristalle,

Predeformation and the Plastic Properties of Metals

The influence of predeformation on the plastic properties of metals is of great importance and interest, particularly since a metal's plastic properties so greatly influence metal-forming processes, such as cold-rolling and deep-drawing. An investigation into the influence of predeformation on the plastic properties of metal single crystals, which constitute the simplest metal structure, is at present being conducted. A number of high-purity zinc single crystals of high perfection was produced. After annealing, they were mechanically tested by subjecting them to alternate tensile and compressive stresses, but great difficulty was experienced due to buckling of the single crystals when they were subjected to compressive stresses. This occurrence unfortunately completely invalidated the mechanical test results. All attempts to eliminate this buckling have failed. It was, therefore, decided to cease tension-compression testing, and to adopt reversed shear testing. This method of stressing eliminates the difficulty due to buckling and has the further advantage in that it reduces to an absolute minimum the complications associated with non-uniform stress distributions occasioned by crystal lattice rotation.

A start has been made with the production of the spherical single crystals of zinc required for shear testing,

en dit word tans in die Sentrale Werkplaas vervaardig.

Invloed van Spanning op Korrosie

In sommige gevalle kan die gelyktydige werking van spanning en van korrosie vinnige verswakking of swigting van metale en legerings veroorsaak. Die gevoeligheid van 'n gegote ligte aluminium-silikonlegering vir spanningskorrosie is ondersoek deur gebruik te maak van 'n soutoplossing as korrosiemiddel. Dit is bewys dat toegepaste trekspannings versnelde korrosie van hierdie besondere legering veroorsaak, maar dat die korrosie in hierdie geval van 'n algemene chemiese aard is, en nie gelokaliseerd is soos in gevalle waar krake deur spanningskorrosie veroorsaak word nie.

Alkaliëse Verbrossing van Keteldromstaal

In die nywerheid vorm alkaliëse verbrossing van geklinkte stoomketeldromme nog steeds 'n groot probleem. Alhoewel heelwat navorsingswerk in hierdie verband gedoen is, kan tot dusver nog geen aanneemlike verklaring gevind word vir die grondoorzaak en meganisme van hierdie verskynsel nie.

'n Reeks voorlopige meganiese toetse is uitgevoer om eers vas te stel watter meganiese toetsmetode gebruik kan word vir die kwantitatiewe bepaling van die graad van verbrossing, omdat 'n noukeurige meting hiervan 'n belangrike voorvereiste is vir die bepaling van die geskikste metode om verbrossing te voorkom.

Verskillende metodes is ondersoek, o.a. die kerfslagtoets, 'n metode van stadige buiging en 'n trektoetsmetode, waarvolgens die kromme van ware spanningsvervorming bepaal word. Hierdie metodes is toegepas op monsters, sommige wat nie en ander wat wél aan verbrossing blootgestel is. Die verbrossing van monsters is bewerkstellig deur hulle met waterstof te laai met behulp van 'n elektrolitiese proses. Die resultate van die ondersoek het bewys dat sowel die metode van stadige buiging, as die trektoetsmetode gebruik kan word vir die meting van die graad van verbrossing.

Swigtings in die Praktyk

'n Hele aantal gevalle van swigtings wat in die praktyk voorgekom het, is ten behoeve van die betrokke nywerhede ondersoek. Hierdie ondersoek het, byvoorbeeld, aangetoon dat die swigting van gegote vleklose staalpipe toegeskryf moet word aan interkristallyne korrosie omdat die staal „gevoelig” geraak het, aangesien die besondere staal van 'n ongestabiliseerde graad was en onderwerp is aan temperature waarby „gevoeligheid” intree; dat die swigting van 'n gesweisde staalimpeller van 'n sentrifugale waaiër veroorsaak is deur vermoeidheid, en dat die hittebehandeling wat toegepas is, nie doeltreffend was nie; en dat, in die geval van 'n staalboorsilinder en die as van 'n groot steenkoolvergruiser, vermoeidheid ook die aanleidende oorsaak van die swigtings was; maar dat in hierdie twee gevalle korrosie ook 'n belangrike rol speel.

and a specially designed apparatus for their strain-free chemical machining is being manufactured in the Central Workshops.

Influence of Stress on Corrosion

In certain cases the simultaneous operation of both stress and corrosion can result in rapid deterioration or failure of metals and alloys. The susceptibility of a light alloy (an aluminium-silicon alloy of casting grade widely employed in industry) to stress-corrosion cracking in saline solutions has been investigated. It has been shown that applied stress of a tensile character causes accelerated corrosion of this particular alloy, but that the corrosion is of a general chemical type and not of the localized type that may result in stress-corrosion cracking.

Caustic Embrittlement of Boiler-plate Steel

In industry, the caustic embrittlement of riveted steam boiler drums still constitutes a great problem. Although much work has been done on this problem, an acceptable explanation of the basic causes and mechanism of caustic cracking is still lacking.

A series of preliminary mechanical tests has been conducted in order to determine which method of mechanical testing could be used for the quantitative measurement of relatively small degrees of embrittlement; such measurement will be an essential requisite for the determination of the most suitable method to avoid embrittlement.

Notched-bar impact, slow-bend and “true stress—true strain” tensile testing methods have been investigated by applying these methods to both un-embrittled and embrittled specimens, the latter being prepared by charging them with hydrogen, using an electrolytic technique. The results of these tests have shown that both the slow-bend and “true stress—true strain” tensile testing techniques are applicable to the measurement of the degree of embrittlement.

Failures in Service

Several cases of failure in service have been investigated on behalf of industry. These investigations have shown, for instance, that the cracking of cast stainless steel pipes had resulted from intergranular corrosion, as so-called “sensitisation” of the steel had occurred because this steel was of an unstabilized grade and had been subjected to an operating temperature at which “sensitisation” occurred; that the failure of a centrifugal fan impeller of welded steel construction had occurred by a fatigue mechanism, and that inefficient stress-relieving of the impeller after welding had been a contributory factor; and, lastly, that in the case of a steel drill-jar and the shaft of a large coal-crusher roll, fatigue failure was the main cause, while corrosion and fretting-corrosion were contributory factors in these respective cases.

STERKTELEER

Gedurende die afgelope jaar is die laboratoriumgeriewe uitgebrei deur die ingebruikname van vier wentelbalk-vermoeidheidsmetingsmasjiene, en die toevoeging van 'n belastingswisselaar tot die 10-ton universele statiese toetsmasjien, sodat laasgenoemde ook as 'n laagspoed-vermoeidheidstoetsmasjien gebruik kan word. Die aanvraag vir ondersoek van metaalvermoeidheid het so toegeneem dat al die groot masjiene vir 'n onbepaalde tyd voltyds in gebruik sal wees.

Invloed van Rusperiodes op Vermoeidheidsenskappe van Metale

'n Vorige ondersoek op 'n paar proefstukke het getoon dat die vermoeidheidslewe van uitgegloeide staal nie beïnvloed word deur vyf rusperiodes van 24-uur gedurende die periode van vermoeidheidsbelasting in wisselbuiging nie. 'n Verdere ondersoek met dubbel die aantal rusperiodes het tot dieselfde resultaat gelei. Nadat die wentelbalk-toetsmasjiene beskikbaar geword het, is die program uitgebrei na vermoeidheidsondersoeke in wentelbuiging, en die S-N kromme is vasgestel vir ononderbroke vermoeidheidsbelasting. Van die proefstukke het dit duidelik geword dat klein verskille in die afwerkingsmetode, voordat hulle gepoleer word, 'n belangrike invloed uitoefen op hul vermoeidheidslewe, selfs al is die graad van afwerking dieselfde soos bepaal met behulp van 'n profielmeter. Ondersoek word tans ingestel na geskikte metodes om proefstukke chemies af te werk.

Vermoeidheid in Spoorstawe

Vir die Spoorwegadministrasie is 'n ondersoek aan die gang oor die vermoeidheid van spoorstawe om draaie, onder belastingtoestande wat soortgelyk is aan dié wat in die praktyk voorkom. Die vermoeidheidsgrens van die web is bepaal vir gevalle waar die belasting 'n suiwer trekspanning of 'n suiwer drukspanning veroorsaak. Met behulp van rekstrookies is die vervorming gemeet in dié gedeeltes waar krake vorm. Dit het geblyk dat die plastiese vloei wat in hierdie gedeeltes plaasvind, geleidelik afneem totdat dit geheel en al staak, net voordat die kraak gevorm word. Sodra die kraak begin vorm, vind 'n vinnige toename in plastiese vloei en histerese plaas. Toerusting is ontwerp en vervaardig om vermoeidheid van die web te bepaal onder toestande van 'n trek-drukbelasting.

Ondersoeke van buigvermoeidheid is op gerolde en termiet-gesweisde spoorstawe uitgevoer en die buigvermoeidheidsgrens bepaal. Die ondersoek word nou uitgebrei deur die spoorproefstukke aan 'n statiese, aksiale-voorlas te onderwerp, terwyl dit onder toestande van pulserende buiging getoets word. Die ondersoek het aangetoon dat lasplaatgate in die spoorweb aanleiding kan gee tot vermoeidheidsbreuke as gevolg van skuifspannings wat in die omgewing van die gate veroorsaak word. Hierdie verskynsel word tans verder ondersoek.

STRENGTH OF MATERIALS

During the past year the laboratory facilities have been increased by the installation of four small rotating beam fatigue testing machines and the addition of a load alternating mechanism, which converts the 10-ton universal testing machine into a slow-speed fatigue machine. The demand for the fatigue testing of components has now increased to the stage where all the larger machines are fully loaded for an indefinite period.

Effect of Rest Periods on the Fatigue Life of Metals

Previous work on a few specimens had shown that the fatigue life of an annealed spring steel is not affected by the introduction of five 24-hour rest periods imposed between applications of fatigue loading in reversed bending. Further tests with double the number of rest periods, gave similar results. As the rotating beam fatigue testing machines became available, the tests were expanded to rotating bending, and a S-N curve obtained for uninterrupted fatigue loading. It became clear that small variations in the pre-machining of the specimens before polishing have a considerable influence on their fatigue life, even if their final surface finish as measured by a profilometer is the same. Enquiries are now being made on methods of chemically machining specimens.

Fatigue in Rails

On behalf of the South African Railways, investigations into the fatigue loading of rails under simulated practical conditions experienced on sharp curves, have been continued, and the determination of the fatigue limit under pure compression and pure tension conditions in the web has been completed. Strain readings, taken at the positions where cracks developed, clearly indicated that plastic flow occurs in these sections during the initial part of the test, and then becomes nil until shortly before failure when a rapid increase in both plastic flow and hysteresis takes place. Equipment has been designed and built to enable a fatigue loading of the web in the tension-compression range to be carried out.

Bending fatigue tests on as-rolled and thermit welded rails have been carried out, and the fatigue limit under pure bending conditions has been determined. Further tests are being carried out with an axial static preload on the rail specimen subjected to pulsating bending. The investigation indicated that the presence of fish plate holes in the rail web can lead to fatigue failure in shear at this position, and further investigations are now in progress to ascertain the importance of this effect.

Invloed van Grootte en Vorm van Proefmonsters op Vermoeidheid

Geskikte hulpstukke word tans ontwerp vir die Sonntag-universele vermoedheidstoetsmasjien ten einde belasting in trek-druk en buiging te kan aanbring.

Spanningsontleding van 'n Dryfstang

Die oorsake van vermoedheidsbreuke in die web-strale van dryfstange van 'n nuwe tipe lokomotief is vir die Suid-Afrikaanse Spoorweë ondersoek. Uitvoerige spanningsontledings is in die laboratorium uitgevoer sowel as op die dryfstang van 'n bewegende lokomotief. Hieruit is 'n duidelike begrip gekry van die ingewikkelde spanningstoestand wat onder praktiese werkstoestande in die stang heers. Die maksimale spannings wat voorgekom het, was laag en binne die veilige ontwerpsgrens. Dit is bewys dat die breuke toegeskryf moet word aan 'n fout in die vervaardiging. 'n Verklaring is ook gevind waarom vermoedheidskrake in lokomotiefdryfstange oor die algemeen geneig is om naby die kleinkop of grootkop te ontwikkel.

Rotsstorting in Diep Mynbou

Die belangrikheid van navorsing in verband met die oorsake en voorkoming van rotsstorting in diep myne, wat die Instituut in samewerking met die Mynbedryf onderneem, is weer beklemtoon. Met die verstryking van die kontrak, in terme waarvan die Instituut hierdie navorsing onderneem het, is 'n nuwe kontrak met die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese aangegaan vir die voortsetting van hierdie navorsing vir 'n verdere tydperk van drie jaar.

Sedertdien is die werksaamhede uitgebrei en gegewens oor rotsstortings is by vier verdere myne versamel. Om die statistiese ontleding te bespoedig, sal die gegewens voortaan op Hollerith-kaarte aangebring word.

'n Hele aantal ondergrondse besoeke is afgelê om die uitwerking van rotsstortings en die verskynsels wat daarmee gepaard gaan, nader te ondersoek en om inligting te probeer verkry in verband met die vorm en grootte van die gekraakte rotssone wat blykbaar rondom elke ondergrondse uitgraving gevorm word.

Belowende resultate is verkry uit die „ontspannings-metode” as 'n teenvoeter vir rotsstortings wat op 'n aantal werkplekke in 'n myn getoets is, en hierdie metode is nou reeds op 23 ondergrondse werkplekke in die myn toegepas. Die voorkoms en intensiteit van rotsstortings in die werkplekke het afgeneem, met weinig nadelige uitwerking op die produksie van erts.

In die laboratorium is 'n uitgebreide toetsprogram onderneem om die lineêre druksterkte, kruipeienskappe en elastiese konstantes van die ondergrondse rotslae van die Witwatersrand te bepaal. Deur middel van 'n foto-elastiese polariscope wat deur die Sentrale Werkplaas van die W.N.N.R. voltooi is, kan die verdeling van spanning om mynuitgrawings bepaal word deur gepolariseerde lig deur klein deurskynende plastiese modelle

Effect of Specimen Size and Shape in Fatigue

Suitable fixtures are now being designed for use on the Sonntag universal fatigue-testing machine in order to be able to apply tension-compression and bending.

Stress Analysis of a Connecting Rod

At the request of the South African Railways, an investigation was carried out on the incidence of fatigue failures originating in the fillets of connecting rods on a new locomotive. An extensive programme of stress analysis was carried out both in the laboratory and on a running locomotive as a result of which a clear understanding was obtained on the complex mechanism of stress in the rod under various running conditions. The maximum stresses were low, well within the design limits, and it was demonstrated that the failures were due to a manufacturing fault. A new reason was found for explaining the fact why connecting rods on locomotives generally tend to develop fatigue cracks near the big or small ends.

Rock Bursts in Deep-Level Mining

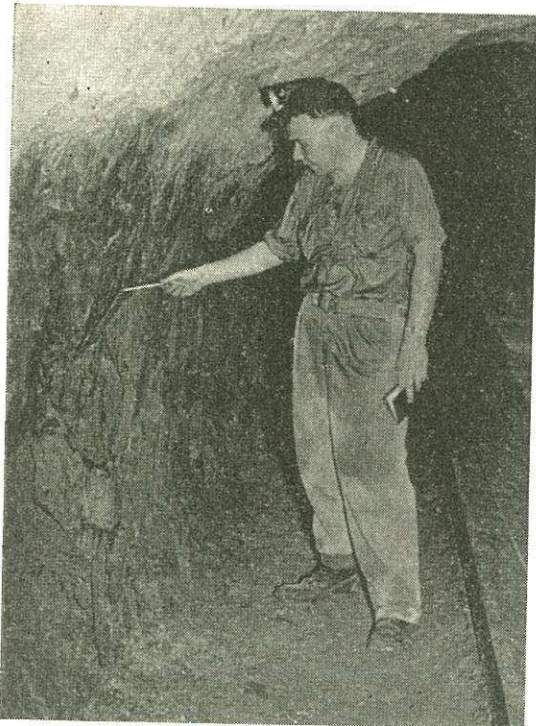
The importance of the research work which the Institute is doing in collaboration with the Mining Industry into the causes and prevention of rock bursts in deep-level gold mining was further emphasized. On the expiration of the contract, in terms of which the Institute undertook research work, a new contract was entered into with the Transvaal and Orange Free State Chamber of Mines for the continuance of this work for another three years.

Since then the research operations have been extended and the recording of rock-burst data on four more mines has been started. To expedite the statistical analyses, the data will in future be recorded on Hollerith-type punched cards.

Numerous underground visits were made to observe the effects of rock bursts and other phenomena associated with them, and to obtain evidence of the shape and size of the zone of fractured rock which, it is believed, surrounds most underground excavations.

Some success can be reported on the effects of de-stressing in a number of test stopes in a mine as a preventative against rock bursts and this practice was extended to 23 stopes in this mine. The incidence and severity of the bursts in these stopes have been reduced, with little adverse effect upon the production of ore.

In the laboratories, an extensive programme of testing was started to obtain the linear compressive strength, creep properties and elastic constants of the various strata encountered on the Witwatersrand. By means of a photo-elastic polariscope, completed by the Central Workshops of the C.S.I.R., the distribution of stresses around mining excavations can be obtained by using small transparent plastic models of the excavations through which polarized light is passed. Such information will be used to verify



'n Lid van die rotsstortingspan ondersoek swigtingsvlakke in 'n ondergrondse myngang.
One of the rock burst team studies the failure planes in an underground drive.

van die mynuitgrawings te straal. Sulke inligting sal gebruik word om die resultate van wiskundige ontleding te bevestig, en bied ook die geleentheid om sulke gevalle wat té ingewikkeld is vir wiskundige ontleding, te ondersoek.

'n Vervormingsmeter is ontwerp om ondergronds die veranderinge in spanning in rots te meet, terwyl 'n instrument ook ontwikkel is om die geleidelike vernouing in ondergrondse werkplekke te meet.

Instrumente wat gebaseer is op soniese beginsels, is deur die Nasionale Fisiese Laboratorium ontwikkel om die dikte van die gekraakte sone rondom ondergrondse uitgrawings te meet, en 'n reeks voorlopige toetse is uitgevoer.

'n Skema is ook opgestel waarvolgens die beweging van rotslae rondom ondergrondse uitgrawings asook die deursakking van die grond op die oppervlakte gemeet kan word. Hierdie ondersoek kan miskien belangrike resultate lewer oor die rotsstortingsprobleem in die algemeen.

Kleiner Ondersoeke ten Behoeve van die Nywerheid

'n Aantal kleiner ondersoeke is op kontrak onderneem. Dit sluit in spanningsontleding en vermoeidheidstoetse

the results obtained from the mathematical analyses, and will also enable an analysis to be made of those cases for which mathematical analysis is too complex.

A strain cell was designed for measuring changes in stress in the rock underground, while "Sagmeters" have been made for measuring the closure of underground workings.

The National Physical Research Laboratory is developing instruments for detecting the thickness of the zone of fractured ground around an excavation, making use of sonic principles. Preliminary tests were carried out.

Plans have also been drawn up for measuring strata movement and surface subsidence, and readings have already been started. It is considered that further light on the rock-burst problem will be cast on the problem of rock bursts in general by these experiments.

Minor Investigations on Behalf of Industry

A number of minor investigations was undertaken on contract. These included stress analysis and fatigue testing of various components, an investigation into the strength of laminated glass windshields, and investigations into the possibility of substituting case-hardened mild steel washers for expensive hardened machined washers in bolted structural joints.

S.A. Timbers for Packaging Purposes

Research in to the utilization of South African timber for packaging purposes has been undertaken on behalf of the South African Lumber Miller's and Shook Manufacturers' Association. A survey of South African timber resources and consumption is now nearing completion, and the indications are that the local timber supply can be expected to exceed the local demand in the foreseeable future. A preliminary survey has been commenced on the design requirements for citrus fruit boxes, as seen in the light of local production and packing methods.

MECHANICS

Composting of Municipal Wastes

The Institute assisted the National Chemical Research Laboratory with the mechanical aspects of the design of a plant for the composting of municipal wastes. As a result of the work done, the Pretoria City Council voted a sum of £5,000 for the erection of a pilot plant.

Decorticating and Ribboning of Kenaf

In connection with the investigation into the retting of Kenaf (Stokroos), the Institute has designed a machine for the burnishing of the fibre from the experimented batches which are being treated by the National Chemical Research Laboratory. This machine is now being built by the Central Workshops.

van verskillende onderdele; 'n ondersoek van die sterkte van gelamineerde glaswindskerms; en ondersoek oor die moontlikheid om liewer dopverharde sagtestaalwassers in geboute lasse te gebruik, as die duur gemasjieneerde en verharde wassers.

S.A. Hout vir Verpakkingsdoeleindes

Navorsing in verband met die gebruik van Suid-Afrikaanse hout vir verpakkingsdoeleindes word ten behoeve van die „South African Lumber Miller's and Shook Manufacturers' Association" voortgesit. 'n Opname van Suid-Afrikaanse houtproduksie en die verbruik daarvan is nou feitlik voltooi. Hierdie ontleding het aan die lig gebring dat die houtproduksie vinniger uitbrei as die verbruik daarvan, sodat in die afsienbare toekoms 'n oorproduksie verwag kan word. 'n Voorlopige ondersoek is begin na die ontwerpvereistes vir sitruskissies, in die lig van plaaslike produksie- en verpakkingsmetodes.

MEGANIKA

Kompos van Munisipale Afval

Die Instituut het die Nasionale Chemiese Navorsings-Laboratorium bygestaan met die werktuigkundige aspekte van 'n ontwerp van 'n meganiese toestel vir die bereiding van kompos uit munisipale afval. As gevolg van hierdie navorsingswerk, het die Stadsraad van Pretoria 'n bedrag van £5,000 beskikbaar gestel vir die oprigting van 'n proefaanleg.

Ontbassing en Ontveseling van Stokroos

In verband met die ondersoek oor die ontbassing en ontveseling van stokroos, het die Instituut, ten behoeve van die Nasionale Chemiese Navorsingslaboratorium, 'n masjien ontwerp vir die dors van proefvesels. Hierdie eenheid word tans deur die Sentrale Werkplaas gebou.

Sleeppringeraas en Trillinge in Waaier-lemme

Uit die ondersoek in verband met die trillings-eienskappe van waaierlemme, wat vir die betrokke nywerheid onderneem is, het dit noodsaaklik geword om 'n sleeppringeenheid te ontwikkel, met behulp waarvan dit moontlik sal wees om seine vanaf rekstrookies of ander optelkoppe, wat op roterende masjienelemente aangebring is, na geskikte meet-instrumente oor te dra. So 'n sleeppring-eenheid, bestaande uit sewe silwersleepringe en koolstof-silwerborsels, is deur die Sentrale Werkplaas vervaardig en word tans getoets om die eienskappe van sleeppring- en borselmateriale te ondersoek. Ander samestellings van geskikte stowwe sal ook ondersoek word om te bepaal watter een die beste resultate gee.

HITTEVOORTPLANTING

Hitte-oordragings-vlieskoëffisiënte vir Plat Plate

Die projek behels 'n studie van die hitte-oordragings-vlieskoëffisiënte tussen vaste wande en vloeistowwe met

Slipring "noise" and Fan-blade Vibration

An investigation of the vibration characteristics of fan blades, which was undertaken on behalf of the industry concerned, indicated the need for developing a slipring unit which would make possible the transmission of signals from wire-resistance strain gauges or other pick-ups located on rotating machine members to measuring instruments. Such a slipring unit, incorporating seven silver sliprings and carbon-silver brushes, was therefore made by the Central Workshops, and is at present being tested to determine the noise characteristics of this combination of slipring and brush materials. Other combinations of suitable materials will be tested to determine which one gives best results.

HEAT TRANSFER

Heat Transfer Film Coefficients for Flat Plates

This project embodies the study of heat transfer film coefficients between fluids and solid boundaries, with special reference to flat plates. A special heater plate was constructed to study the point heat exchange from a flat plate in an airstream. The investigation on this plate is being conducted by using the 10 ft. wind tunnel of the Aeromechanics Division to provide a uniform and directed air flow.

During the year, tests with the heater plate in a horizontal position were continued under conditions of both forced and natural convection. The former was carried out at various air speeds and, in addition to the determination of the film coefficient from direct readings of temperature difference between air and plate surface and the amount of heat lost by the plate to the air, distributions of temperature and velocity in the boundary layer were measured. Modifications to the experimental set-up were required for the natural convection tests, as it was found that even the most elaborate precautions and the closing of all doors failed to suppress sporadic air movements which had considerable influence on the tests.

The results of the forced convection tests have been published. It was shown that good agreement exists between experimental values and theory, provided corrections are applied for natural convection and the unheated starting length.

Heat-transfer Characteristics of Finned Tubes

A wind tunnel with closed-circuit, and in which it will be possible to control both air temperature and humidity, is at present being constructed. This tunnel will be a valuable addition to the equipment of the subdivision, since for the majority of its projects a wind tunnel is required. It should alleviate the present critical shortage of wind tunnel facilities considerably. As soon as this tunnel is ready, a study will be made of the heat exchange characteristics of finned tubes, the determination of

spesiale verwysing na die hittevloei van of na plat plate. 'n Spesiale verhitterplaat is gebou, met behulp waarvan die hitte-oordraging op 'n punt bepaal kan word wanneer die plaat in 'n lugstroom geplaas word. Om 'n egalige en gerigte lugstroom te verkry, word gebruik gemaak van die 10-voet windtonnel van die afdeling Lugmeganika.

Gedurende die jaar is die toetse met die verhitterplaat in 'n horisontale posisie voortgesit, en die hitte-oordraging onder toestande van geforseerde, sowel as natuurlike konveksie, ondersoek. Eersgenoemde ondersoek is uitgevoer met verskillende lugsnelhede, en behalwe die bepaling van die vlieskoëffisiënte uit regstreekse metings van temperatuurverskil tussen lug en plaatoppervlak en die hoeveelheid hitte wat die plaat aan die lug afgee, is die temperatuur en snelheidsverdeling in die grenslaag ook gemeet. Vir die uitvoering van toetse onder toestande van natuurlike konveksie, moes veranderinge in die opstelling aangebring word, aangesien gevind is dat selfs die mees uitvoerige voorsorgmaatreëls en die sluiting van alle deure nie daarin kon slaag om steurings in die luginvloei te voorkom wat die toetsresultate ernstig beïnvloed nie.

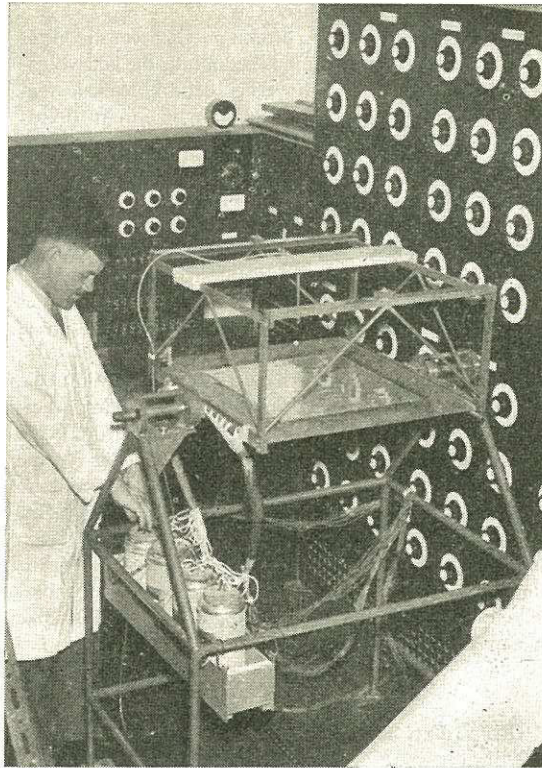
Die resultate van hierdie toetse is gepubliseer en daarin is aangetoon dat goeie ooreenkoms tussen eksperimentele en teoretiese waardes verkry kan word, mits korreksie aangebring word om toe te laat vir natuurlike konveksie asook vir die onverhitte-aanlooplengte van die plaat.

Hitte-oordragingseienskappe van Gevinde Buise

'n Windtonnel, van die tipe met 'n geslote kringloop en waarin voorsiening gemaak word vir die beheer van lugtemperatuur sowel as van lugvochtigheid, is tans in aanbou. Hierdie tonnel sal 'n waardevolle toevoeging tot die toerusting van die afdeling wees as in gedagte gehou word dat die oorgrote meerderheid van projekte met behulp van windtonnelgeriewe aangepak moet word. Dit behoort gevolglik die huidige kritieke tekort aan windtonnels te verlig. Sodra die tonnel gereed is, sal voortgegaan word met die studie van die hitte-uitruilings-eienskappe van gevinde buise, die bepaling van die kenkrommes van hitte-uitruilers met gevinde buise en van die vlieskoëffisiënte vir sodanige apparaat onder toestande waar fase-veranderinge plaasvind, dit wil sê, kondensasie of verdamping op die buise.

Hitte-uitruilingskoëffisiënte by Hoë Temperatuur

In die vertakking van die moderne ingenieurswese wat handel oor hitte, duik talle probleme op waarin dit nodig is om die hitte-uitruiling tussen vaste liggame en vloeistowwe onder toestande van hoë hittevloei en skerp temperatuurgradiënte te bepaal. Voorbeelde hiervan word gevind in stoomopwekking, kernkragreaktore en in die gas-turbienpraktyk, soos die verkoeling van turbienlemme en verkoeling van reaktore deur gesmelte metale. Voorlopige studies en tentatiewe berekenings is gemaak met die doel om 'n geskikte apparaat te ontwerp vir die uitvoering van toetse op hierdie gebied.



A heater plate used in the study of heat transfer from a flat plate in an air stream.

'n Verhitterplaat wat vir die ondersoek van die hitte-oordraging van 'n plat plaat in 'n lugstroom gebruik word.

characteristic curves for heat-exchangers with finned tubes, and a study of the film coefficients with such apparatus with change of phase, i.e. with condensation on or evaporation from the tubes.

Study of Heat Transfer Coefficients at High Temperatures

The field of modern heat engineering abounds with cases where it is necessary to compute the heat exchange between solids and fluids subject to high temperature gradients and heat fluxes. Examples are to be found in steam engineering, nuclear energy utilization and gas turbine practice, such as the cooling of turbine blades, and heat removal from reactors by liquid metals. Some preliminary studies and tentative calculations have been made to enable suitable apparatus to be designed for work in this field.

Die Hittebalans by die Mens

Navorsingswerk oor die direkte meting van die hittevloei uit die menslike liggaam is gedurende die jaar voortgesit. Pogings om die hitteverlies deur konveksie regstreeks te meet op 'n proefmodel van 'n man in 'n 10-voet windtunnel, het gefaal vanweë die feit dat die onstabiele van die lugvloei in die naloop, die noukeurige bepaling van die temperatuurstyging en aksiale snelheid onmoontlik maak. Gevolglik is op 'n empiriese benadering besluit deur gebruik te maak van 'n rooster van termokoppels of weerstandsdraad om die gemiddelde temperatuurstyging in die naloop te meet. Voorlopige toetse op 'n kleiner model in die 2-voet windtunnel het belowende resultate gelewer.

Die ondersoek van die fisiologiese reaksies van die mens onder verskillende omgewingstoestande behels fisiologiese sowel as fisiese oorwegings, en daarom is die Instituut deur die Kamer van Mynwese genader om die laboratorium vir Toegepaste Fisiologie behulpsaam te wees met die uitvoering van hul toetsprogram. In terme van hierdie ooreenkoms sal die Instituut behulpsaam wees met die beplanning van toetsprosedures en met die interpretasie van resultate; en het verder ook die ontwikkeling van 'n elektriese analogie van die menslike liggaam onderneem.

LUGREËLING EN VERKOELING

Klimatologiese Gegewens vir Gebruik in Ingenieurswese

Daar is baie gevalle waar klimaatsfaktore van groot belang is in die ontwerp of werkverrigting van toerusting. Die ontwerp van 'n lugreëlingstelsel in 'n gebou word, byvoorbeeld, in 'n groot mate bepaal deur die klimaat van die betrokke gebied waar die gebou staan, terwyl die grootte van 'n sonenergieversamelaar bepaal word deur die intensiteit van die inkomende sonstrale.

Om presies te kan vasstel hoe groot die verskillende eenhede moet wees, of selfs watter soort die beste aan die doel sal beantwoord, is dit noodsaaklik dat die klimaatgegevens noukeurig ontleed en in so 'n vorm opgestel word dat ingenieurs dit regstreeks kan gebruik.

Die ontleiding van hierdie resultate vereis baie rekenwerk, en daarom is daar, in samesprekings met die Weer-buro, besluit dat laasgenoemde 'n duplikaatstel Hollerith-kaartjies aan die Laboratorium beskikbaar stel waarop die nodige weergegewens aangebring is.

Toepassings van die Hittepomp

'n Hittepomp is 'n masjien wat, deur die aanwending van meganiese krag vir die aandrywing van 'n kompressor, hitte beskikbaar stel vir verhitting, ens., wat meer is as die ekwivalente hitte van die krag wat gebruik word om die kompressor aan te dryf.

'n Studie waarin die moontlikhede van die hittepomp vir woonhuis- en gebouverhitting (en verkoeling) onder-

Human Heat Balance

Work on the direct measurement of heat flow from the human body has been continued during the year. Attempts to measure directly the convective heat loss from a heated model of a man in the 10-ft. diameter wind tunnel proved unsuccessful due to the fact that instability of the airflow in the wake rendered impossible the accurate measurement of the temperature rise and axial velocity. It was therefore decided to try an empirical approach using a grid of thermocouples or resistance thermometers to measure the average temperature rise in the wake. Preliminary tests on a smaller model in the two-foot wind tunnel gave promising results.

The investigation of the physiological reactions of man to various environmental conditions involves physiological as well as physical considerations. The Institute was accordingly requested by the Chamber of Mines to assist the Chamber's Applied Physiology Laboratory in the execution of their test programme. In terms of an agreement with the Chamber, the Institute will assist in the planning of test procedures and the interpretation of results. In addition, it will undertake the development of an electrical analogy of the human body.

AIR CONDITIONING AND REFRIGERATION

Climatological Data for Engineering Use

There are many cases where climate has a considerable influence on the design or performance of apparatus. For example, the design of air conditioning equipment in a building depends to a large extent on the climate of the locality concerned and the size of a solar energy collector on the intensity of the incident solar radiation.

In order to be able to specify exactly how large certain units must be, or even which of several possible designs would be best suited to the purpose, it is necessary that the climatic elements be accurately analyzed and presented in a form suitable for immediate use by engineers.

Because these analyses require much computation, it was decided, following discussions with the Weather Bureau, that a duplicate set of Hollerith cards, on which the climatic data have already been recorded, would be provided for use in this Laboratory.

Applications of the Heat Pump

A heat pump is a machine which, through the application of mechanical work to drive a compressor, makes heat available in quantities greater than the equivalent heat of the power used to drive the compressor.

A study of the possible use of the heat pump for heating (and cooling) of houses and large buildings has been completed, and the findings are, briefly, that the

soek is, is so pas voltooi, en die bevindings is, kortliks, dat die koste van so 'n eenheid vir gewone woonhuise bo die geldelike vermoë van die gemiddelde huisgesin is, maar vir groot geboue blyk dit wel ekonomies te wees. Die werk word nou voortgesit om moontlike toepassings van die hittepomp in die nywerheid te ondersoek.

'n Klimaatskamer

Die klimaatskamer is gedurende die jaar voltooi, en die ykingstoetse waarvan in die vorige Jaarverslag melding gemaak is, vorder goed. Behalwe 'n paar geringe moeilikhede wat nou opgelos is, is aan die spesifikasies van die kamer voldoen.

Noukeurige Meting van Lugvogtigheid

In baie nywerhede is dit nodig dat die lugvogtigheid noukeurig gereël en gemeet word. Gevolglik is sorgvuldige ondersoek ingestel na die verskillende meetmetodes en die ontwikkeling van nuwe instrumente.

Die ontwikkeling van 'n nuwe instrument, die sogenaamde verhitte psigrometer, vir noukeurige metings van hoë vogtigheide is gedurende die jaar voltooi. Hierdie instrument het die voordeel dat dit gebruik kan word om die doupunt regstreeks te reël en te meet. Twee instrumente wat op hierdie beginsel werk, is reeds deur die Laboratorium vir die Kamer van Mynwese gebou vir gebruik in die klimaatskamer.

Verdere werk word nou onderneem om 'n adiabatiese versadiger te bou wat as basiese instrument in die Laboratorium sal dien. Elektriese instrumente wat van higroskopiese materiale gebruik maak, word ook ondersoek.

Studie van Sonenergieversamelaars

Daar is baie gevalle waar hitte by betreklik lae temperatuur aangewend kan word vir verhittingsdoeleindes, soos byvoorbeeld, die verhitting van water in woonhuise en die droging van landbouprodukte en van chemiese stowwe in die nywerheid. Die groot aantal sonnige dae maak die aanwending van son-energie, wat die beste by lae temperatuur opgevang kan word, 'n aantreklike onderneming in Suid-Afrika, en die Instituut het dus 'n navorsingsprogram op hierdie gebied ontwerp. Eksperimentele werk om die invloed van verskillende oppervlakke en oppervlakafwerking op die absorpsie van son-energie en die uitstraling van langgolfstraling te bestudeer, is aan die gang. Hierdie ondersoek is van belang ten opsigte van die Instituut se voorgenome navorsingswerk oor die toepassing van absorpsie-verkoelers.

TERMODINAMIKA

Die termodinamiklaboratorium is onlangs verskuif na 'n ander tydelike gebou waarin meer ruimte beskikbaar is vir die opberging en verpoeiëring van steenkool in vyf-ton hoeveelhede. Toerusting vir die gasturbienavorsing, soos die kompressore en die steenkoolvergruiser word in 'n aparte kamer gehuisves om lawaai te verminder en instandhouding te vergemaklik.

cost of such a unit for household use is still too high for the average householder, but that in large buildings the heat pump could be an economical heating unit. The study is now being directed to assess the possible use of the heat pump in industry.

Climatic Chamber

The climatic chamber was completed during the year and the calibration tests mentioned in the last Annual Report are now under way. Except for a few minor difficulties which have now been overcome the specifications for the chamber were met.

Accurate Measurement of Humidity

In many industries it is necessary that the humidity of the air be accurately controlled and measured. Accordingly, a thorough investigation of existing measuring methods and the development of new instruments have been undertaken.

The development of a new instrument (known as the heated psychrometer) for the accurate measurement of high humidities was completed during the year. This instrument has the advantage that it can be used for direct measurement and control of dew point. Two instruments operating on this principle were constructed on behalf of the Chamber of Mines for use in the climatic chamber.

Further work is now in progress on an adiabatic saturator which will be used as a basic instrument in the Laboratory. Electrical instruments employing hygroscopic salts are also being investigated.

Study of Solar Energy Collectors

There are many situations in which heat at relatively low temperatures is required, such as, for example, the heating of water in houses and the drying of agricultural products and of chemicals in industry. The large proportion of sunny days makes the utilization of solar energy, which can best be collected in the low temperature range, an attractive proposition in South Africa, and the Institute has initiated a programme of research in this field. Experimental work on the influence of different surfaces and surface-finishes on the absorption of solar energy and the re-emission of long-wave radiation is now under way. This investigation is of importance in connection with the Institute's projected research into the application of absorption refrigerators.

THERMODYNAMICS

The thermodynamics laboratory was recently moved to new temporary premises where more space is available for the storage and pulverizing of coal in 5-ton batches. Apparatus for the gas turbine research, such as the compressors and the pulverizer, is being housed in a separate room to reduce noise and to facilitate maintenance.

Gasturbiennavorsing

Soos in die vorige jaarverslag vermeld, is na deeglike ondersoek van die moontlikhede van die gasturbien as primêre kragbron in die land, bevind dat hierdie eenhede alleen ekonomies met ander tipes kragbronne kan meeding indien steenkool as brandstof gebruik word. Die doel van hierdie projek is dus om verbrandingstoerusting te ontwikkel wat gebruik maak van plaaslike steenkool as brandstof. Om te voorkom dat die fyn asdeeltjies die turbienlemme wegvreet, moet die warm verbrandingsgasse gesuiwer word om sodoende van die skadelike bestanddele ontslae te raak. Om hierdie doel te bereik, word studies onderneem op die verbranding van verpoeierde steenkool in 'n sterk klankveld, om vas te stel of die asdeeltjies deur hierdie proses so fyn opgebreek kan word dat dit skadeloos deur die turbien kan beweeg. Om so 'n intense klankveld te bewerkstellig, en wat vir die instandhouding daarvan van die hitte van verbranding gebruik maak, is 'n termo-akoestiese resonator ontwikkel waarvan die ontwerp tans afgerond word.

Heelwat ontwikkelingswerk op termo-akoestiese resonators is onderneem en waterstof is as brandstof gebruik. Eksperimentele gegewens is eers verkry met 'n prototipe drukresonansie-eenheid, en daarna is alle werk toegespits op 'n snelheidsresonansie-eenheid wat teoreties, altans, 'n groter ademingsvermoë as die drukresonansie-tipe het. Belangrike gegewens oor die ontwerp van hierdie tipe resonator is ingewin en etlike verbeteringe word aangebring om sy doeltreffendheid te verhoog. Apparaat is nou beskikbaar om die verloop en grootte van golwe in die resonator te bepaal, en vooruitgang is gemaak met die korrelasie tussen teoretiese en praktiese resultate.

Wat steenkoolverbranding betref, is die hoofdoel om apparaat te ontwikkel wat verpoeierde steenkool in 'n gelykmatige en maklik beheerbare snelheid in 'n lugstroom voer. Die eerste suksesvolle eenheid het bestaan uit 'n meganies-geroerde silindriese voorraadtenk wat in aansluiting met 'n vibrerende voerbak gewerk het. 'n Ander metode wat tans ondersoek word, is om die steenkool te voer uit 'n houër waarin dit in 'n vervloeide toestand verkeer. Hierdie studies sal ook belangrike inligting verskaf oor die opgaar en vervloeiing van verpoeierde Suid-Afrikaanse steenkool.

Voorlopige waarnemings oor die verbranding van verpoeierde steenkool in 'n metaal-verbrandingskamer het bewys hoe belangrik dit is om noukeurige beheer oor die lugvloei patroon te hê en om 'n stabiele ontstekingsone daar te stel. Dit het gelei tot die ontwerp van 'n eenheid wat tans gebou word vir die studie van lem-erosie.

Toerusting word tans ook ontwikkel om die verbrandingsnelheid van verskillende tipes verpoeierde steenkool onder verskillende toestande van druk en temperatuur te bepaal.

Vernietiging van Verouderde Banknote

Op versoek van die Suid-Afrikaanse Reserwebank het die Instituut 'n verbrandingsoond ontwikkel vir die

Gas Turbine Research

As mentioned in the previous report, a comprehensive survey of the possibilities of the gas turbine as a prime mover in this country, has revealed that these units could compete with other types of prime movers only if coal is used as fuel. The aim of the Institute's work is therefore to develop combustion equipment that will utilize local coal as fuel. To prevent erosion of the blades or deposition of ash thereon, the hot combustion gases must be cleaned so as to remove the harmful components. With this object in view studies are being made of the burning of pulverized coal in an intense sound field to determine whether the ash particles could, by this process, be pulverized to a fineness that would render them harmless in passing through the turbines. To generate such a sound field, that can be kept in vibration by the heat of combustion, a thermo-acoustic resonator was developed and is at present being perfected.

An appreciable amount of development work on thermo-acoustic resonators was done by using hydrogen as fuel. Experimental data were first obtained on a pressure-resonance prototype, and subsequently all efforts were concentrated on the development of a velocity-resonance unit which, theoretically, should have a greater breathing capacity. Important data have already been obtained on this resonator, and a number of improvements are now being incorporated in order to improve the efficiency of the unit. Apparatus has also become available to study the shape and amplitude of the pressure waves and progress has been made in correlating theoretical and practical results.

As far as the coal burning problems are concerned, attention has mainly been directed to the development of suitable coal feeding apparatus which can deliver pulverized coal into a stream of air at an even and easily-controllable rate. The first successful unit consisted of a mechanically stirred cylindrical hopper working in conjunction with a vibratory feeding trough. An alternative method now being investigated is the feeding from a container of coal in a fluidized state. These studies will also yield valuable information on the storing and fluidizing of pulverized South African coals.

Preliminary observations of the combustion of pulverized coal in an all-metal chamber, emphasized the importance of close control over the air flow pattern and also of a stable ignition zone. This led to the design which is now being built for the study of blade erosion.

Apparatus is also being developed to study the flame velocity of different types of pulverized coal under different conditions of temperature and pressure.

The Destruction of Obsolete Bank Notes

At the request of the South African Reserve Bank, the Institute developed an incinerator for the destruction of

vernietiging van verouderde banknote. Dog voordat die finale ontwerp gemaak is, is 'n tussentydse verslag aan die Bank voorgelê waarin die sisteem wat ontwikkel is, beskryf word. Daar is ook ander moontlike metodes van vernietiging uiteengesit, onder andere, om die note tot 'n poeier te maal en dit daarna met water in die munisipale rioolstelsel te laat afspoel.

Aangesien die Bank aan laasgenoemde metode voorkeur gegee het, het die Instituut onderneem om die uitvoerbaarheid van hierdie metode te ondersoek en om die nodige ontwerpsegegewens in te win. Hierdie ondersoek het suksesvol geblyk, en op versoek van die Bank is daar nou, op grond van hierdie resultate, 'n aanvang gemaak met die ontwerp van die finale opstelling.

LUGDINAMIKA

Meting van Lae Lugsnelhede

Goeie vordering is gemaak met die ontwikkeling van nuwe instrumente en metodes vir die meting van baie lae lugsnelhede. Sulke instrumente vind toepassing by die studies van ventilasie in geboue, asook by die ondersoek van grenslaag-verskynsels.

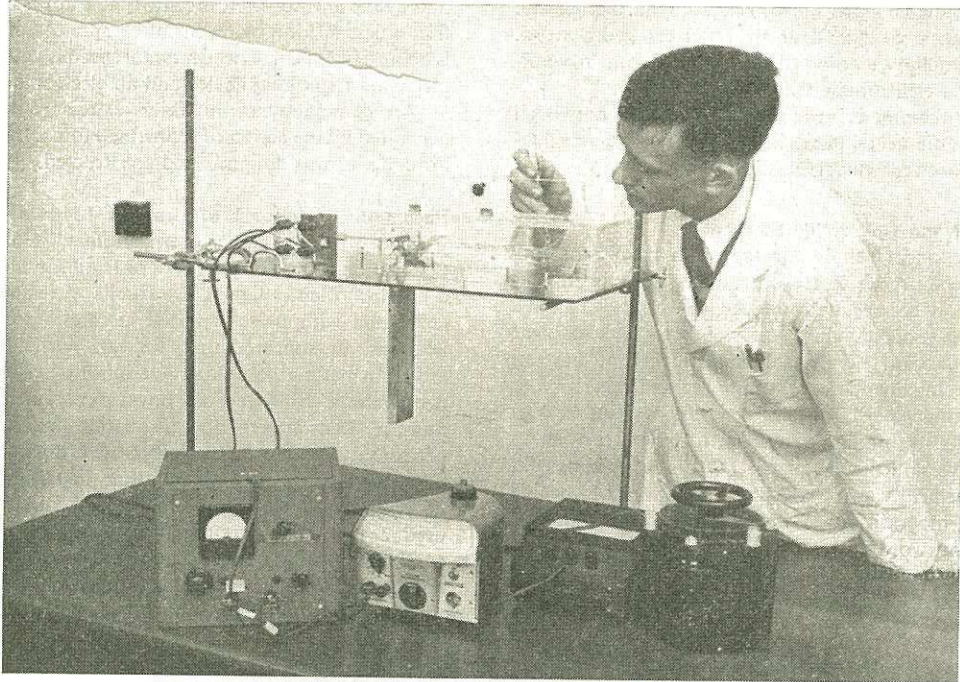
obsolete bank notes. However, before the final design was drawn up, an interim report was submitted to the Bank, describing the system evolved and also other possible methods of destruction, such as the pulverizing of the notes and then washing the material into the municipal sewer.

Since the Bank gave preference to the latter method, the Institute undertook an investigation to prove its feasibility and establish the necessary design details. This investigation has proved successful, and at the request of the sponsor, the Institute is now preparing the design of the final plant based on these principles.

AERODYNAMICS

Measurement of Low Velocities

Good progress has been made with the development of new instruments and methods for the measurement of very low velocities. Such instruments are used when studying the ventilation of buildings and boundary-layer phenomena.



'n Laespoed-aanduider wat deur die Instituut ontwerp is vir gebruik as standaard by roetiene-ykings van lugspoedinstrumente in die 24-duim windtunnel.

A low-velocity indicator developed by the Institute for use as a standard in routine calibrations of anemometers in the 24-inch diameter wind tunnel.

Die standaard warmdraad-spoedmeter het verdere verbeterings ondergaan, en is tussen 0.1 en 16 vt./sek. op die wentelarm geëyk. Kontrole-toetse is daarna tussen 11 en 16 vt./sek. in die 24-dm. windtunnel uitgevoer, waar die weergawe met dié van 'n standaard pitot-statische buis vergelyk is. Die uitstekende ooreenstemming wat hierdeur verkry is, dui daarop dat die wentelarm-metode van yking basies korrek is.

'n Tweede warmdraad-instrument, wat ongevoelig vir windrigting is, is met sukses ontwikkel vir metings in die bereik 0 tot 10 vt./sek. Hierdie meter is deur die Nasionale Bounavorsingsinstituut in 'n uitgebreide reeks windtunneltoetse op modelle van geboue gebruik.

'n Laespoed-indikator, wat in beginsel 'n baie gevoelige lugdinamiese balans is, is vervaardig vir gebruik in die 24-dm. windtunnel. Hierdie indikator, wat dit moontlik maak om lugsnelhede in die toetsruim met hoë akkuraatheid te bepaal, word aangewend by roetine-ykings van laespoed-instrumente.

Om die waarneembare hitteverlies by die mens in 'n lugstroom te bepaal, is 'n instrument benodig wat in staat is om alleenlik die aksiale snelheidskomponente in 'n drie-dimensionele onbestendige stromingsveld te meet. Sodanige instrument, wat in hoofsaak 'n spesiale Warmdraad-spoedmeter is, is ontwerp en geëyk.

'n Vlerkmeule word ontwikkel, waarvan die lemwiél op wrywingslose wyse deur drukluglaers gedra word. Die omwentelingspoed word deur middel van 'n vonk-toestel en 'n elektroniese teller bepaal.

'n Lugmanometer, waarin drukverskille ontwikkel word deur die sentrifugale kragte op 'n roterende lugkolom, is ontwerp en vervaardig.

Lugvervoer van Gekorrelde Stowwe

Hierdie ondersoek is voortgesit, en na afhandeling van die eerste reeks toetse op sand en sago in 'n een-duimspyp, is die resultate ontleed en vergelyk met dié uit die jongste oorsese publikasies. Hieruit blyk dat daar vir 'n gegewe korrelmateriaal 'n vaste verband bestaan tussen die lugdinamiese benuttigingsgraad van vervoer en die Froudegetal. Ten einde hierdie verband te kan bevestig, het dit nodig geword om toetse uit te voer op pype met verskillende deursnee. Daar is aanduidings dat die eindsnelheid van vryvallende korrels van 'n bepaalde materiaal moontlik as die enigste bykomstige faktor gebruik kan word om die Froudegetal-eienskappe saam te snoer in 'n enkele reeks krommes.

'n Nuwe opstelling is gevolglik ontwerp met die doel om verdere toetse uit te voer.

Windtunnel-ontwikkeling

Goeie vordering word gemaak met die ontwerp van 'n klein windtunnel waarin die temperatuur- en druktoestande veranderbaar sal wees. Die tunnel word ontwerp met 'n 12-dm. agtkantige toetsruim, waarin die lugspoed veranderbaar is tussen 0.1 en 100 vt./sek., die temperatuur

The standard hot-wire anemometer has undergone further improvement, and has been calibrated between 0.1 and 16 ft./sec. on the whirling arm. Check tests were then conducted between 11 and 16 ft./sec. in the 24-inch wind tunnel, where readings were compared with those of a standard pitot-static tube. The excellent agreement that was obtained showed the whirling arm method of calibration to be basically correct.

A second hot-wire instrument, of the omni-directional type, was successfully developed for measuring in the range 0 to 10 ft./sec. This instrument has been used by the National Building Research Institute during the course of an extensive series of wind tunnel tests on scale-model buildings.

A low speed indicator, in principle a very sensitive aerodynamic balance, was constructed for use on the 24-inch wind tunnel. This device, by which air velocities in the working section can be accurately determined, is used for routine calibration of low-speed anemometers.

The study of the sensible heat loss from a human body in an airstream required an instrument that would be capable of measuring only the axial component of velocity in a three-dimensional, unstable field of flow. Such an instrument, essentially a special type of hot-wire anemometer, was designed and calibrated.

A vane anemometer, in which the rotor is carried in a frictionless fashion by means of compressed air bearings, is being developed. The rotational speed is determined by means of a sparking device and an electronic counter.

An air manometer, in which a pressure difference is generated by the action of centrifugal forces on a rotating air column, was designed and constructed.

Pneumatic Conveyance of Granular Material

This investigation has been continued. Following the completion of the first series of tests on sand and sago in a one-inch diameter pipe, the results were analyzed and correlated with those reported in recent overseas publications. It appeared that, for any particular type of granular material, a unique relationship existed between aerodynamic efficiency of conveyance and the Froude number. In order to verify this relationship it has become necessary to conduct experiments with pipes of different diameter. It appeared, further, that the terminal velocity of the particles of any specific material could perhaps be used as the only additional parameter necessary for combining Froude number characteristics into a single family of curves. A new experimental installation has, therefore, been designed for purposes of further investigation.

Wind Tunnel Development

Good progress is being made with the design of a small wind tunnel in which the air pressure and temperature conditions are to be variable. The tunnel is being designed to have a 12-inch octagonal working section in which the airspeed will be variable between 0.1 and 100 ft./sec., the

tussen heersende kamertemperature en 80°C., en die lugdruk tussen perke wat atmosferiese toestande by 6,000 vt. benede seespieël tot 10,000 vt. bo seespieël sal naboots. Die tunnel sal van die geslote-kringloop-tipe wees, met hoofafmetings van ongeveer 8 vt. by 11 vt. Dit sal verder op so 'n wyse om laers swaai dat die vloei-richting in die toetsruim na wense verander kan word tussen vertikaalafwaarts tot vertikaal-opwaarts. Hierdie Wind-tunnel sal besonder geskik wees vir werk wat in verband staan met die ontwikkeling en toets van lugvloei-instrumente.

Lugweerstand van Gaasskerms by lae Reynoldsgetalle

Die sukses wat met die lae-lugspoed-indikateur van die 24-dm. windtunnel behaal is, het die moontlikheid daargestel om die toestel as 'n lugdinamiese balans te gebruik vir die meting van klein sleepkragte op gaaskywe. Hierdie tegniek sou die bepaling van gaasweerstand moontlik maak by laer Reynoldsgetalle as wat doenlik sou wees met die gewone metodes waar drukverskille oor die gaas gemeet word. 'n Geskikte weerstandsbalans, wat 'n verbetering en 'n verfyning op die oorspronklike indikator is, is derhalwe vervaardig, en 'n begin gemaak met eksperimentele werk.

Ander Ondersoeke en Dienste

Verskeie lugspoedmeters is ten behoeve van ander laboratoria vervaardig en geëyk. Twee vlerkmeulens is op so 'n wyse gewysig dat die weergawes op 'n afstand waargeneem kan word.

'n Aantal instrumente is vir mynmaatskappye geëyk, en vir die Nasionale Bounavorsingsinstituut is 'n instrument geëyk wat beide spoed en rigting registreer.

LUGDINAMIESE WERKTUIG EN VENTILASIE

Toets van Dakventilatore

Om prosedures vas te stel vir die toets van dakventilatore van verskillende groottes, is 'n uitgebreide teoretiese en eksperimentele ondersoek uitgevoer. Die teoretiese werk was hoofsaaklik bedoel om die toetsresultate, wat in die 10-vt. windtunnel verkry is, op so 'n wyse te verwerk dat dit van toepassing sal wees onder werklike toestande in die praktyk. Dit het ook gedien om vereenvoudigings in die toetsmetode aan te dui, en om die invloed wat die temperatuur- en drukverskille tussen die lug binne en buite geboue mag uitoefen, in ag te neem.

'n Tipiese dakventilator is vervolgens getoets, en die resultate is verwerk in die vorm van 'n grafiek, wat gebruik kan word om die lewering te bepaal wat ooreenstem met enige gegewe windtoestand, indien veranderlikes soos temperatuurverhouding, effektiewe skoorsteenhoogte en skoorsteenweerstand bekend is. Resultate van hierdie aard is baie nuttig vir kwalitatiewe vergelyking van verskillende tipes ventilatore. Die resultate verkry van 'n ventilasiestudie op skaalmodelle van geboue het egter

temperature between ambient and 80°C., and the pressure from 6,000 ft. below sea level to 10,000 ft. above. The tunnel is to be of the closed circuit type of overall dimensions approximately 8 ft. by 11 ft. The whole tunnel will be made to swing on bearings in such a way that the flow through the working section could be in any direction from vertically upwards to vertically downwards. This tunnel will be useful particularly for work in connection with the development and testing of air-flow instruments.

Gauze Screen Resistance at Low Reynolds Numbers

The success experienced with the low airspeed indicator for the 24-inch wind tunnel suggested the possibility of using this device as a drag balance to measure small drag forces acting on discs of gauze material. Such a technique could enable gauze screen resistance to be determined at lower Reynolds numbers than would be feasible by way of the usual methods involving pressure drop measurements. A suitable balance, essentially a considerably refined and improved version of the original indicator, was therefore constructed and a start made with the experimental work.

Other Investigations and Services

Several anemometers were constructed and calibrated on behalf of other laboratories. Two vane anemometers were modified in such a way as to be remotely indicating.

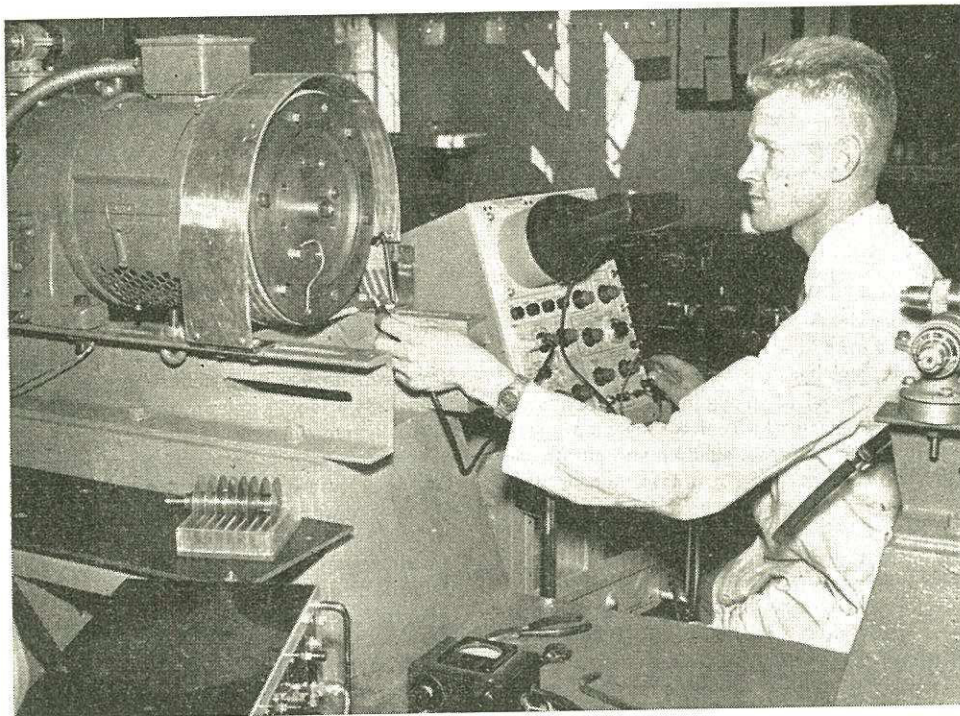
A number of instruments were calibrated for mining concerns. For the National Building Research Institute an instrument which records the speed and direction of winds was calibrated.

AERODYNAMIC MACHINES AND VENTILATION

Testing of Roof Ventilators

Extensive theoretical and experimental investigations have been conducted to establish suitable procedures for the testing of roof ventilators of different sizes and types. The theoretical work was concerned mainly with the problem of presenting the test results, obtained in the 10-ft. wind tunnel, in such a way as to be applicable under the actual conditions obtained in practice. It also served to indicate simplifications in the test procedure, and further involved the evaluation of effects due to the temperature and pressure differences that may exist between the air inside and outside buildings.

A typical roof ventilator was tested, and the results plotted in the form of a chart by means of which it became possible to determine the volumetric extraction corresponding to any given wind condition, if such parameters as the temperature ratio and effective stack height, and the stack resistance were known. Results of this nature are very useful for qualitative comparison of different ventilator types. The results of ventilation studies on



Uitrusting vir die bepaling van die elektriese weerstand van sleepringe gedurende die ondersoek na die elektriese kontakte tussen beweegbare en statiese geleiers.

Equipment used for the determination of the electrical resistance of slippings in the course of research into the design of electrical contacts between moving and stationary conductors.

daarop gedui dat die toepassing van werkverrigtings-gegewens op die ontwerp van ventilasiestelsels afhang van die windtoestande wat heers by elke afsonderlike ventilator.

Ventilasiestudies op Skaalmodelle van Geboue

Ten einde die invloed van dakhelling op die werkverrigting van dakventilatore vas te stel, is die vloeitoestande oor die dak van 'n skaalmodel-gebou in die 10-vt. windtonnel bestudeer. In samewerking met die Nasionale Bounavorsingsinstituut is 'n uitgebreide reeks toetse uitgevoer om die verskillende vloiepatrone onder verskillende toestande van dakhelling, muurhoogte en dakoorhang na te speur.

Daar is gevind dat dakhelling alleenlik 'n belangrike invloed uitoefen wanneer die hellings 30° oorskry. Met kleiner hoeke is die invloed van muurhoogte oorwegend. In alle gevalle was die vloei geneig om weg te breek by die dakrand, om sodoende 'n gebied van stillug oor die hele dakoppervlak te veroorsaak.

Die gevolgtrekking is dat die toepassing van gegewens oor dakventilator-werkverrigting afhang van 'n juiste kennis van die vloeitoestande waar die ventilator aange-

scale-model buildings have suggested, however, that application of the performance data to the actual design ventilating systems could depend upon a knowledge of the wind conditions prevailing at the location of each individual ventilator.

Ventilation Studies on Scale-model Buildings

The problem of determining the effect of roof pitch on natural draught ventilator performance led to the idea of studying flow conditions over the roof of a scale-model building placed in the 10-ft. wind tunnel. In collaboration with the National Building Research Institute an extensive series of tests was conducted in order to determine the flow pattern under different conditions of roof pitch, wall height and roof overhang.

It was found that the roof pitch was a major influence only when the pitch angles exceeded 30° . With smaller pitch the effect of wall height predominated. In all cases the flow tended to separate at the eaves, causing a zone of stagnant air over the entire roof surface.

It was concluded that the application of roof ventilator performance data would depend upon a prior knowledge of the flow conditions existing at the position where the ventilator is to be situated. If tests on a scale-model

bring moet word. Indien toetse op 'n skaalmodel van 'n gebou toon dat 'n ventilator binne die stilluggebied geplaas word waar 'n lae druk heers, kan die lewering van die ventilator nog bereken word, mits die onderdruk en die ventilatorweerstand bekend is.

Waaierontwerp met Betrekking tot Geraas

Die probleem van waaiergeraas wat van aansienlike belang in die nywerheid geword het, word bestudeer met die doel om geraas deur middel van 'n doeltreffende waaierontwerp te beheer. 'n Taamlik uitgebreide studie is gemaak van metodes om waaiergeraas te meet. Hierdie navorsingswerk het gelei tot die finale ontwikkeling van 'n geskikte stelsel wat die gebruik behels van 'n standaard waaier-toetseenheid wat toegerus is met 'n akoestiese horing en klankabsorberende uitlaat, asook met 'n afgeskermd mikrofoon wat die meting van lawaai binne 'n lugkanaal moontlik maak.

Goeie vordering is ook gemaak met die teoretiese werk om 'n meer rasionele benadering van die uiteindelijke korrelasie tussen waaierontwerps-veranderlikes en die geraas-eienskappe van waaiers te bewerkstellig.

Werkverrigting van Windmeulens

Weens talle navrae vir sodanige werk is permanente toerusting ontwerp en opgestel om toetse op die werkverrigtings van windmeulens te vergemaklik. Volskaalse meulens sal weer buite getoets word deur gebruikmaking van 'n bewegende vragmotor wat spesiaal daarvoor ingerig word.

Die toets van drie windmeulens van 6 vt. deursnit in die 10-vt. windtonnel is ook onderneem. Hierdie meulens, wat in ontwerp onderling van mekaar verskil, het gedien as modelle om op 'n vergelykende basis die beste lemontwerp te bepaal, wat dan op 'n groter tipe windmeule aangebring kan word. Die meeste van hierdie werk is onder kontrak uitgevoer.

Stofneerslag

'n Ondersteunde ondersoek het gelei tot die instelling van druklugfluite vir die opwekking van ultrasoniese note om stofneerslag in 'n ventilator-aanleg te bevorder. Instelling van die fluite is uitgevoer met behulp van toerusting wat 'n mikrofoon, 'n elektroniese teller en 'n ossilloskoop ingesluit het.

building reveal a ventilator to be located inside the stagnant zone, which is a low pressure region, then the ventilator delivery may still be calculated from a knowledge of the depression and the ventilator resistance.

Fan Design in Relation to Noise

The problem of fan noise, which has become one of considerable importance in industry, is being studied with the object of reducing noise by means of suitable fan design. A fairly extensive experimental study was made of methods for measuring fan noise. This work resulted in the final development of a suitable system involving the use of a standard fan performance test rig, fitted with a horn and absorptive termination, and of a screened microphone that will enable noise to be measured inside a fan duct.

Good progress has also been made with theoretical work directed at the preparation of a more rational approach to the eventual correlation of fan design parameters with fan noise phenomena.

Windmill Performance

Owing to numerous requests for the testing of the performance of windmills, permanent equipment was designed and erected for this purpose. Full-size windmills will again be tested out-of-doors by using a moving truck as a test-bed.

The testing of three 6-ft. diameter windmills in the 10-ft. wind tunnel was also undertaken. These windmills were of different design, and served as models in order to determine, on a comparative basis, the best blade design to be incorporated in larger windmills. Most of this work has been done under contract.

Dust Precipitation

A sponsored investigation led to the task of setting two compressed air whistles for the emission of ultrasonic vibrations to precipitate dust in a ventilation system. The correct adjustments were made by using equipment comprising a microphone, an electronic counter and an oscilloscope.

Nasionale Telekommunikasie- Navorsingslaboratorium

Direkteur: DR. F. J. HEWITT

Die program van die Nasionale Telekommunikasie-navorsingslaboratorium is hoofsaaklik toegespits op die oplossing van probleme waarmee gebruikers van radiogolwe vir burgerlike en militêre dienste in Suid-Afrika te kampe het.

'n Belangrike deel van hierdie program is die studie van die voortplanting van radiogolwe deur die laer en hoër atmosfeer en navorsingswerk oor die aard van steurings veroorsaak deur lugsteurings, asook die uitwerking daarvan op radio-ontvangstelsels sover dit radio-kommunikasie en radiohulpmiddels vir navigasie betref.

Die res van die program was gerig op die ontwikkeling van sekere items van toerusting om aan spesiale vereistes in Suid-Afrika te voldoen, asook om plaaslike produksieprobleme van sulke toerusting op te los. As gevolg hiervan word radio- en radartoerusting van 'n baie hoë gehalte, en gebaseer op ontwerpe wat in die laboratorium voltooi is, nou deur verskeie kommersiële firmas in Suid-Afrika vervaardig. Gelisensieerde produksie in die Verenigde Koninkryk is ook aan die gang.

Die Laboratorium is nog gehuisves in akkommodasie wat beskikbaar gestel is deur die Universiteit van die Witwatersrand, Johannesburg. Veldwerk is gedoen by die Universiteit se Proefplaas op Frankenwald, by die Jan Smuts-lughawe en by die radio-ontvangstasie van die Suid-Afrikaanse Uitsaaikorporasie by Panorama. Die Raad wens die betrokke organisasies te bedank vir die beskikbaarstelling van hierdie fasiliteite. Permanente huisvesting vir die Laboratorium word nou beplan.

DIE VOORTPLANTING VAN RADIOGOLWE

Ionosferiese Waarnemings

Gereelde metings van ionosfeer-eisnskappe by vertikale invalshoeke word nog gedoen by Johannesburg, Kaapstad en Nairobi. Die metings vind outomaties plaas met tussenpose van 20 minute. Met tye wanneer iets baie interessants voorkom, soos byvoorbeeld gedurende 'n sonsverduistering of ander soortgelyke verskynsels, word die metings geneem met 'n tussenpose van een minuut. Vir Johannesburg is ionosferiese gegewens oor 'n tydperk van meer as tien jaar nou beskikbaar. Die gegewens wat van hierdie waarnemingstasies verkry word, word in die laboratorium ontleed en die inligting gereeld gepubliseer. Meer as 70 ionosferiese waarnemingstasies in die wêreld neem deel aan die meting

National Telecommunications Research Laboratory

Director: DR. F. J. HEWITT

The programme of the National Telecommunications Research Laboratory is primarily directed towards the solution of problems which confront the various users of radio waves in South Africa for civil or military purposes.

An important part of this programme is the study of the propagation of radio waves through the lower and upper atmosphere, and the investigation of the nature of the disturbances caused by atmospheric and their effect on radio-receiving systems, both in so far as radio communication and radio aids to navigation are concerned.

The remainder of the programme has been concerned with the development of certain items of equipment to meet special requirements that have arisen in South Africa, and with the problems encountered in the local production of such equipment. As a result, radio and radar equipment of a highly specialized nature based on designs developed in the Laboratory, is now being manufactured by various commercial firms in South Africa. Production in the United Kingdom, under licence, is also in progress.

The Laboratory is still housed in premises made available by the University of the Witwatersrand, Johannesburg. Field work has been conducted at the University Experimental Farm at Frankenwald, at Jan Smuts Airport and at the Panorama receiving station of the South African Broadcasting Corporation. The Council wishes to accord to the organisations concerned its appreciation of these facilities. Permanent accommodation for the Laboratory is now being planned.

THE PROPAGATION OF RADIO WAVES

Ionospheric Observations

Regular measurements of ionospheric characteristics at vertical incidence have continued at Johannesburg, Cape Town and Nairobi. The measurements are made automatically at intervals of 20 minutes. On occasions of particular interest, such as during a solar eclipse or other interesting solar phenomenon, the records are taken at one minute intervals. Ionospheric records covering more than ten years, are now available for Johannesburg. The records from these three observatories are analysed in the Laboratory and the data published regularly. Over 70 ionospheric observatories throughout the world are participating in the measurement of ionospheric characteristics and the exchange of ionospheric data.

van ionosferiese eienskappe en die uitruil van ionosferiese gegewens.

Die Raad is dank verskuldig aan die Suid-Afrikaanse Departement van Pos- en Telegraafwese en die Oos-Afrikaanse Departement van Weerkunde wat die ionosfeerwaarnemingstasies onderskeidelik in Kaapstad en Nairobi bedien.

Ionosfeervoorspellings

Die uitreiking van maandelikse voorspellingsdienste vir radiotransmissie is voortgesit. Op versoek van die Departement van Pos- en Telegraafwese asook ander belangstellende organisasies is spesiale voorspellings gemaak vir sekere oorsese roetes. Voorspellings in so 'n vorm dat dit deur bemannings van vliegtuie gebruik kan word vir hoëfrekwensie-radiotelefonie is ook vir die Departement van Vervoer gemaak. Hierdie werk is nou oorgeneem deur die Departement van Vervoer, wat gunstige werkfrekwensiekaarte voorberei volgens gegewens verstrek deur die Laboratorium. Twee kaarte, een vir die Ooskus en een vir die Weskus, word maandeliks voorberei. Ongeveer 'n honderd van elke kaart word elke maand uitgereik om deur die burgerlike lugvaart in daardie streke gebruik te word tot 'n afstand van 1,700 myl vanaf die betrokke grondradiostasie.

Die Laer Ionosferiese Streke

Die ionosferiese metings waarvan melding hierbo gemaak is, is vir ionosferiese streke op 'n hoogte van 90 km. en hoër, aangesien hierdie streke hoofsaaklik verantwoordelik is vir hoëfrekwensie-radiovoortplanting. Die streke van die ionosfeer wat laer is as 90 km. is grootliks verantwoordelik vir die opneem van radiogolwe en is dus ook van baie belang. Dit is baie moeiliker om hierdie laer streke te bestudeer, en spesiale tegniek moet dus gebruik word.

Vordering is gemaak met 'n dubbelpulsmetode vir die bestudering van die verandering van elektrondigtheid en botsingsfrekwensie volgens hoogte in die laer ionosfeer. Die uitwerking van een puls op die verskillende ionosfeerlae is deur 'n tweede verkenningspuls waargeneem, terwyl die tyd van voorkoms van laasgenoemde in verhouding tot die eerste gekontroleer kan word.

Die teoretiese basis waarop die eksperiment gebaseer is, is alreeds ontwikkel en die resultate van voorlopige metings is ontleed in terme van die teorie. Die resultate werp heelwat lig op die geldigheid of andersins van verskillende teorieë van kruismodulasie in die ionosfeer, en dit stem baie ooreen met die vroeër teorie van Bailey en Martin.

Hierdie metode maak dit moontlik om die elektrondigtheid en die botsingsfrekwensie apart te verkry. Die resultate oor elektrondigtheid het die eerste inligting in Suid-Afrika verskaf oor ionosferiese toestande op 'n hoogte van omtrent 70 km., en dui daarop dat daar 'n duidelike laag in daardie streek bestaan. Hierdie resultate

The Council is indebted to the South African Department of Posts and Telegraphs and to the East African Meteorological Department, which are responsible for the operation of the equipment at Cape Town and Nairobi respectively.

Ionospheric Forecasts

The issue of monthly forecasts of radio transmission conditions in Southern Africa has continued. Special forecasts are made on request, for particular overseas circuits, on behalf of the Department of Posts and Telegraphs and other interested organisations. Forecasts in a form suitable for use by aircraft have also been prepared for the Department of Transport for use particularly with high-frequency radio telephony. This work has now been taken over by the Department of Transport, which prepares *Optimum R/T Frequency Charts* using the basic information provided by the Laboratory. Two charts are issued monthly, one for the East Coast and one for the West Coast, and are intended for use by civil aircraft operating in these regions up to 1,700 miles from the ground radio station concerned. Approximately 100 of each chart are issued each month.

The Lower Ionospheric Regions

The ionospheric measurements referred to above are concerned with ionospheric regions at heights of about 90 km. and above, as these are the regions primarily responsible for high-frequency radio propagation. The regions of the ionosphere below 90 km. are largely responsible for the absorption of radio waves and are thus also of considerable interest. The study of these lower regions is much more difficult and special techniques have to be used.

Work has been in progress on a double pulse system for the study of the variation with height, of the electron density and collision frequency in the lower ionosphere. The effect of one pulse on the various ionospheric layers is observed by a second exploring pulse, the time of occurrence of the latter relative to the first being controllable.

The theoretical basis underlying this experiment has been developed and the results of some preliminary measurements have been analysed in terms of this theory. The results throw considerable light on the validity or otherwise of various existing theories of cross-modulation in the ionosphere and strongly support the earlier theory of Bailey and Martin.

This method enables both the electron density and collision frequency to be obtained independently. The electron density results have provided the first information obtained in South Africa on ionospheric conditions at heights of about 70 km. and indicate the existence of a distinct layer in this region. These results agree with some obtained recently in Australia by Pawsey and Gardner

stem ooreen met die wat onlangs in Australië deur Pawsey en Gardner verkry is deur die waarnemings van gedeeltelike weerkaatsings. So 'n ooreenstemming is baie bevredigend aangesien albei metodes gebaseer is op teoretiese beskouing wat nog nie heeltemal bewys is nie.

Die aanbou van sterker pulssenders om inligting in groter besonderhede te verkry, nader voltooiing.

Die Internasionale Geofisiese Jaar

Gedurende die Internasionale Geofisiese Jaar, sal die studie van ionosferiese voortplanting deur die hele wêreld beklemtoon word. Die Laboratorium het alreeds voorbereidings getref om deel te neem aan die program. Die Suid-Afrikaanse Nasionale Komitee vir die Internasionale Geofisiese Jaar het 'n onderkomitee vir die Ionosfeer in die lewe geroep, met die Direkteur van die Laboratorium as voorsitter.

Troposferiese Verstrooi voortplanting

Die jongste oorsese navorsings oor radiovoortplantingsgolwe in die frekwensiebestek van 100 tot 10,000 megahertz, het aan die lig gebring dat daar 'n voortdurende veldsterkte bestaan oor 'n paar honderd myl verder as die horison, wat voorheen beskou was as die praktiese grens vir hierdie frekwensies. Hierdie veldsterktes is veel groter as wat verwag sou word van die buiging onder standaardbrekingstoestande. Nieteenstaande dit, is die verlies by deursending groot en moet daar aan albei kante gebruik gemaak word van hoë-versterkingsantennes om bevredigende kommunikasies te verkry. Afsien hiervan, het so 'n stelsel bepaald aantreklike kenmerke vir 'n land soos Suid-Afrika. Die onderwerp is in die Laboratorium deeglik oorweeg en oorspronklike teoretiese werk is gedoen in verband met die grootte van die deursendingsverlies. Hierdie werk het ten doel om binnekort praktiese metings te onderneem.

RADIORUISPEILE EN NAVIGASIEHULPMIDDELS

Die reeks metings van radio-ruispeile by 100 kh., met die doel om die uitwerking van radiolugsteurings op verskillende navigasiehoelpmiddels te bepaal, is byna voltooi. Die studie word gesteun deur die Lugvervoerraad van Suidelike Afrika. Die registreerder of Jinja, wat deur die Oos-Afrikaanse Pos- en Telekommunikasiesadministrasie bedien word, het baie goeie resultate gelewer en die toerusting is nou onttrek.

Resultate vir 'n tydperk van min of meer 'n jaar of langer is nou beskikbaar vir Johannesburg, Ladysmith (Natal), Lusaka, Nairobi en Jinja. Geen verdere registrasies in hierdie frekwensieband word beplan nie, behalwe vir die tussenvergelyking van hierdie Laboratorium se tipe geruisregistreerder met 'n nuwe laefrekwensie registreerder wat deur die Radionavorsingsafdeling van die Departement van Wetenskaplike en Industriële Navorsing van die Verenigde Koninkryk ontwikkel is.

by the observation of partial reflections. Such agreement is very satisfactory in view of the fact that both methods are based on theoretical considerations which are not yet firmly established.

The building of higher power pulse transmitters to enable more detailed information to be obtained is now nearing completion.

International Geophysical Year

During the International Geophysical Year, increased emphasis will be placed throughout the world on the study of ionospheric propagation. Preparations are in hand for the Laboratory's participation in this programme. The S.A. National Committee for the International Geophysical Year has established a Sub-Committee for the Ionosphere under the Chairmanship of the Director of the Laboratory.

Tropospheric Scatter Propagation

Recent overseas investigations of radio wave propagation in the frequency range 100 to 10,000 Mc/s. have revealed that field strengths exist at all times several hundred miles beyond the horizon, which previously was thought to be the practical limit for these frequencies. These field strengths are very many times greater than would be expected from diffraction under standard refraction conditions. Nevertheless, the transmission loss is large and high gain aerials have to be used at both ends of the circuit to obtain satisfactory communication. Despite this, the system has distinctly attractive features for a country such as South Africa. The subject has been considered in some detail in the Laboratory and some original theoretical work was done on the magnitude of the transmission loss. This work was done with a view to undertaking some practical measurements in the near future.

RADIO NOISE LEVELS AND NAVIGATION AIDS

The series of measurements of radio noise levels at 100 kc./s. sponsored by the Southern African Air Transport Council with a view to assessing the effect of atmospheric radio noise on various radio aids to navigation is nearing completion. The recorder operated by the East African Posts and Telecommunications Administration at Jinja, Uganda, has given very satisfactory results and has now been withdrawn.

Results covering a year or more are now available for Johannesburg, Ladysmith (Natal), Lusaka, Nairobi and Jinja. No further recordings in this frequency band are planned, with the exception of the inter-comparison of this laboratory's type recorder and that recently developed by the United Kingdom Department of Scientific and Industrial Research. This is now in progress at the receiving station of the South African Broadcasting Corporation at Panorama.

Die tussenvergelyking is nou aan die gang by die Suid-Afrikaanse Uitsaaikorporasie se ontvangstasie op Panorama.

Daar is niks gedoen in verband met lugsteurings in die hoëfrekwensieband nie, omdat die multifrekwensie-geruisregistreerder, wat deur die Sentrale Radiovoortplantingslaboratorium van die Verenigde State se Buro vir Standaard ontwikkel is, nog nie beskikbaar is nie. 'n Studie van statistiese eienskappe van lugsteurings was ook nie moontlik nie, omdat die toerusting wat verwag is van die Universiteit van Florida, nog nie beskikbaar is nie.

Aandag word bestee aan breëband-registrasie van die golfvorms van lugsteurings, waarvoor Suid-Afrika uiters geskik is weens die afwesigheid van laëfrekwensie-radioverbindings.

Die studie van die gedrag van verskillende soorte weerligtellings, wat aan die hand gegee is deur die Internasionale Konsulerende Komitee vir Radio, is voortgesit op versoek van die Departement van Pos- en Telegraafwese.

WEERLIGSTUDIES MET BEHULP VAN RADAR

Vorbereidings word getref om gedurende die volgende weerligseisoen verdere waarnemings te maak van

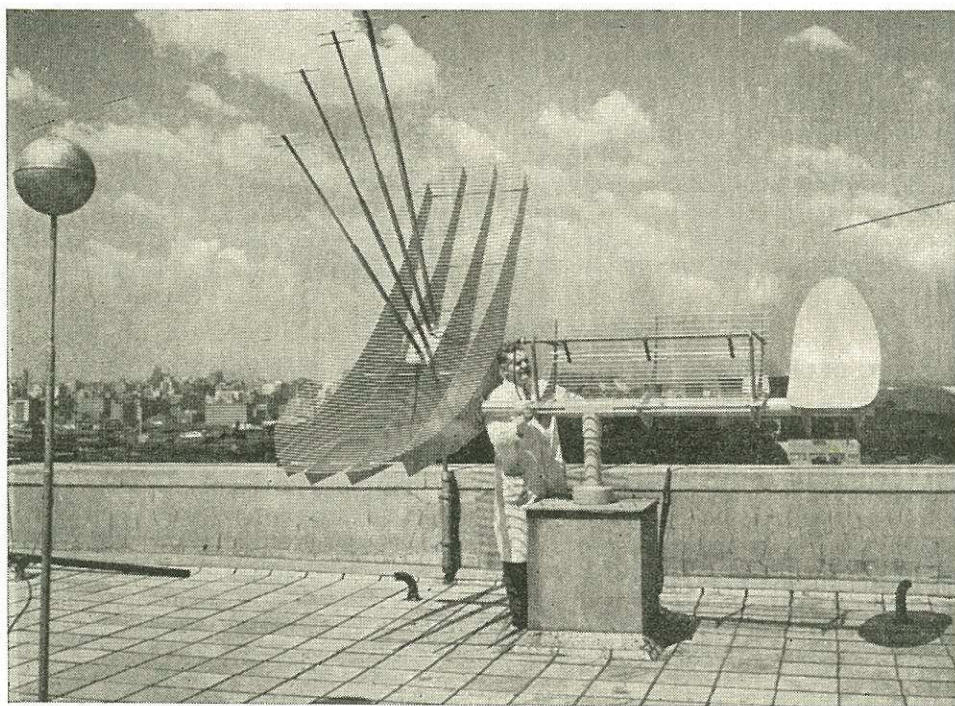
No work on the recording of atmospheric radio noise in the high-frequency band has been possible, as the multi-frequency noise recorder developed by the Central Radio Propagation Laboratory of the United States is still not available, nor has any work been possible on the study of the statistical properties of atmospheric noise, as the equipment expected from the University of Florida has also not materialized.

Work is being concentrated on the wide-band recording of atmospheric noise waveforms for which South Africa is well suited, owing to the absence of low frequency radio communications systems.

The study of the behaviour of various types of lightning counter recommended by the International Radio Consultative Committee has continued at the suggestion of the Department of Posts and Telegraphs.

LIGHTNING STUDIES BY RADAR

Preparations are in progress for further observations of lightning by radar during the next lightning season.



Radar-antenna wat vir die studie van weerlig gebruik word.

A radar aerial system used for lightning studies.

weerlig, deur gebruik te maak van radar. Die resultate sover verkry is gereed gemaak vir publikasie. 'n Aantal interessante feite is verkry in verband met die tussen-slagprosesse wat gedurende grondwaartse weerligontlading voorkom, en die aard en kragsterkte van die slagstraal van weerlig op ultrahoëfrekwensies.

KRISTALBEHEER VAN VERANDERBARE FREKWENSIE

'n Ontvangstoestel, wat gebruik maak van die „Wadley”-metode van kristalbeheer van veranderbare frekwensie, word in die Verenigde Koninkryk vir produksieontwikkeling, volgens 'n Britse Interdiens-Spesifikasie, toegewys aan 'n Britse firma aan wie 'n lisensie deur die W.N.N.R. toegeken is vir die vervaardiging en verkoop van hierdie ontvangstoestelle in sekere dele van die wêreld. Bestellings vir hierdie ontvangstoestel is deur die Britse Militêre Dienste geplaas.

'n Verdere poging is aangewend om die plaaslike vervaardiging van die toestel aan te moedig, en 'n nuwe ooreenkoms is gevolglik met 'n Suid-Afrikaanse firma aangegaan. Verskeie verbeterings is deur die Laboratorium voorgestel wat in die nuwe ontwerp opgeneem sal word.

'n Generator van 2 tot 7 megahertz wat in die Laboratorium gebou is, en gebaseer op hierdie beginsels, is deur die Britse Admiraliteit aan toetse onderwerp en 'n baie bevredigende verslag is ontvang oor die werkverrigtingsvermoë daarvan. Die generator is sedertdien weer vir verdere toetse tot beskikking van die Britse Uitsaaikorporasie gestel. Twintig generators word in die werkwinkels van die S.A. Departement van Pos- en Telegraafwese op dieselfde beginsels gebou vir spesiale toepassings. Die Suid-Afrikaanse Uitsaaikorporasie het reeds negentien generators voltooi vir gebruik met die frekwensiebeheer van die Korporasie se nuwe sender op Paradys, naby Bloemfontein.

AFSTANDMETING DEUR RADIO

Die „Tellurometer-stelsel” vir afstandmeting, wat in die Laboratorium ontwikkel is, het in 'n reeks veldtoetse bewys dat, vir geodetiese doeleindes, die oorspronklike spesifikasie van akkuraatheid van 1 in 100,000 (bv. 1 voet in 20 myl) in 'n taamlike mate oorskry is. Die toerusting is lig, maklik om te gebruik en betreklik sterk. Opmetingsoutoriteite oor die hele wêreld toon belangstelling in die ontwikkeling van hierdie instrument aangesien alle pogings wat deur oorsese lande in die afgelope paar jaar aangewend is om hierdie probleem op te los, nie suksesvol was nie.

Dit is duidelik dat die instrument ook toegepas kan word vir doeleindes anders as van 'n geodetiese aard; byvoorbeeld, om kort afstande te bepaal waar dit vir een

The results obtained to date have been prepared for publication and have revealed a number of interesting facts regarding the inter-stroke processes that occur during lightning discharges to ground and on the nature and power level of noise radiated by the lightning at ultra high-frequencies.

VARIABLE FREQUENCY CRYSTAL CONTROL

A receiver using the “Wadley” system of variable frequency crystal control has been developed for production to a British Interservice specification by a United Kingdom firm licensed by the C.S.I.R. to manufacture and sell these receivers in certain parts of the world. Orders for this receiver have been placed by British Service Departments.

A further effort to encourage local manufacture has been made and a new agreement has been signed with a South African firm. Various improvements suggested by this Laboratory are being incorporated in the new design.

A laboratory-built generator, covering 2-7 Mc./sec. based on these principles has been subjected to tests by the British Admiralty and a very favourable report on its performance has been received. The generator has subsequently been made available to the B.B.C. for further trials. Twenty generators operating on this principle are under construction in the workshops of the South African Department of Posts and Telegraphs for certain specialized applications. Nineteen have been made by the South African Broadcasting Corporation for the frequency control of transmitters at the Corporation's new short-wave centre at Paradys near Bloemfontein.

DISTANCE MEASUREMENT BY RADIO

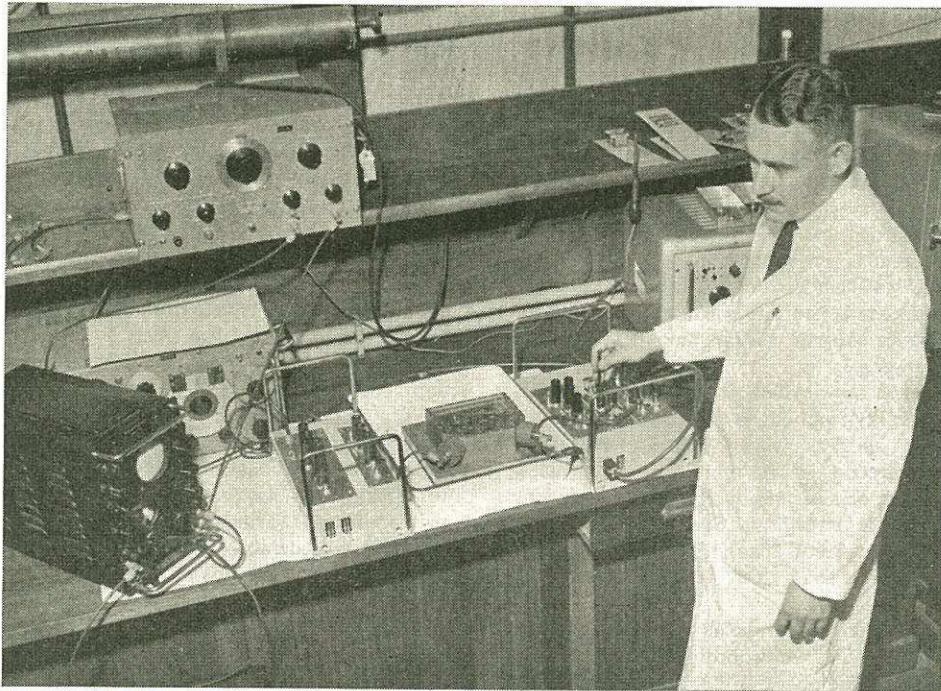
The “Tellurometer System” of distance measurement, developed in the Laboratory, has proved, in a series of field tests, that for geodetic purposes the original specification of an accuracy of 1 in 100,000 (e.g. 1 foot in 20 miles) has been exceeded by a fair margin. The equipment is light in weight, easy to operate and relatively robust. Its development has aroused considerable interest from survey authorities throughout the world, as considerable effort has been devoted to this problem in overseas countries during the past few years without success.

It is apparent that the instrument will also have application in other than the geodetic role, e.g. at short ranges where existing methods are for some reason difficult to apply.

of ander rede moeilik is om die reeds bestaande metodes toe te pas.

Aansoek is gedoen om die patent te registreer en reëlings word getref om die toerusting in Suid-Afrika te vervaardig deur 'n firma wat spesiaal vir die doel tot stand gebring is. Daar is alreeds 'n aantal voorlopige bestellings geplaas.

Patent application has been made and arrangements are in progress for the production of this equipment in South Africa by a firm especially established for the purpose. A number of tentative orders have already been placed.



'n Supersoniese inligtingsopgaarstelsel vir radar.

A supersonic delay system for radar.

AFDELING VIR VERDEDIGINGSNAVORSING

Werk van hierdie afdeling was toegespits op die voltooiing en toetsing van die proefmodel van die radar-toerusting wat in die laboratorium ontwikkel is. Hierdie toerusting het 'n aantal spesiale kenmerke. Plaaslike vervaardiging daarvan behoort geen moeilikhede op te lewer nie aangesien dit betreklik eenvoudig is. Die vervaardiging van 'n kommersiële prototipe deur 'n Suid-Afrikaanse firma is nou in die beginstadium.

DEFENCE RESEARCH SECTION

The work of this section has been concentrated on the completion and testing of a "pilot" model of the radar equipment developed in the Laboratory. This equipment has a number of special features. In particular, it is relatively simple and should present no difficulty in local manufacture. Manufacture of a commercial prototype by a South African firm is now in its early stages.

Nasionale Bounavorsingsinstituut

Direkteur: MNR. N. STUTTERHEIM

Die Adviserende Komitee vir Bounavorsing het vier keer gedurende die jaar vergader en het waardevolle dienste aan die Instituut gelewer deur advies en leiding, asook deur sy afsonderlike lede wat skakeling gehandhaaf het met sentrale en plaaslike owerhede, die nywerheid en beroepe. Die Kaapse Streeksubkomitee wat vier keer gedurende die jaar vergader het, het tot 'n waardevolle forum ontwikkel waar sake in verband met die boubedryf in Wes-Kaapland met lewendige belangstelling bespreek word. Baje voorstelle en aanbevelings vir bykomende navorsingswerk wat deur die Nasionale Bounavorsingsinstituut onderneem behoort te word, spruit voort uit hierdie subkomitee en waar enigsins moontlik word uitvoering daaraan gegee.

'n Verblydende ontwikkeling is die toenemende toepassing in die praktyk van die navorsingsresultate.

Die afgelope jaar is gekenmerk deur groter druk op die Instituut deur staatsdepartemente, streeks- en plaaslike owerhede, korporasies, inrigtings, firmas en individue om werk vir hulle te onderneem. Saam met 'n toename in die aantal navrae wat ontvang is, het dit 'n swaar las op die hele personeel geplaas, maar veral op hoofde van afdelings.

Die stadium is bereik waar die navorsingspersoneel te veel van hul tyd aan die beantwoording van navrae moes bestee en 'n Inligtingsafdeling is dus geskep na wie alle navrae in die eerste plek verwys word. As die personeel van dié kantoor oor die vereiste inligting beskik, hetsy uit kennis van vorige gevalle of in die vorm van 'n publikasie, handel hulle regstreeks met die navraag. So nie, word dit na die betrokke afdeling verwys vir afhandeling of om die gevraagde inligting aan die inligtingskantoor beskikbaar te stel vir deursending aan die navraer.

In sy hoedanigheid as Sekretaris van die Inter-Afrikaanse Behuisingskomitee van die Kommissie vir Tegniese Samewerking in Afrika suid van die Sahara (C.C.T.A.) het die direkteur vroeg in 1956 verskeie gebiede in Sentraal-Afrika besoek. In April 1956 was hy na Australië om die Statebondskonferensie van Direkteure van Bounavorsing by te woon.

Die Instituut het beurse, toekennings en kontrakte ter waarde van nagenoeg £23,000 gehanteer. Werk is gedoen volgens 106 kontrakondernemings waarvan 77 nuwes was wat gedurende die jaar aan die Instituut opgedra is.

AFDELING ARGITEKTUUR

Die grondslag is gelê vir navorsingswerk op hospitaal-

National Building Research Institute

Director: MR. N. STUTTERHEIM

The Building Research Advisory Committee met four times during the year, and has rendered valuable service to the Institute, not only with advice and guidance, but also, through its individual members, in providing liaison with central and local authorities, industry and the professions. The Cape Regional Sub-Committee, which met four times during the year, has developed into a valuable forum where matters affecting the building industry in the Western Cape area are discussed with lively interest. Many suggestions and recommendations for additional research work to be undertaken by the National Building Research Institute emanate from this sub-committee, and are acceded to wherever possible.

A gratifying development is the increasing application in practice of the results of research.

The past year has been marked by increased pressure from government departments, regional and local authorities, corporations, institutions, firms and individuals, for work to be undertaken by the Institute. This, together with an increase in the number of enquiries received, has thrown a considerable burden on the staff at all levels, but particularly on heads of divisions.

The stage was reached when a disproportionate amount of time was being devoted by research staff to the answering of enquiries, and an Information Section was therefore set up, to which all enquiries are routed in the first instance. If the staff there have the information required, either from knowledge of previous cases or in the form of a publication, they deal with the matter directly; otherwise the case is referred to the division concerned to deal with or to make the relevant information available to the Information Section for transmission to the enquirer.

The Director, in his capacity as Secretary to the Inter-African Housing Committee of the Commission for Technical Co-operation in Africa South of the Sahara (C.C.T.A.) visited several Central African territories early in 1956. In April, 1956, he travelled to Australia to attend the Conference of Commonwealth Building Research Directors.

The Institute handled fellowships, grants and contracts to an estimated value of £23,000. Work was done on 106 contracts, of which 77 were commissioned during the year.

ARCHITECTURAL DIVISION

Foundations have been laid for research on hospital

geboue, behuising vir blankes en die bestuurs- en diens-koste van Naturelledorpe. Geleentheid het hulle voorgedoen vir die ontwerp en oprig van eksperimentele geboue, sodat dit moontlik was om navorsingsbevindings in die praktyk toe te pas. Goeie vordering is gemaak met die twee meer gevestigde projekte, naamlik navorsingswerk op naturellebehuising en skoolgeboue en verskeie publikasies is opgestel wat handel oor die werk wat op dié gebiede gedoen is. In verband met navorsingswerk op skoolgeboue moet spesiaal melding gemaak word van die Skoolgebouekomitee van die Transvaalse Provinsiale Administrasie wat met besondere ywer as Loodskomitee vir die span navorsers opgetree het. Die werk het goed gevorder en het toepassing gevind in die ontwerp en bou van verskeie nuwe skole.

Skoolmeubels

Deur die aanvaarding van die navorsingswerk in verband met skoolmeublement en die bestel en verskaffing van meubels aan Transvaalse skole op grond van navorsingsbevindings, is hierdie studie suksesvol afgesluit.

Skoolgeboue

Drie gradekamers is by die Arthur Matthews-skool in Florida gebou volgens die aanbevelings van die Nasionale Bounavorsingsinstituut. Werkstekeninge is gemaak vir die Laerskool Waterkloof, Pretoria, wat al die navorsingsbevindings oor laer skole insluit en tenders sal binnekort gevra word.

Verslae oor skoolgeboue dek tot dusver nog net die navorsingswerk oor laer skole, terwyl waarnemings gedoen en prototipe-kamers vir hoër skole voltooi is.

Dagligprojeksieskerm

'n Dagligprojeksieskerm is ontwikkel vir gebruik in klaskamers sodat geen verdonkering van die kamer nodig is nie. Hierdie skerms word vervaardig deur die Spesiale Skool Gezina, Pretoria. Tot dusver is vyftig reeds gemaak terwyl daar nog bestellings vir meer as honderd is. Verdere werk moet nog gedoen word op die aluminium-pigmentverf wat op die skerm gebruik word voordat 'n spesifikasie opgestel kan word.

Krytborde

'n Glaskrytbord is ontwerp deur 'n navorsingspan van die Afdeling Argitektuur, Materiale en Funksionele Doeltreffendheid van die Instituut.

Hospitaalgeboue

'n Kraaminrigting vir naturelle in Vlakfontein, Pretoria, is deur die Instituut ontwerp en as 'n proef-inrigting opgerig. Die doel van hierdie werk was om vas te stel in hoeverre beplanning daartoe bydra om die hospitaal doeltreffend te laat funksioneer en hoe die boukoste verlaag kon word.

Die boukoste was baie laag, deels as gevolg van verstandige voorbeplanning en kostebeheer en deels as

buildings, on European housing, and into the costs of running Native townships. Opportunities for designing and erecting experimental buildings have arisen, thus making it possible to apply research findings under actual field conditions. Good progress has been made with the two more established projects, viz. research into Native housing and research into school buildings, and several publications have been prepared on the work done in these fields. In connection with the schools research, particular mention must be made of the Transvaal Provincial Administration's School Buildings Committee, which has acted as a Steering Committee for the research team and has worked with outstanding enthusiasm. The work is well advanced and has found application in several new schools being designed and built.

School Furniture

The acceptance of the research work in respect of school furniture and the ordering and supply of furniture based on research findings to schools in the Transvaal, has brought this study to fruition.

School Buildings

Three grades' rooms have been built at the Arthur Matthews Primary School, Florida, in accordance with the recommendations of the N.B.R.I. Working drawings for the Waterkloof Primary School, Pretoria, embodying all the proposals in respect of research work on primary schools, have been prepared, and tenders will be called for soon.

Thus far, the reports published on school buildings cover the work to the stage of primary schools, while observations and prototype rooms have been completed for high schools.

Daylight Projection Screens

A daylight projection screen was developed for use in classrooms so that no darkening of the room was necessary. These screens are being made by the Gezina Special School, Pretoria: to date, fifty have been made and more than one hundred are on order. Some further work on the aluminium pigment paint used on the screen must still be done before a specification can be drawn up.

Chalkboards

A glass chalkboard was developed as a team project by the Institute's divisions of Architecture, Materials and Functional Efficiency.

Hospital Buildings

A maternity hospital for Natives at Vlakfontein, Pretoria, was designed by the Institute and built as an experimental maternity home. The objects of this work were to test how planning could assist in bringing about efficiency in running the hospital, and how the costs of the building could be reduced.

Very low costs were achieved, partly by rationalized pre-planning and cost control, and partly by adopting

gevolg van baie lae standaarde van afwerking. Sulke standaarde mag te laag wees vir algemene gebruik en sal moontlik gewysig moet word om te voldoen aan bepaalde mediese, fisiese of estetiese vereistes.

Metodes van Kostebeheer

Met die bou van die Vlakfonteinse kraaminrigting is metodes van voorbeplanning en kostebeheer uitgetoets. Dit lyk asof sulke metodes voordele inhou, wat, as dit volledig toegepas word, vir bou-ondernemers tyd en geld kan bespaar. Die bouery het plaasgevind ooreenkomstig 'n vooraf opgestelde rooster van werksaamhede en die werk is binne een-en-twintig weke voltooi deur 'n span van gemiddeld 40 geskoolde en ongeskoolde natuurlike werkers gedurende die hele bou tydperk.

'n Loodskomitee i.v.m. Boukoste is saamgestel onder voorsitterskap van mnr. T. H. Louw om die koste-eenheid van advies te bedien. Die komitee sal hom slegs bepaal by die koste betrokke in die werklike bouery en nie op die moontlikhede van kostevermindering deur middel van ontwerp nie—hierdie gebied word reeds deur werk in die Afdeling Argitektuur gedek.

Bestuurskoste van Naturelledorpe

Die gegewens vir tien dorpe van verskillende groottes in verskillende dele van die Unie is ontleed en hul bestuurs- en dienskoste onder verskillende hoofde ingedeel. Uit hierdie ontleding word kostenorms afgelei. Dit lyk asof die grootste bydrae tot kostevermindering gelewer kan word deur verhoging van doeltreffendheid van die verskaffing van die verskillende dienste. Hierdie werk het reeds uit verskeie oorde gunstige kommentaar uitgelok.

Algemeen

Aangesien die werk van die Afdeling Argitektuur so nou verbonde is aan die Administrasies van die vier provinsies, wil die Instituut sy innige waardering betuig aan die beampies wat so goedgegunstiglik met die ondersoek behulpsaam was.

AFDELING FUNKSIONELE DOELTREFFENDHEID

Plafonhoogtes

Wat betref faktore wat die hoogte van plafonne in geboue bepaal, is aandag geskenk aan dié aspekte wat van spesiale belang is by die keuse van minimum-hoogtes vir Suid-Afrikaanse toestande, naamlik voldoende hoogte bokant die kop met betrekking tot die lengte van persone vir elk van die rasse-groepe in die land en die uitwerking van plafonhoogte op natuurlike verligting, ventilasie- en termiese toestande binnenshuis. Wat laasgenoemde aspek betref, is 'n reeks subjektiewe toetse uitgevoer onder termiese toestande wat ooreenstem met die wat gedurende warm somerweer in geboue ondervind word ten einde vas te stel of veranderinge van 'n voet of wat in plafonhoogte

very low standards of finish. These standards may be too low for general use and may have to be modified to suit particular medical, physical, or aesthetic requirements.

Cost-control Methods

In building the Vlakfontein maternity hospital, pre-planning and cost-control methods were tested. It would appear that such methods have advantages which, when fully applied, could save building contractors time and money. Construction proceeded according to a pre-planned schedule and the building work was completed in twenty-one weeks by a skilled and unskilled Native labour force averaging forty men over the construction period.

A Steering Committee on Building Costs has been set up under the Chairmanship of Mr. T. H. Louw, to advise on the work of the Cost Unit. This committee will concern itself only with the costs involved in the actual building operation and not with the possibilities of reducing costs by design—this field being already covered by work in the Architectural Division.

Running Costs of Native Townships

The records for ten townships of varying sizes in different parts of the Union have been analyzed and their running costs broken down into different headings. From these breakdowns, cost norms are being derived; it appears that the biggest contribution towards the reduction on costs could be made by increasing the efficiency of providing the various services. This work has already provoked favourable comment from several quarters.

General

As the work of the Architectural Division is so closely associated with the Administrations of the four provinces, it is with great pleasure that the Institute records its deep appreciation to those officials who have so generously assisted in the investigations.

FUNCTIONAL EFFICIENCY DIVISION

Ceiling Heights

In regard to factors governing the height of ceilings in buildings, attention was given to those aspects which are of special significance in the selection of minimum heights for South African conditions, viz. adequacy of clearance and of headroom in relation to the heights of persons for each of the racial groups of the country, and the effect of ceiling height on interior daylighting, ventilation and thermal conditions. In connection with the latter aspect, a series of subjective tests was carried out in thermal conditions such as are found in dwellings during hot summer weather, to ascertain whether changes of a foot or so in the height of a ceiling have a noticeable effect on

'n merkbare uitwerking het op die menslike gewaarwording van hitte-uitruiling tussen liggaam en plafon.

Aanbevelings vir minimum-plafonhoogtes sal binnekort deur die Nasionale Bounavorsingsinstituut gepubliseer word.

Hittevloei in Geboue

Eksperimentele huise is voltooi om te bepaal watter uitwerking plafonmateriaal en plafonisolasië onder Suid-Afrikaanse toestande het op die gevoel van binnenshuise behaaglikheid. Ontwikkelingstoetse is uitgevoer ten einde te bepaal in hoever die huise termies ekwivalent is vir die geval waar geen isolasië gebruik word nie en ook om bevredigende metodes te vind vir die meet van hittevloei deur die plafonne, sowel as vir die meet van lug-, muropervlakke- en weerstralingstemperature in die vertrekke. Daar is begin met die outomatiese aantekening van metings en dit is baie voordelig bevind in hierdie soort ondersoek.

Ventilasië

Aangesien skaalmodelle die studie van ventilasië-ontwerpe vir geboue baie sal vergemaklik, is die moontlikhede om sulke modelle te gebruik vir die bepaling van die verwantskap tussen ventilasië in die geboue en die windtoestande in 'n 10-vt. windtonnel ondersoek. Die werk is uitgevoer in medewerking met die Nasionale Navorsingsinstituut vir Meganiese Ingenieurswese. Dit is bevind dat hierdie metode van studie volkome bevredigend is indien sekere voorsorgmaatreëls in ag geneem word.

'n Spesiale ventilasiëprobleem in huise en veral in naturellehuise, ontstaan in Suid-Afrika as gevolg van die gebruik van oop konkas vir verhitting in die winter. Windsnelhede kan op koue nagte baie laag wees en heel dikwels is ventilasië in huise onvoldoende om die skadelike uitwerking van dampe en koolstofmonoksiedvergiftiging te voorkom. Die erns van die vraagstuk blyk uit die feit dat oor die honderd sterftes aan koolstofmonoksiedvergiftiging gedurende die winter van 1955 aangemeld is. Metings waar 'n konka in 'n standaardtipe-huis vir stedelike Bantoes gebrand het, toon dat koolstofmonoksiedkonsentrasies baie hoër styg as die veilige grens wanneer vensters en deure toe, dog lugstene oop is. Verdere toetse word uitgevoer om vas te stel wat die uitwerking van ander sisteme van ventilasië-opeeninge is en of 'n vorm van skoorsteen wenslik is.

Verligting

Die modeltegniek vir die studie van natuurlike verligting in geboue is verder ontwikkel en 'n kunsmatige hemelruim van 20 voet deursnee is voltooi om modelstudies onder beheerde ligtoestande uit te voer. Verder is spesiale instrumente en toerusting vir ligmeting ontwikkel, sodat binnemuurse en buitemuurse verligtingstoestande gelyktydig gemeet kan word wanneer opnames in kamers van bestaande geboue gedoen word.

the human perception of radiation exchange between body and ceiling.

Recommendations for minimum ceiling heights will shortly be published by the National Building Research Institute.

Heat Transmission in Buildings

Experimental houses for studying the effects of ceiling material and ceiling insulation on indoor comfort conditions for the South African climate, have been completed. Some development tests were carried out to check the similarity of thermal performance of the houses when no insulation is used and also to find satisfactory methods for measuring heat flows through the ceilings, and air, surface and radiant temperatures in the rooms. Automatic recording of measurements in this type of investigation has been introduced and has been found to have many advantages.

Ventilation

As scale models would greatly facilitate the study of ventilation design for buildings, the feasibility of using such models to establish relationships between ventilation in buildings and wind conditions was tested in a 10-ft. wind tunnel. The work was carried out in collaboration with the National Mechanical Engineering Research Institute and it was found that this method of study was entirely satisfactory, provided certain precautions were observed.

A special problem of ventilation in houses, and particularly in Native houses, arises in South Africa due to the use of open braziers for heating in winter. Wind speeds can be very low on cold nights and very often ventilation arrangements in houses are insufficient to prevent harmful effects from fumes and carbon monoxide poisoning. The seriousness of the problem is indicated by the fact that over one hundred deaths from carbon monoxide poisoning in houses were reported during the winter of 1955. Measurements with a brazier burning coal in a standard-type urban Bantu house, show that carbon monoxide concentrations can rise far in excess of the safe limit when windows and doors are closed but air bricks are open. Further tests are being conducted to ascertain the effect of other systems of ventilation openings, or whether some form of flue is desirable.

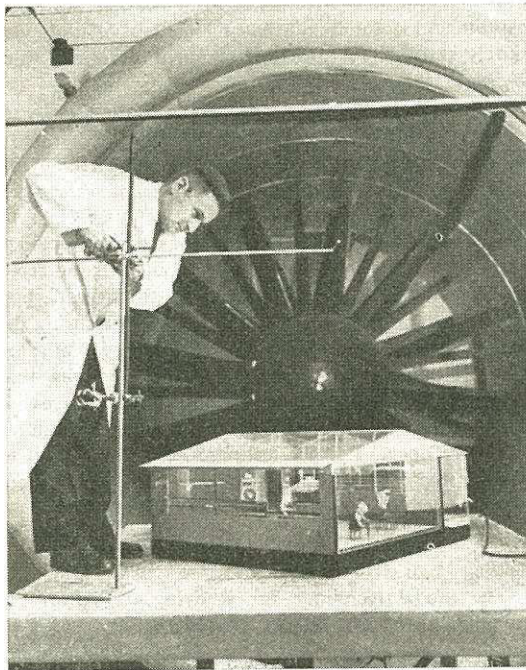
Lighting

The model technique for studying daylighting in buildings has been further developed, and a 20-ft. diameter artificial sky for carrying out model studies under controlled sky conditions has been completed. In addition, special light-measuring instruments have been made, so that indoor and outdoor illumination conditions can be rapidly measured at the same time when undertaking lighting surveys in rooms of existing buildings.

Verligting van Skoolgeboue

Heelwat aandag is geskenk aan die verskillende probleme in verband met die ontwerp van skoolgeboue ten einde bevredigende verligting, ventilasie en termiese omgewings te verseker vir die klimaatstoestande wat in die Unie ondervind word. Uitgebreide gebruik word gemaak van die reeds vermelde modeltegnieke om die invloed op beide die kwaliteit en kwantiteit van lig en die ventilasiesnelheid en interne-lugvloeioptrone van faktore soos oriëntasie, glasoppervlakte en plasing, tipe venster of ander ventilasie-opening, plafonhoogte en eksterne obstrukties te bepaal. Dié tegniek is ook gebruik vir die ondersoek na die nodige grootte en rangskikking van vensters vir verligting en ventilasie in die geval van nuwe skoolontwerpe wat deur die Afdeling Argitektuur ontwikkel is. Een van hierdie geboue is sedertdien opgerig en metings in die voltooië klaskamers het goeie ooreenstemming getoon met die resultate wat verkry is uit die modelstudies.

Twee besoeke—een in die somer en een in die winter—is gebring aan die Kaapse Skiereiland om breedvoerige inligting in te win oor die spesiale probleme wat ontstaan as gevolg van die klimaat in hierdie en ander winterreënvalstreke.



Studies met 'n model in 'n windtonnel om die lugvloei-toestande in en om geboue te bepaal.

Model studies in a wind tunnel to determine air flow conditions in and around buildings.

Lighting of School Buildings

Considerable attention has been given to the problems of design for satisfactory lighting, ventilation and thermal environments in school buildings for the range of climatic conditions prevailing in the Union. Extensive use is being made of the model techniques, previously referred to, for investigating the influence of such factors as orientation, glass area and arrangement, type of window or other ventilation opening, ceiling height and external obstruction, on either the quality and quantity of indoor lighting or on interior ventilation rate and air-flow patterns. The method has also been used for examining and modifying the lighting and ventilation arrangements of new school designs evolved by the Architectural Division. One of these buildings has since been constructed, and measurements in the completed rooms have verified the predictions obtained by means of the models.

Two visits, one in summer and one in winter, were paid to schools in the Cape Peninsula to obtain detailed information on the special problems which arise as a result of the climate of this area.

SOIL MECHANICS DIVISION

The first Southern African Regional Conference on Soil Mechanics and Foundation Engineering was held at the Institute under the auspices of the S.A. Institution of Civil Engineers. Members of the Division presented papers on the mechanism of heaving, stability of slimes dams, and on shear in partially saturated soils. One of the main topics was the problem of heaving soils which, according to the discussion in which delegates from several countries outside the Union participated, is wide-spread in southern Africa.

Foundations on Expansive Soils

The problem of predicting the rate and amount of heave that may be expected on an expansive clay is being tackled in two ways. The first is more fundamental in nature and entails the solution of the differential equation involving the diffusion and swelling coefficients of a soil profile for given initial and boundary conditions, while the second on the standard soil-mechanics procedure for prediction of settlement.

Stability of Soils

The work on stability of slimes dams is nearing completion. An experimental section of slimes dam, incorporating the Institute's proposed method of stabilisation by under-drainage, is under construction at a Free State mine. The Steering Committee has met regularly and has formed a valuable link between the Chamber of Mines and the Institute in connection with this investigation.

A similar project for SASOL, concerning the stability of an ash dam, is under way.

AFDELING GRONDMEGANIKA

Die eerste Streekskonferensie van Suidelike Afrika oor Grondmeganika en Fondamenteingenieurswese is by die Instituut gehou onder beskerming van die S.A. Instituut van Siviele Ingenieurs. Referate is gelewer deur verskeie lede van die afdeling, bv. oor die meganisme van grondstyging, die stabiliteit van slykdamme en oor die verskuiwing van gedeeltelik-versadigde grondsoorte. Een van die belangrikste onderwerpe was die probleem van stygende gronde wat, volgens besprekings waaraan afgevaardigdes uit verskillende gebiede buite die Unie deelgeneem het, wydverspreid in Suidelike Afrika voorkom.

Fondamente op Uitsettende Gronde

Die probleem om die verwagte snelheid en mate van styging op uitsettende kleigronde vooraf te bepaal, word op twee maniere aangepak: die eerste is meer fundamenteel van aard en bring mee dat 'n oplossing gevind moet word van die differensiaalvergelyking wat die diffusie- en uitsettingskoëffisiënte van 'n grondprofiel insluit vir gegewe aanvangs- en grenstoestande, terwyl die tweede gebaseer is op die standaard-grondmeganikaprosedure vir die voorspelling van vassakking.

Stabiliteit van Gronde

Die werk oor die stabiliteit van slykdamme nader voltooiing. 'n Eksperimentele seksie van 'n slykdam wat die Instituut se voorgestelde metode van stabilisering deur onderdreinerings insluit, is in aanbou by 'n Vrystaatse myn. Die Loodskomitee het gereeld vergader en in hierdie ondersoek 'n waardevolle skakel gevorm tussen die Kamer van Mynwese en die Instituut.

'n Soortgelyke projek in verband met die stabiliteit van ashope word vir SASOL onderneem.

Ander Projekte

Aandag word geskenk aan die vraagstuk van afskuiwing in gedeeltelik versadigde gronde en aan die pas ontdekte verskynsel van wegsakkende sand, wat tot ernstige sakkings van fondamente in verskeie dele van Suidelike Afrika gelei het.

Routine-grondtoetse en ondersoeke word uitgevoer vir konsultante.

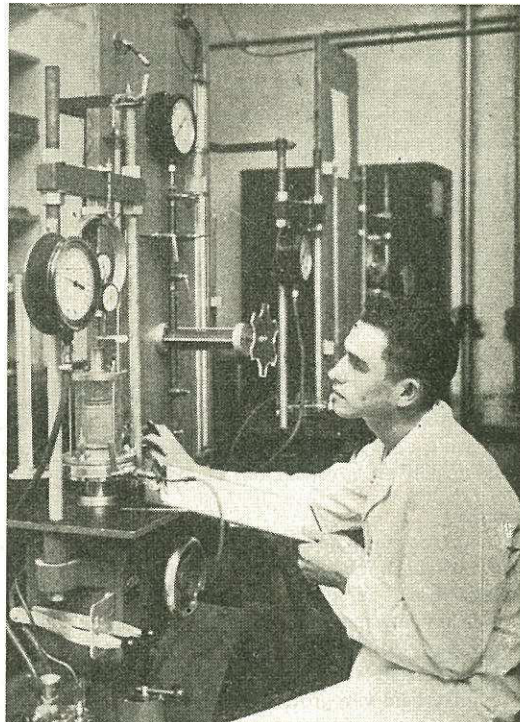
INGENIEURSAFDELING

Betontechnologie

Resultate van navorsingswerk wat gedurende die jaar uitgevoer is, toon dat die verband tussen ultrasoniese golf-snelheid en die sterkte van beton onafhanklik is van ouderdom en water-ementverhouding. Verdere toetse met verskillende aggregate is aan die gang.

'n Onderzoek word uitgevoer om vas te stel in watter mate standaard-toetsmetodes 'n aanduiding sal gee van die gehalte van beton in 'n gebou. Die eerste deel van die werk is afgehandel en word vir publikasie gereed gemaak.

Werk in verband met betonmengsels is uitgevoer vir



*Triaxial compression test to determine the shear strength of soils.
'n Drie-as-druktoets om die afskuiwingsterkte van grond te bepaal.*

Other Projects

Attention is being given to the question of shear in partially-saturated soils and to the newly-recognized phenomenon of collapsing sands, which has led to severe settlement of foundations in various parts of Southern Africa.

Routine soil testing and exploration is carried out for consultants.

ENGINEERING DIVISION

Concrete Technology

Results of research carried out during the year indicate that the relationship between ultrasonic wave velocity and the strength of concrete is independent of age and water/cement ratio. Further tests using different aggregates are in progress.

An investigation is being carried out to ascertain to what extent standard methods of testing concrete are indicative of the quality of concrete as it exists in a structure. The first part of this work has been completed and is being prepared for publication.

Departemente van Waterwese en Verdediging. Navorsingswerk is ook onderneem in verband met die deurdringbaarheid van beton, die gebruik van vergruisde klip, vergruisersand en versnelde toetsmetodes. Hulp is verleen aan talle organisasies in verband met die gehaltebeheer van beton, die uitwerking van vuur op beton, die gebruik van ligte aggregate, ens.

'n Kursus in betontechnologie is in medewerking met die Universiteit van die Witwatersrand en die Betonvereniging van Suidelike Afrika vir nagraadse ingenieurs gegee. Die kursus wat 'n week geduur het, is deur ses-en-sestig ingenieurs bygewoon.

Haelweerstand van Dakmateriale

Gedurende die jaar is haelweerstandstoetse op 'n aantal dakmateriale uitgevoer. Die resultate van al die toetse wat tot dusver gedoen is, word ontleed met die oog op die opstel van 'n verslag oor die onderwerp.

Houtmaat

Toetse met houtkapspante het getoon dat aanmerklike besparings in bouhout teweeggebring kon word deur aandag te bestee aan ontwerp in teenstelling met die blote aanvaarding van metodes volgens ondervinding.

Wat betref die relatiewe voordele van die 2-duim en die 1½-duimmaat word die mening gehuldig dat koste en verkrygbaarheid van groter belang is as strukturele oorewegings.

Work has been carried out for the Department of Water Affairs and the Department of Defence in connection with the design of concrete mixes. Research has also been undertaken concerning the permeability of concrete, the use of crushed stone, crusher sand, and accelerated methods of testing. Assistance has been given to numerous organisations in connection with the quality control of concrete, the effect of fire on concrete, the use of lightweight aggregates, etc.

In co-operation with the University of the Witwatersrand and the Concrete Association of Southern Africa a course on concrete technology was given for post-graduate engineers. Sixty-six engineers attended the course which extended over a period of one week.

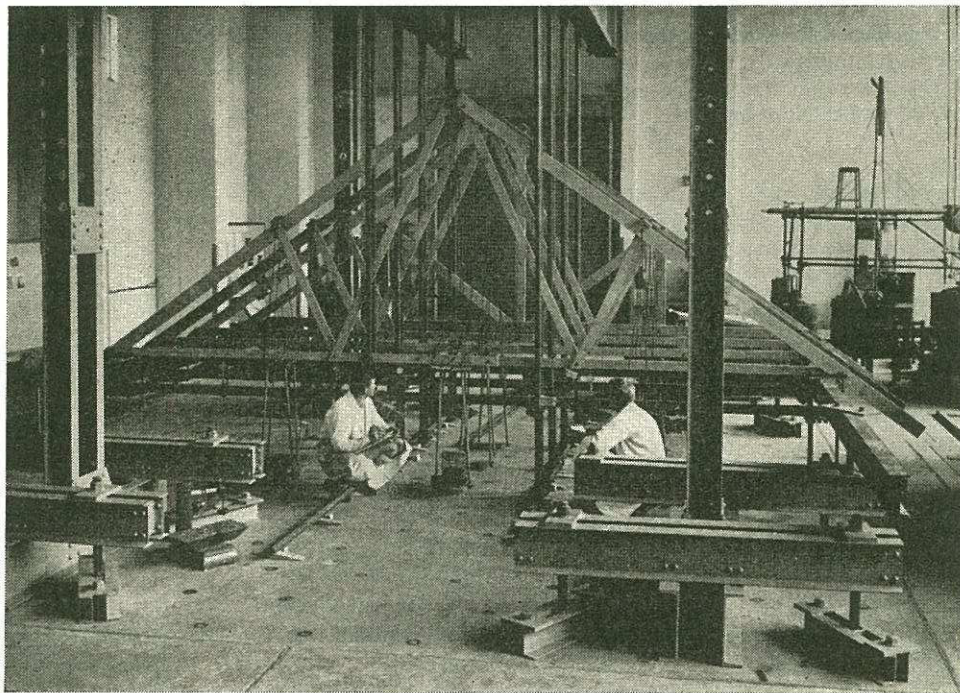
Hail Resistance of Roofing Materials

Hail resistance tests on a number of roofing materials were carried out during the year. The results of all the tests thus far done are being analyzed with a view to the preparation of a report on this subject.

Timber Module

Tests on timber trusses have shown that considerable savings in timber may be effected if attention is paid to design as opposed to the mere acceptance of rule of thumb methods.

In regard to the relative merits of the 2-inch and the 1½-inch module, the view is held that cost and availability are more critical than structural considerations.



Proef-houtkapspante word uitgetoets.

Experimental roof trusses under test.

Brandnavorsing

Heelwat statistiese inligting oor brande, plaaslik sowel as in ander lande, is ingewin en getabuleer. 'n Aantal insiggewende feite het reeds uit hierdie studie aan die lig gekom. Dit is ook duidelik dat daar 'n dringende behoefte bestaan aan 'n organisasie om gegewens oor brande in Suid-Afrika in te samel en te ontleed. Tans word 'n opname gemaak om vas te stel watter brandweerdienste in die stede van die Unie beskikbaar is. 'n Verblydende belangstelling en begeerte vir samewerking is getoon deur almal wat belang het by die vraagstuk van brande in geboue in Suid-Afrika en 'n adviserende komitee is saamgestel.

Bewapende Baksteenmure

'n Artikel is gepubliseer oor die gebruik van bewapende baksteenwerk om die bars van geboue op stygende fondamente te verminder, terwyl 'n ander oor die steun van huise op drie punte binnekort voltooi sal wees. Laboratoriumwerk oor die gebruik van vertikale voorspanning in bewapende baksteenmure is voortgesit.

Spannings en Vervormings in Bewapende Beton as gevolg van Krimping

Hierdie projek sluit beide betontechnologie en boukundige navorsingswerk in. Dit is vasgestel dat toename in die oppervlakte/volume-verhouding van betontoetsmonsters toenemende krimping veroorsaak in die vroeë stadiums.

Toetse op betonbalke het getoon dat wanneer „krimpende” aggregate gebruik word, die spannings tot nege keer groter mag wees as in balke wat met goeie aggregaat gemaak is. In dié geval is buiging van 'n balk met 'n spanwydte van 10 voet ook nagenoeg nege keer groter. Hopelik sal 'n metode as gevolg van dié navorsingswerk ontwikkel kan word om die uitwerking van krimping op bewapende beton in geboue te bereken.

Spannings in Spoorbane

Op versoek van die S.A. Spoorweë is begin met navorsingswerk in verband met die spannings in 'n spoorbaan. Die eerste deel van die werk sal handel oor die bepaling van die drakrag en belastingsakkingseienskappe van die ballas. Daarna sal werk gedoen word om die verspreiding van spannings in die spoorbaan vas te stel.

Kontrakondersoeke

Met die finansiële steun van verskeie plaaslike owerhede en private firmas is navorsingswerk onderneem in verband met belastingsdefleksie-eienskappe van struktuurstukke, die struktuurgedrag van verskeie goedkoop onortodokse huisboumetodes, die veiligheid van geboue waarvan die sterkte verdag was, en die doeltreffendheid van verskillende soorte betonbewapening.

Fire Research

A considerable amount of statistical information in regard to fires, both local and in other countries, has been collected and tabulated. A number of enlightening facts have already emerged from this study. It is also clear that there is a pressing need for an organization to collect and analyze data in regard to fires in South Africa. A survey is currently being conducted to ascertain what fire services are available in the towns of the Union. A gratifying interest and desire to co-operate has been shown by all who are interested in the question of fires in buildings in South Africa and an advisory committee has been formed.

Reinforced Brick Walls

An article on the use of reinforced brickwork to reduce cracking of buildings on heaving foundations has been published, while another on three-point support of brick houses will shortly be completed. Laboratory work on the use of vertical pre-stressing in reinforced brick walls has continued.

Stresses and Deformations in Reinforced Concrete due to Shrinkage

This project involves both concrete technology and structural research. It has been established that at early ages an increase in the surface/volume ratio of concrete test specimens results in increased shrinkage.

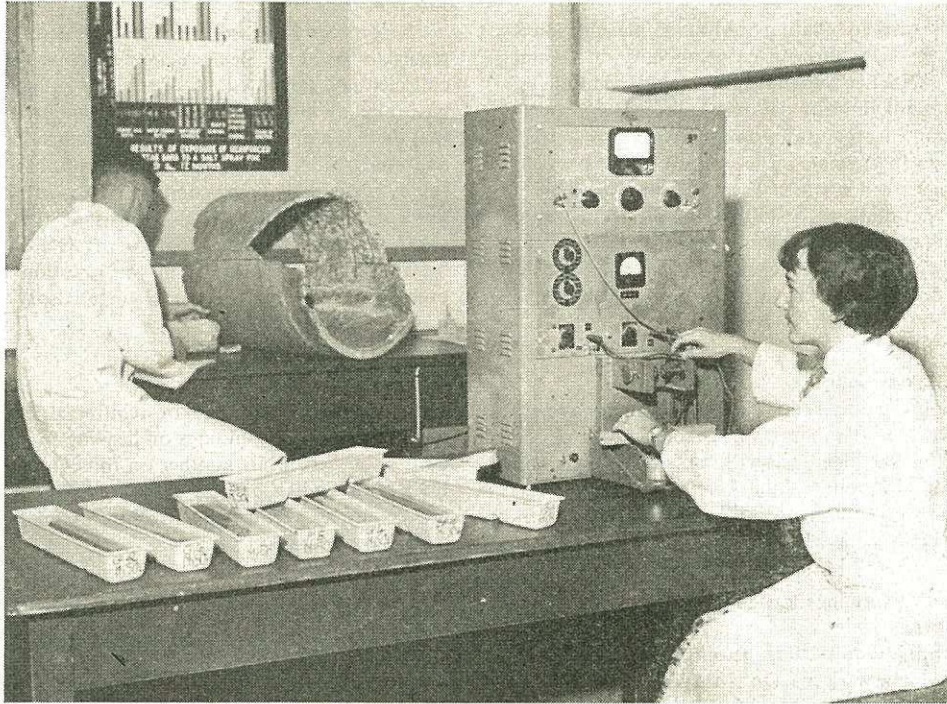
Tests on concrete beams have shown that, when using “shrinking” aggregates, the strains may be as much as nine times as great as in beams made with sound aggregates; for this case deflections on a beam of 10 ft. span are also approximately nine times as great. It is hoped that as a result of this work a method may be developed for the calculation of the effects of shrinkage on reinforced concrete in structures.

Stresses in Railway Track

At the request of the S.A. Railways, research has commenced into the stresses in a railway track. The first part of this work will deal with the determination of the bearing capacity and load-settlement characteristics of the ballast. Work will then be done to ascertain the distribution of stresses in the track.

Contract Investigations

Work sponsored by various local authorities and private firms, was undertaken in connection with load-deflection characteristics of structural members, structural behaviour of various low-cost unorthodox methods of housing construction, safety of buildings whose strength was suspect, and efficacy of various types of concrete reinforcement.



Toetse op die korrosieweerstand van mortel-monsters gemaak van verskeie soorte sement en onderwerp aan verskillende aggressiewe media.

Tests on the corrosion resistance of mortar specimens made with various cements and subjected to different aggressive media.

MATERIALE-AFDELING

Verwe

As gevolg van navorsingswerk wat gedurende die afgelope vier jaar gedoen is, is twee nuwe soorte redelik goedkoop dakverwe ontwikkel wat regstreeks op nuwe gegalvaniseerde staal aangewend kan word. Wanneer hulle op nuwe dakke aangewend word, is hulle aansienlik meer duursaam as gewone verwe in dieselfde prysreeks. Besonderhede oor formulering daarvan is beskikbaar gestel aan die verfnywerheid en die voordele daarvan word tans verder ondersoek.

Op versoek van 'n ondersteuner is reëlings getref vir toesig oor die vervaardiging van hierdie verwe en hul aanwending op industriële dakke van sowat 700,000 vierkante voet.

Slakkesement en Kalk

'n Reeks sementsoorte, gebaseer op navorsingswerk wat die Nasionale Bounavorsingsinstituut op Suid-Afrikaanse hooggoondslakke uitgevoer het, word in toenemende mate deur die nywerhede geproduseer. 'n Nuwe ontwikkeling is die produksie van 'n messesement.

Deels as gevolg van navorsingswerk deur hierdie Instituut is 'n grootskaalse produsent van dolomietkalk tans besig met die vervaardiging van 'n kalk wat onder druk gehidreer word.

MATERIALS DIVISION

Paints

As a result of research during the past four years, two new types of reasonably low-cost roof paints, which can be applied directly to new galvanized steel, have been developed. When applied to new roofs they are considerably more durable than conventional paints in the same price range. Details of their formulation have been made available to the paint industry and are currently being further evaluated.

At the request of a sponsor, arrangements have been made for supervising the manufacture of these paints and their application to about 700,000 square feet of industrial roofing.

Slag-cement and Lime

A range of cements, based on the National Building Research Institute research work on South African blast-furnace slags, is being produced by industry on an increasing scale. A new development is the production of a masonry type cement.

A major producer of dolomitic lime is now manufacturing a pressure-hydrated lime, partially as a result of research done in the Institute.

Korrosie van Bewapeningstaal in Beton

Werk wat gesamentlik gesteun word deur die S.A. Spoorweë en Hawens, die Provinsiale Administrasies van Natal en Kaapland, die Departemente van Vervoer en Besproeiing en die Kaapstadse Stadsraad, op die korrosie van bewapeningstaal onder seelugtoestande is tans aan die gang in medewerking met die Nasionale Chemiese Navorsingslaboratorium. Die basiese meganisme van die korrosieproses is verklaar en stappe word ondersoek om sodanige korrosie te verminder.

Verval van Beton

Verdere werk in verband met die verval van beton in aggressiewe omgewings soos in riole en in die aanwesigheid van sulfate, is voortgesit. Fundamentele navorsingswerk word gedoen met die oog op ontwikkeling van sementsoorte wat beter bestand is teen wegvreting. Die finale verslag oor die navorsingswerk in verband met die wegvreting van betonriole word vir publikasie in boekvorm opgestel.

Dit het al duideliker geword dat die verval van beton wat in aanraking is met sagte waters 'n probleem van aansienlike omvang is en 'n aanvang is gemaak met 'n ondersoek na die verskynsel.

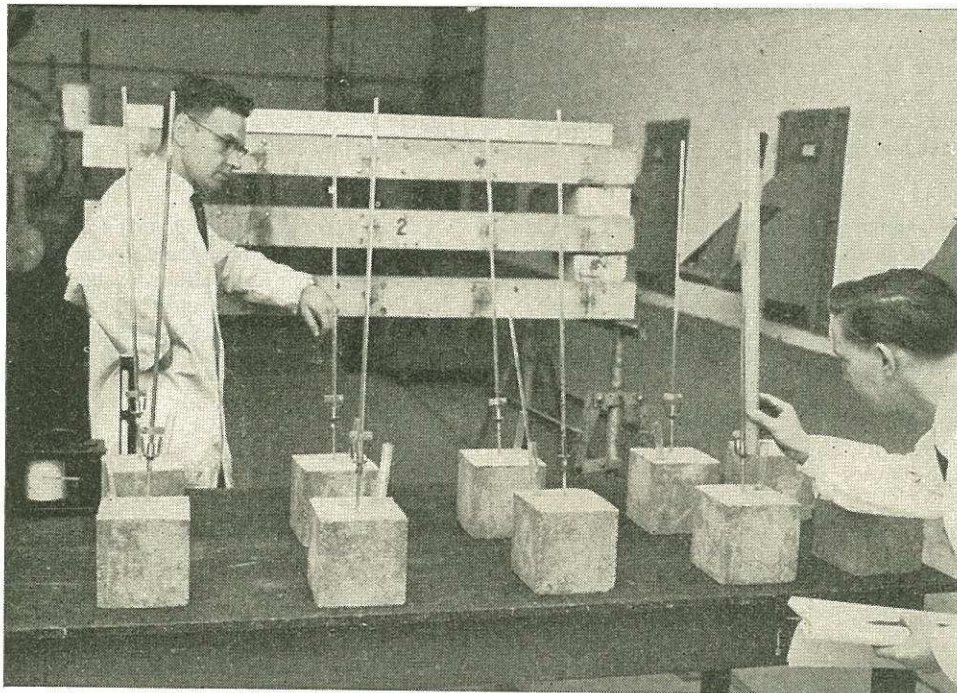
Corrosion of Reinforcing Steel in Concrete

Work sponsored jointly by the S.A. Railways and Harbours, the Provincial Administrations of Natal and the Cape, the Departments of Transport and Irrigation and the Cape Town Municipality, on the corrosion of reinforcing steel in marine environments, is in progress, in collaboration with the National Chemical Research Laboratory. The basic mechanism of the corrosion process has been elucidated and action to reduce such corrosion is being investigated.

Deterioration of Concrete

Further work on the deterioration of concrete in aggressive environments, such as in sewers and in the presence of sulphates, has continued. Fundamental work aimed at developing cements which are more resistant to corrosion of concrete sewers is being prepared for publication in book form.

It has become increasingly apparent that the deterioration of concrete in contact with soft waters is a problem of considerable magnitude, and an investigation of this phenomenon has commenced.



Die meting van dimensionele veranderinge in betonmonsters wat van krimpende aggregate gemaak is.

Measurement of dimensional changes in concrete specimens made with shrinking aggregates.

Krimpende Aggregate

Navorsingswerk wat gedeeltelik gesteun is deur die Betonvereniging van Suidelike Afrika, in verband met die abnormale gedrag van beton en mortel van dimensioneel onstabiele aggregate, het getoon dat hierdie ernstige probleem nie beperk is tot die klei-afsettings van die Karoo-sisteem nie. Die verskynsel van oormatige krimpings van beton as gevolg van die gebruik van krimpende aggregate is nou ook in Skotland en die V.S.A. waargeneem en kom vermoedelik ook in Australië voor.

'n Baie gevoelige toetsmetode met 'n uitsettingsmeter is ontwikkel om sulke aggregate in die veld en die laboratorium te identifiseer. Hierdie metode word nou verder afgerond en getoets voordat dit gepubliseer word. Die ingewikkelde meganisme van krimpings word nog ondersoek. Hoewel die teenwoordigheid van montmorilloniet-kleisoorte in die meeste van hierdie materiale vermoedelik vir die krimpings verantwoordelik is, is daar aggregate wat nie krimpende kleisoorte bevat nie, maar tog oormatige krimpings veroorsaak. Dit lyk asof die elastisiteitsmodulus van die aggregate ook 'n betekenisvolle faktor is.

Gebrande Kleiprodukte

Toerusting is verkry vir die uitpersing en brand van kleiprodukte, en die groot aanvraag vir navorsing oor baksteenklei het gelei tot die ondersteunde ondersoek van 48 kleisoorte. Die langtermynnoogmerk met hierdie navorsingswerk is 'n korrelasie van die mineralogiese samestelling van kleisoorte met hul geskiktheid vir die vervaardiging van swaar gebrande kleiprodukte. Bevredigende aanduidings is verkry.

Ander Projekte

Ander belangrike projekte wat onderneem is, sluit in die ondersoek na die gebruik van kooksgruis en stofas, die ontwikkeling van doeltreffende vloere vir slagpale, die bepaling van weerstand van mure teen reëndeurdringing, die ondersoek van beton- en pleistersoorte, die toets van boustene, die ondersoek van soutuitbloeiing op marmar en die vervaardiging van stene uit sand en kalk.

Shrinking Aggregates

Research, partially sponsored by the Concrete Association of Southern Africa on the abnormal behaviour of concretes and mortars made from dimensionally unstable aggregates, has shown that this serious problem is not confined to the argillaceous sediments of the Karoo system. This phenomenon of excessive shrinkage of concrete due to the use of shrinking aggregates has now also been observed in Scotland, the U.S.A., and is suspected also in Australia.

A very sensitive dilatometer test for identifying such aggregates both in the field and the laboratory has been developed, and is being further refined and evaluated preparatory to its publication. The complex mechanism of shrinkage is still under investigation: although for most of these materials, the presence of montmorillonoid clays is considered responsible, there are aggregates which impart excessive shrinkage which are free of shrinking clays. Modulus of elasticity of the aggregates also appears to be a significant factor.

Burnt Clay Products

Equipment for preparing, extruding and firing of burnt clay products has been acquired, and considerable demands for research on brickmaking clays have led to the sponsored investigation of 48 clays. The long-term objective of this work is a correlation of the mineralogical composition of clays with their suitability for the manufacture of heavy burnt clay products. Satisfactory trends have been obtained.

Other Projects

Other major projects undertaken include the investigation of the use of breeze and fly-ash, development of satisfactory floors for abattoirs, evaluation of the resistance of walls to rain penetration, examination of concretes and plasters, testing of building stones, examination of efflorescence on marble, and the manufacture of sand-lime bricks.

Nasionale Instituut vir Personeelnavorsing

Direkteur: DR. S. BIESHEUVEL

Gedurende die jaar het die klem by navorsingsprojekte veral geval op die praktiese oplossing van personeelprobleme by nywerhede en staatsdepartemente. Vir die Departement van Verdediging is die gebruiklike personeel seleksiewerk gedoen, benewens operatiewe studies van die opleiding van ambagsleerlinge en die beoordeling van vliegprestasie by leerlingloodse. Vir die Yster- en Staalbedryf is die ontwerp van taakwaarderingskemas vir daagliksbetaalde personeel voortgesit. Hulp is verleen by die keuring van administratiewe kwekelinge en tegniese kadette, en aandag is gegee aan die probleem van druipelinge onder laasgenoemde. Aanlegtoetse is ook toegepas in verband met die keuring van ambagsleerlinge. Basiese studies is onderneem van meet- en ontledingstegnieke op die gebied van afwesigheid en arbeidsomset en 'n punt is nou bereik waarop die resultate aangewend kan word om individuele en groepsoorsake van hierdie verskynsels verder te ondersoek.

Metodes van merietebeoordeling en taakwaardering wat by die Staatsdienskommissie in gebruik is, is bestudeer met die oog op vereenvoudiging en verhoogde betroubaarheid. Ook in die mynbedryf is taakwaarderingsstudies onderneem—in hierdie geval vir natuurlike. Ander navorsingsprojekte in die mynbedryf sluit in die meting van liggaamlike werkkapasiteit en deursettingsvermoë by natuurlike-arbeiders, die uitwerking van hoë temperatuur en akklimatisasie op arbeidsdoeltreffendheid en vermoedheid, indelings-toetse vir blanke arbeiders en beamptes, en 'n studie van probleme by die werwing, keuring, opleiding en werksaanpassing van leerlingbeamptes.

'n Aantal kontrakte is met ingenieursfirmas gesluit vir die studie van motivering en houding teenoor werks-toestande; 'n ontleding van die uitwerking van aansporingslone; 'n opname van personeelprobleme, en die wenslikheid om 'n personeelbestuursdepartement in te stel, asook die keuring en werksprestasie van ambagsleerlinge. Met betrekking tot opleiding in ambagte word nou 'n hoogs doeltreffende toetsbattery by 'n tegniese kollege gebruik om die geskiktheid van kandidate vir toelating tot die Tegniese Hoërskoolkursus vas te stel. Die resultate van die studie van die geldigheid van die toetse, wat gebaseer is op die opvolgingsstudies van vakleerlinge uit 'n aantal ambagte, sal binnekort voltooi word.

Daar is 'n toenemende vraag vir indelings-toetse vir natuurlike-arbeiders. 'n Battery is nou beskikbaar wat arbeiders en operateurs in drie hoofklasse in deel: ongeskoold; geskik vir halfgeskoolde, meganiese, of masjienbedieningswerk, en geskik vir opsienerswerk. By 'n aantal ingenieurs- en ander nywerheidsbedrywe is

National Institute for Personnel Research

Director: DR. S. BIESHEUVEL

During the year emphasis in research projects has been placed mainly on the practical solution of personnel problems in industry and government departments. Routine selection and classification has been carried out for the Department of Defence, as well as operational studies into the training of artisan apprentices and the assessment of flying ability of pupil pilots. In the iron and steel industry the development of the job-evaluation programme for daily-paid staff has been continued. Assistance was given in the selection of management trainees and technical cadets, and attention given to the problem of failures amongst the latter. Experimental testing in connection with the selection of apprentice artisans was also carried out. The basic studies on the techniques of analysis of absenteeism and labour turnover data have now reached a point where the findings can be applied to the study of the underlying individual and group factors in these phenomena.

Studies have been carried out on the merit rating and job evaluation scheme at present being used by the Public Service Commission with a view to simplification and the improvement of reliability. In the mining industry, job evaluation has also been undertaken for native labour. Other projects in the mining industry include the measurement of work capacity and perseverance of native labourers, the effect of high temperature and acclimatization on efficiency, classification tests for European officials and miners, and a study of the problem of recruiting, selection, training and occupational adjustment of learner officials.

A number of contracts have been concluded with various engineering firms for a study of motivation and attitudes towards the work situation, an analysis of the effects of bonus incentive schemes, a survey of personnel problems and desirability of establishing a separate personnel managers' department, and selection and merit rating of apprentice artisans. With reference to apprentice training, it can be mentioned that a highly efficient test battery is now in use at a technical college for the purpose of selecting students for admission to the Technical High School. The results of the study of the validity of the tests, based on a follow-up of apprentices in a number of trades, will be available shortly.

There is a growing demand for classification tests for native labourers. A battery is now available which classifies labourers and operatives into three categories: unskilled, suitable for employment as semi-skilled, mechanical or machine minder, suitable for supervisory duties. These tests have now been installed in a number

hierdie toetse in gebruik geneem. Vir kleiner bedrywe is dit nie ekonomies om hul eie toetsafdelings in te stel nie, en 'n plan word nou oorweeg om toetse toe te pas by natuurlike-arbeidsburo's. Die toetsbattery is so ontwerp dat dit in enige deel van Afrika ten suide van die Sahara bruikbaar kan wees. Navrae oor die toetsbattery is dan ook ontvang uit die Federasie, Oeganda, Wes- en Oos-Afrika en die Kongo, en stappe is alreeds gedoen om die toetse in gebruik te stel in die kopermyne in Noord-Rhodesië, in 'n goudmyn by die Goudkus, in die Wes-Afrikaanse Leër vir die indeling van ambagsmanne en kadette, in 'n kopermyn in Oeganda, en by 'n aantal bedrywe en regeringsdepartemente in Kenia.

Die doeltreffendheid van natuurlike in klerklike werk het ook aandag geniet. Vir die Departement van Natuerlesake word 'n studie gemaak van die invloed van aanleg, karaktereienskappe, motivering, opleiding en menslike verhoudings op die werksprestasie van natuurlike amptenare in die Staatsdiens.

Projekte wat nog nie voltooi is nie, sluit in: 'n standaardisering van 'n diagnostiese verstandstoets vir volwassenes in Suid-Afrika; 'n studie van die oorsake van motorfietsongelukke; faktore wat behuisingsvoorkeur bepaal by blanke mynwerkers met betrekking tot nuwe mynontwikkeling in Oos-Transvaal; behuisingsvereistes vir die blanke bevolking van die Unie as 'n sosiologiese studie vir die Nasionale Bounavorsingsinstituut, om as basis te dien vir die beplanning van behuisingskemas; sosio-ekonomiese opnames van natuurellegemeenskappe in stedelike gebiede, en ook vir die Nasionale Bounavorsingsinstituut in verband met die ontwerp van natuureledorpe. Van sowel strategiese as ekonomiese belang is die opname van die Unie se blanke manlike arbeids-hulpbronne, wat in samewerking geskied met die Departement van Verdediging. Produktiwiteit van arbeid kry aandag in 'n studie van loonaansporingsmiddels wat op 'n verteenwoordigende monster van handel- en nywerheidsondernemings in die land uitgevoer word. Die personeelseleksieafdeling wat verlede jaar opgerig is om roetinetoetse op applikante vir administratiewe, klerklike, tegniese en uitvoerende werk op 'n konsulerende basis toe te pas het redelike vooruitgang gemaak. Die aanvraag vir dienste van dié afdeling is egter groter op die gebied van beroepsvoorligting dan van personeel-seleksie en indeling.

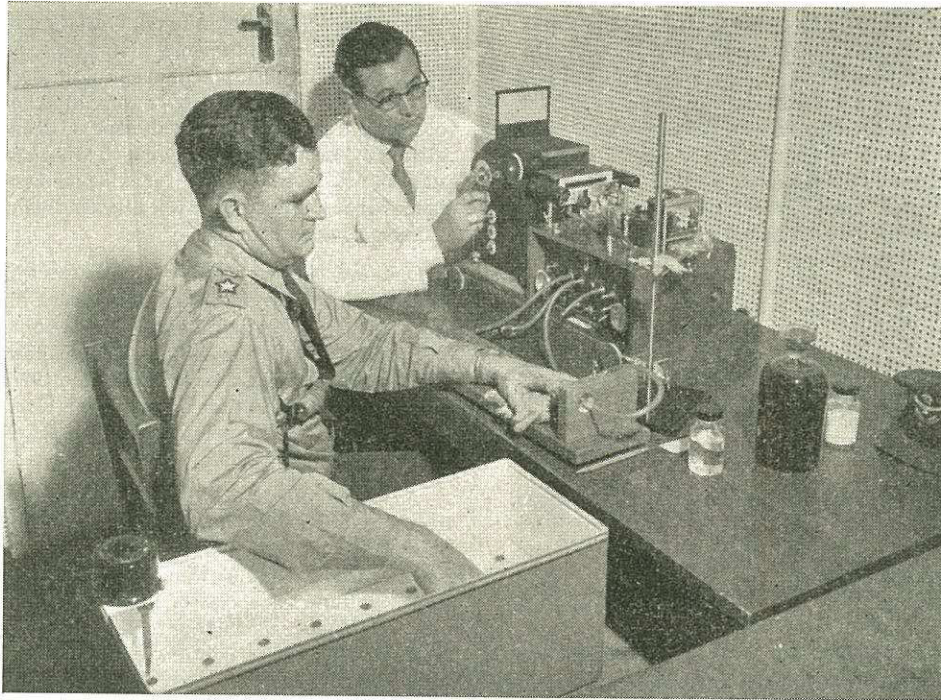
Nieteenstaande die uitgebreide program van toegepaste navorsing, is daar nog tyd vir studies van 'n meer basiese aard. In samewerking met ander organisasies is voorbereidende werk gedoen in die langtermyn-studie van die invloed van voeding, maatskaplike en kulturele omstandighede op liggaamlike en intellektuele ontwikkeling. Hierdie projek het weer tot sekere subsidiêre studies gelei, naamlik die uitwerking van tropiese en ondervoedingsiektes op die elektroënsefalogram; die uitwerking van kroniese voorgeboortelike ondervoeding by

of engineering and other industrial concerns. For the smaller organizations it is often uneconomic to establish their own testing departments and a plan is being considered whereby the tests will be applied at the native labour bureaux. The test battery has been so designed that it can be applied anywhere in Africa, south of the Sahara. Enquiries on the test battery have been received from the Federation, Uganda, West and East Africa and the Congo. Steps have already been taken to install the tests in the copper mines of Northern Rhodesia, a gold mine in the Gold Coast, in the West African army for the selection of artisan and cadet officers, in a copper mine in Uganda and a number of industries and government departments in Kenya.

The efficiency of native clerks has also been investigated. On behalf of the Department of Native Affairs, a study is being made of the influence of aptitude, character development, motivation, training and interpersonal relations on the work performance of Bantu civil servants.

Projects which have not yet been completed are: standardization of a diagnostic intelligence test for adults in South Africa; a study of the causes of motor cycle accidents; factors determining the housing requirements of European mine-workers with reference to mining development in the Eastern Transvaal; housing requirements of the European population of the Union, a sociological study undertaken for the National Building Research Institute to serve as a basis for the planning of housing schemes; socio-economic surveys of native communities in urban areas, also for the National Building Research Institute in connection with the development of Bantu townships. Of strategic as well as economic importance is the survey of the Union's European manpower, which is being carried out in collaboration with the Union Defence Force. Productivity is also receiving attention in a study of incentive schemes which is being carried out on a representative sample of the commercial and industrial organisations. The Personnel Selection Unit which was established last year in order to carry out routine selection of administrative, clerical, technical and executive personnel on a consultative basis, has made satisfactory progress. The demands for the services of this unit are greater in the field of vocational guidance than personnel selection and classification.

Notwithstanding the expanding programme of applied research, it has been possible to devote some time to more basic studies. In collaboration with other organizations preparatory work has been done on a long-term study of the influence of nutrition, environmental and cultural conditions on physical and intellectual development. This project in turn led to the development of a number of subsidiary studies—mainly on the effects of tropical diseases and malnutrition on the electro-encephalogram, the effect of chronic pre-natal malnutrition on the



'n Apparaat wat die verandering in vingerdikte, polsslag, asemhalingstempo en elektriese potensiaal registreer, en gebruik word om die emosionele spanning in persoonlikheidsstudies te meet.

Apparatus for recording changes in finger volume, pulse, breathing rate and electrical potential used to measure emotional tension in the study of personality.

die rot; en die ontwerp van metodes om intellektuele ontwikkeling by natuurlekinders te meet.

Psigofisiologiese studies van die wese van temperament en persoonlikheid, en van die faktore wat ontwikkeling op hierdie gebied bepaal, is voortgesit. Nuwe apparate vir die meet van individuele temperamentsverskille is ontwerp, en artikels oor die onderwerp is in binne- en buitelandse vaktydskrifte gepubliseer. Voortspruitende uit die navorsingsprojek oor die werksprestasie van naturelle in poste wat betroubaarheid vereis, is 'n studie gemaak van die naturel se houding teenoor Westerse etiese begrippe, gewoontes, regspraak en teenoor sy wettelike verpligtings. Nadruk is veral gelê op sosiologiese en oor-en-weer kulturele invloede by die ontwikkeling van sy houding. Ten spyte van 'n aansienlike hoeveelheid konsulerende en berekenwerk wat ten behoeve van ander afdelings van die Instituut uitgevoer is, het die Psigometrie- en Wiskundige Statistiekafdelings 'n aantal oorspronklike navorsingsbydraes gelewer wat in vaktydskrifte gepubliseer is.

'n Paar van die belangriker navorsingsprojekte word hieronder in groter besonderhede behandel.

development of the rat and on the development of methods of measuring intellectual growth of Bantu children.

Psychophysiological studies of the nature of temperament and personality and of the factors which influence their development, have been continued. New apparatus for the measurement of individual temperamental differences has been developed, and articles on the subject have been published in local and international journals. Arising out of the project on work achievement of Natives in positions in which personal integrity is an important requirement, studies have been made of their attitude towards western ethical concepts, customs, administration of justice and statutory obligations. Particular attention has been devoted to sociological and cross-cultural influences in the development of these attitudes. Despite a considerable amount of consultation and computation work done on behalf of the other divisions in the Institute, the Psychometric and Mathematical Statistics Divisions have produced a number of original research findings which have been published in various technical journals.

A few of the more important research projects are discussed in greater detail later.

Opname van Arbeidskrag

Die doel van die opname is om vir 'n verteenwoordigende monster van die blanke manlike bevolking, tussen die ouderdomme van 18 tot 20, vas te stel wat hul potensiele aanleg is, in hoeverre hierdie aanleg deur middel van skool- en vakopleiding ontwikkel word, en watter beroepe hulle volg of van plan is om te volg. In die lig van hierdie gegewens sal vasgestel word of die Unie ten volle gebruik maak van sy arbeidshulpbronne. Ook sal dit inligting verskaf oor die mannekrag wat beskikbaar sou wees in geval van oorlog.

Vraelyste is gestuur aan alle lotelinge van 1956 wie se name getrek is vir diens in die Aktiewe Burgermag, sowel as aan almal wat van militêre diens vrygestel is of of wat uitstel verkry het. Van die eerste groep het 97.7%, en van die tweede groep 95% die vraelyste beantwoord en teruggestuur. Gegewens is sodoende beskikbaar oor 'n taamlik verteenwoordigende monster van die betrokke bevolkingsgroep.

'n Tweede vraelys en 'n aanlegtoets is daarna toegepas op 'n groep van 3,200 rekrute na indeling by militêre eenhede en gedurende hul opleiding in die kampement van die Aktiewe Burgermag. Om ook die aanleg vas te stel van vrygesteldes of van die wat nie vir opleiding opgeroep is nie, is as volg te werk gegaan: By twee Afrikaanse Universiteite (Pretoria en Potchefstroom) en twee Engelse Universiteite (Witwatersrand en Natal) is alle studente, gebore gedurende 1937, opgespoor en versoek om die toets af te lê en ook om die tweede vraelys te voltooi, wat die stabiliteit meet van informasie oor opleiding en beroepskeur, soos in die eerste vraelys verkry. Die prosedure is herhaal in die Normaalkolleges van Pretoria, Heidelberg, Potchefstroom en Johannesburg. 'n Totaal van 1,600 studente is betrokke by hierdie toetsprogram wat die welwillende medewerking van die owerhede ontvang het.

Verder is Wes-Transvaal en die Witwatersrand gekies om 'n monster te toets van vrygesteldes wat nie op 'n Universiteit of Normaalkollege ingeskryf is nie. Kontak is gemaak met individuele persone deur die pos, en hulle is gevra om hulself op sekere sentrums vir die toets aan te meld. Hierdie deel van die program is nog nie voltooi nie en 'n oordeel oor die verteenwoordigende aard van die groep kan nog nie gevel word nie.

Ongeveer 90,000 Powerskaarte is reeds gepeperforeer vir tabulering van die gegewens wat op die eerste vraelys versamel is. Dit word verwag dat sekere bevindings betreffende opvoedkundige peil en beroepsrigting aan die begin van 1957 beskikbaar sal wees. Die studie as 'n geheel sal egter nie voor die einde van 1958 voltooi wees nie.

Aansporingslone

Die eerste stap in die studie van die uitwerking van aansporingsloonskemas op produktiwiteit, was 'n opname om vas te stel tot watter mate deur nywerhede gebruik gemaak word van aansporingslone. 'n Vraelys is gestuur

Manpower Survey

The aim of the survey is to establish for a representative sample of the European male population, between the ages of 18 and 20, their potential aptitude, to what extent this aptitude is developed by means of schooling and vocational training, and their present or intended occupation. By means of these findings it will be possible to establish whether the Union is making the best use of its manpower resources. Data will also be obtained on the available manpower in time of war.

Questionnaires were sent to all ballottees whose names had been drawn for service in the Active Citizen Force in 1956, as well as to all those who had been exempted from military service or had obtained deferment. Completed questionnaires were received from 97.7% of the first group and 95% of the second group. Data are thus available for a fairly representative sample of this particular population group.

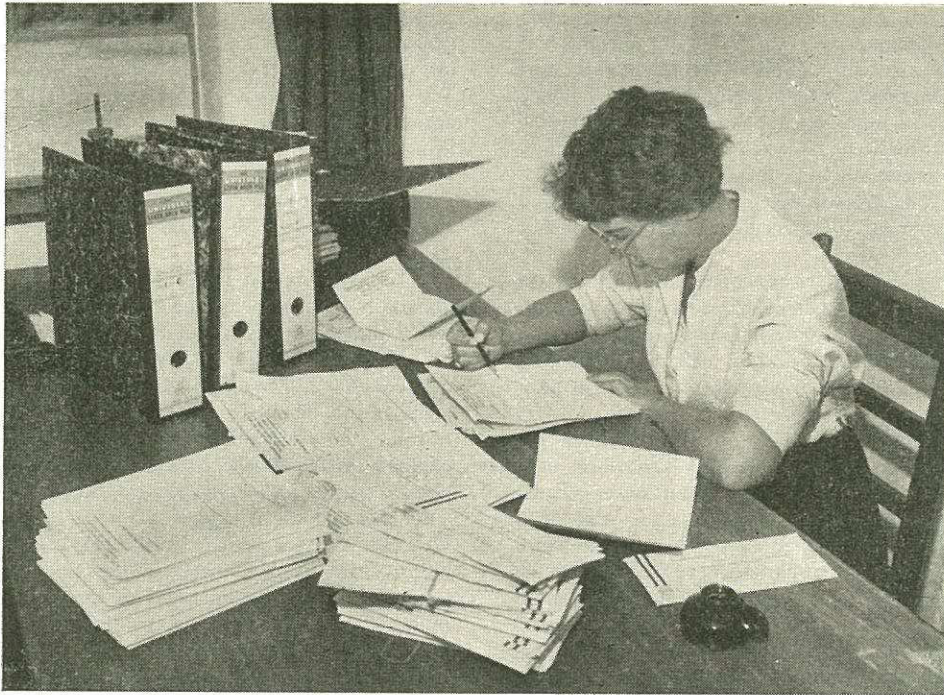
A second questionnaire and an aptitude test was thereafter applied to a group of 3,200 recruits after posting to military units and during their training in A.C.F. camps. The following steps were taken in order to get aptitude test scores of those who were exempted or who were not called up for service. At two Afrikaans-medium universities (Pretoria and Potchefstroom) and two English-medium universities (Witwatersrand and Natal) all students born in 1937 were requested to complete the aptitude test and the second questionnaire, which is designed to assess the stability of information on education and occupational choice, as given in the first questionnaire. The procedure was repeated at the teachers' training colleges in Pretoria, Heidelberg, Potchefstroom and Johannesburg. A total of 1,600 students was involved in this testing programme, which received the full co-operation of the authorities.

In order to obtain test results of the exempted group who did not go to University or Normal College, a sample was drawn from the Western Transvaal and Witwatersrand areas. Individuals were contacted through the post and asked to report at various centres for testing purposes. This part of the programme has not yet been completed and it is not known at this stage whether a representative group has been tested.

Approximately 90,000 Powers' cards have already been punched in order to enable the data from the first questionnaire to be tabulated. It is expected that certain findings in respect of educational goal and occupational direction will be available towards the beginning of 1957. The study as a whole will not be completed before the end of 1958.

Incentive Bonus Schemes

The first step in the study of the effect of incentive bonus schemes on productivity, is a survey to determine the extent to which these schemes are used in industry. A questionnaire was sent to 3,814 firms who were mem-



Rangskikking van opgawes wat ontvang is in verband met die opname oor die doeltreffendheid van aanspoeringsloonskemas in Suid-Afrika.

Checking the returns received in the survey carried out to find out how effective wage incentive schemes are in South Africa.

aan 3,814 firmas wat lede is van plaaslike of nasionale handels- of nywerheidskamers. Slegs 1,013 vraelyste is beantwoord (27% van die totaal wat uitgestuur is). Van hierdie aantal was daar 68% wat geen gebruik van aanspoeringslone maak nie, 3% wat aanspoeringsbetaling gestaak het, en 18% wat nog daarvan gebruik maak. Die res (11%) is van plan om 'n aanspoeringskema in te stel en baie van hierdie firmas het dienaangaande om raad en hulp gevra. Om die gevolgrekkings meer verteenwoordigend te maak, is met behulp van die Departement van Arbeid 'n verdere monster van 2,017 werkgewers getrek (8% van die totale aantal werkgewers) wat nou ook die vraelys ontvang het. Die firmas in die eerste monster wat nie geantwoord het nie, het 'n tweede vraelys ontvang, met die versoek om hul samewerking te verleen. 'n Aantal firmas is bereid om hul samewerking te verleen vir 'n intensiewe ondersoek in hul fabriek en kantore om die uitwerking van aanspoeringslone verder te bestudeer. Hierdie ondersoeke sal gedurende die volgende jaar uitgevoer word.

Keuringstoetse vir Naturelle personeel

Die gebruik van keuringstoetse vir naturelle-arbeiders begin al hoe meer byval vind by nywerhede. Arbeids-tekorte maak dit dikwels noodsaaklik om naturelle vir meer verantwoordelike werk op te lei, en in hul eie

bers of local or national Chambers of Commerce and Industry. Only 1,013 completed questionnaires were returned (27% of the total dispatched), of these 68% do not make use of incentive bonus schemes, 3% have suspended bonus schemes, 18% still make use of them. The rest (11%) are planning to introduce bonus schemes, and many of these firms have sought advice and help in this connection. In order to make the conclusions more representative, the questionnaire has been sent to a further 2,017 employers. This sample (8% of the total number of employers) was drawn with the help of the Department of Labour. The firms in the first sample who did not answer have been sent a second questionnaire with the request for their co-operation. A number of firms have indicated their willingness to co-operate in an intensive study in their offices and factories of the effects of incentive bonus schemes. These investigations will be carried out next year.

Personnel Selection Tests for Natives

The use of selection tests for Native labourers is finding more favour in industry. Shortages of labour often make it necessary to train Natives in more responsible work, and in their own areas they can also be taught

gebiede kan ook geskoolde werk aangeleer word. Die hoeveelheid skoolonderwys wat 'n natuere ontvang het, sy agtergrond, en vorige werk is onder huidige omstandighede nie noodwendig 'n aanduiding van sy aanleg nie. Toetse is dus nuttig om applikante in te deel volgens die peil van bedreweheid wat hulle na opleiding kan bereik. Die toetse ontwerp in die indeling van mynwerkers vir ongeskoolde werk, meganiese konstruktiewe take, operateurstake en opsienerswerk het ook bruikbaar geblyk vir nywerheide.

Die siftingstoetsbattery, bestaande uit 10 toetse, wat met eenvoudige apparaat en deur middel van 'n rolprent, wat gesproke instruksies oorbodig maak, op groepe van 100 of meer toegepas kan word, dek die vernaamste vaardighede wat by fabriekswerk betrokke is. Dit meet veral leer- en aanpassingsvermoë. Studies wat op natuerele skoolkinders uitgevoer is, het aangetoon dat die battery ook as verstandstoets gebruik kan word, daar prestasie reëlmatig styg met ouderdom sowel as met klasprestasie. Gewoonlik is nie meer as ses toetse vir 'n bepaalde bedryf nodig nie, en die kombinasie van toetse in 'n battery wissel volgens die spesifieke vereistes van die werk. Die Instituut volg gewoonlik die prosedure om 'n beampte in die personeelafdeling van 'n bedryf op te lei in toetstoepassing. Indien leierskaptoetse vir opsieners ingesluit word, wat subjektiewe beoordeling insluit, duur die opleiding ses weke. As 'n maatstaf vir geldigheidsbepaling kan resultate vergelyk word met werksprestasie, of die resultate wat met ongeskoolde werkers verkry is, kan vergelyk word met dié van meer geskoolde werkers. Die toetse wat beste onderskei, word dan uitgekies en keuringstandaarde word vir die nuwe battery bereken. 'n Dergelike projek is voltooi vir die Naturellehervestigingsraad wat verantwoordelik is vir naturelle behuising op Meadowlands. Uit die totale arbeidsmag van 1,000 bouarbeiders is 462 getoets. Vyf toetse, waarby veral ruimtelike verhoudings 'n rol speel, was nodig om tussen drie grade van werkers te onderskei. In die boonste groep was messelaars, loodgieters en timmermans; in die middelste, skilders en pleisteraars, en in die derde, ongeskoolde werkers. Die leierskaptoetse het verder tussen taakleiers en andere onderskei.

Personeelnavorsing in die Mynbedryf

Een van die langste en veelomvattendste kontrakte wat nog deur die Instituut onderneem is, sal binnekort beëindig word. Dis 'n kontrak met 'n myngroep wat in 1949 'n aanvang geneem het, en dus nou in sy agtste jaar is. Gedurende hierdie periode is toetsbattery ingestel vir naturelle werkers, 'n aantal opleidingsprobleme is bestudeer, die funksie van die „bossboy” en die faktore wat hom min of meer doeltreffend maak is nagegaan, 'n bemannings- en arbeidsbeheerstelsel is ingestel, 'n basis vir die indeling van blanke mynwerkers en beamptes is uitgewerk, 'n begin is gemaak met studies van die werk-

skilled work. Under present conditions the standard of education of a Native, his background and previous work history, are not necessarily an indication of his aptitude. Tests are thus necessary in order to be able to classify applicants according to the level they would be able to achieve with training. The tests which were developed for the classification of mine labourers for unskilled, mechanical construction tasks, operatives' work and supervisory duties, also appear to be useful in secondary industry.

The screening test battery, consisting of ten simple apparatus tests administered by means of a ciné film which does away with verbal instructions, and which can be applied to groups of 100 or more subjects at a time, includes the most important abilities required for factory employment. The abilities measured appear to be mainly learning and adaptability. Studies with native school children provide further evidence that the battery can also be used as an intelligence test, because scores show a regular increase with age and educational standard. Generally six tests are sufficient for the needs of a specific industry, and the combination of tests in a battery varies according to the special needs of the work. It is the policy of the Institute to train an official for the personnel department of an industry in test administration. In cases where the selection procedure includes leadership testing for supervisors which involves subject assessments, the training course lasts six weeks. As a criterion for validation, test results may be compared with work achievement, or the results obtained by unskilled labourers may be compared with those of more skilled workers. The tests which differentiate most successfully are then chosen and selection standards calculated for the battery. Such a project has been completed for the Native Rehousing Board which is responsible for the rehousing scheme at Meadowlands. An experimental group of 462 building labourers, out of a total labour force of 1,000, was tested. Five tests in which spatial relations was the most important single factor, were necessary in order to distinguish between three groups of workers. In the top group were bricklayers, plumbers and joiners; in the middle group painters and plasterers, and in the third group, unskilled labourers. Leadership tests successfully distinguished between task leaders and others.

Personnel Research in the Mining Industry

One of the longest and most extensive contracts which has ever been undertaken by the Institute will shortly be completed. This is a contract, with a mining group, which was started in 1949, and is thus in its eighth year. During this period a selection test battery was installed for native labourers, a number of training problems were investigated, the functions of the boss-boy and the factors which influence his efficiency were studied, a manning and labour control system was installed, a basis for the selection and classification of European miners and officials was worked out and a start was made on

vermoë van naturelle arbeiders, en taakwaarderingskemas is opgestel vir al die myne in die groep. Die laaste onvoltooide taak is die behuisingsvoorkeur van blanke mynwerkers—'n projek wat van belang is vir die nuwe mynuitbreiding in Oos-Transvaal. Hieraan verbonde is ook 'n oorsig van die sosiologiese agtergrond van die blanke mynwerker en sy houding teenoor die werk wat daarmee gepaard gaan. Rede vir beëindiging van die kontrak is dat die oorblywende probleme soos akklimatisasie van arbeiders, die opleiding van leerlingbeamptes, die motivering en die werksaanpassing van die blanke mynwerker, meer 'n saak vir die mynbedryf as 'n geheel is. Sommige van die projekte is dan ook al deur die Kamer van Mynwese oorgeneem. Die kontrak het die Instituut waardevolle gegewens vir basiese studies verskaf.

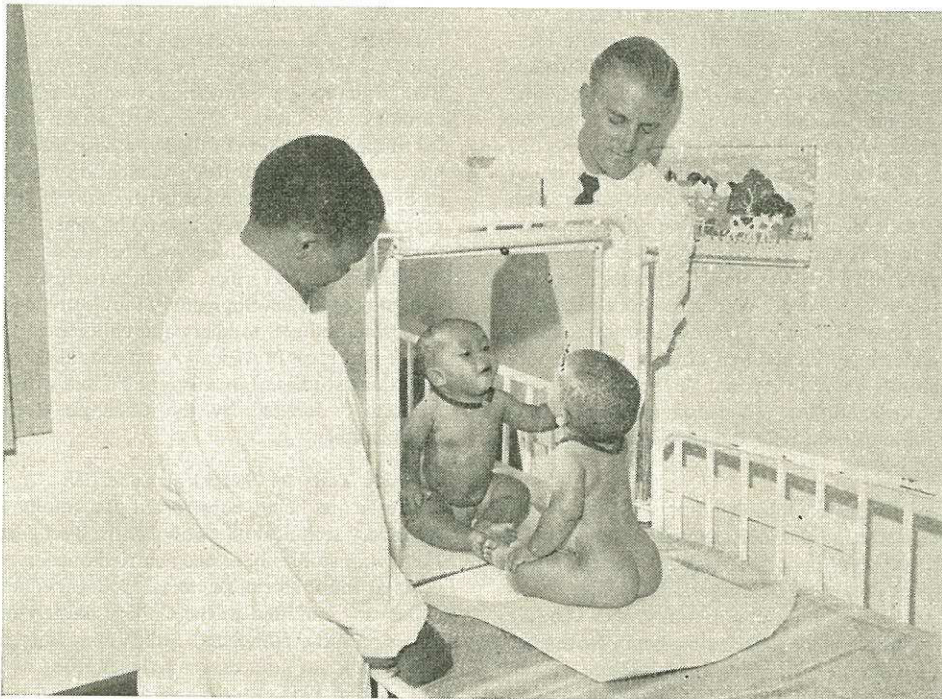
Die Invloed van Omgewingsfaktore op Geestelike en Liggaamlike Ontwikkeling

Hierdie studie, wat gesamentlik met die Nasionale Voedingnavorsingsinstituut, die Departement van Voeding, en die Mediese Fakulteit van die Universiteit van Pretoria onderneem is, is vanjaar bemoeilik deur die feit dat soveel van die gevalle wat by die kraaminrigting op Lady Selborne ondersoek is, die plek verlaat het en dus

studies of the work capacity of Native labourers, and a job-evaluation scheme was completed for all the mines of the group. The last project which has yet to be completed is the housing requirements of European mine workers, a project of importance for the new mining developments in the Eastern Transvaal. In this connection a survey was also carried out of the sociological background of the European miner and his attitudes towards his work. Reasons for ending the contract are that the remaining problems, such as acclimatization of labourers, the training of learner officials, the motivation and occupational adjustment of the European miner, can more effectively be handled on an industry basis. Some of these projects have already been taken over by the Chamber of Mines. The contract provided the Institute with valuable data for basic research.

The Influence of Environmental Factors on Mental and Physical Development

This study, which was undertaken jointly with the National Nutrition Research Institute, the Department of Nutrition and the Medical Faculty of the University of Pretoria, experienced difficulties during the year because of the fact that many of the subjects attending the maternity hospital at Lady Selbourne left the township



Reaksie op die spieëlbeeld—een van die toetse wat uitgevoer word as deel van die studies oor die verstandelike en fisiese ontwikkeling van Bantoe-kinders.

Response to the mirror image— one of the tests carried out in the course of studies of the mental and physical development of Native infants.

nie beskikbaar was vir opvolgingstudies nie. Aangesien dit die bedoeling is om voedings-, gesondheids-, kulturele en sosiologiese faktore eers by die swanger vrou en daarna by die suigeling en kind vir minstens ses jaar te kontroleer, moes 'n woongebied gevind word met 'n meer stabiele bevolking. Vlakte naby Pretoria en Orlando naby Johannesburg voldoen aan hierdie eise, en die werk sal nou in samewerking met die plaaslike klinieke voortgesit word. Gedurende die jaar is egter hoogs waardevolle ervaring opgedoen in die ontwikkeling van tegnieke vir dieetopnames, beoordeling van sosio-ekonomiese faktore in die stedelike Bantoe-kultuur, en die ontwerp van toetse om die intelligensie van die ouers en die ontwikkeling van kinders te meet.

Ontwikkelingsmeting is 'n gespesialiseerde tegniek wat nog maar min in die Unie beoefen is. Dit was dus wenslik, veral met die oog op vergelykende studies, om 'n Amerikaanse deskundige se dienste in te roep. Met behulp van 'n skenking deur die Carnegie-Korporasie vir dié doel aan die W.N.N.R., was dit moontlik om dr. Katherine Cobb, wat reeds vir jare op hierdie gebied navorsing gedoen het, vir 'n tydperk van ses maande aan te stel. Sy sal lede van die Instituut se personeel in die toepassing van die toetse oplei en ook aan die projek in die algemeen deelneem. In een van die bykomende studies van die projek, naamlik die uitwerking van kwashiorkor op die elektriese funksie van die hersings, is goeie vordering gemaak. In samewerking met die Infantile Malnutrition Research Group te Kampala, is 146 elektroënsefalogramme opgeneem, 72 van kwashiorkorpatiënte. By die Baragwanath Hospitaal vir nie-blankes is nog 68 opnames gemaak. 'n Ontleding van die opnames het tot die hipotese gelei dat kwashiorkor 'n vertragende of belemmerende uitwerking het op die ontwikkeling van breinfunksie, soos deur die elektroënsefalogram waargeneem. Daar is egter so baie bykomende faktore dat 'n aantal kontrole-studies nodig sal wees voor die hipotese bevestig kan word. Wat veral nodig is, is 'n studie van die ontwikkeling van die elektroënsefalogram by normale suigeling, kleuters en kinders van die verskillende inheemse rasse in Afrika. 'n Begin is alreeds gemaak met hierdie studies. Vir hierdie tipe veldwerk is die mobiele laboratorium deur die Carnegie-Korporasie geskenk, onontbeerlik.

Aanlegtoets vir Tegniese Opleiding

Vir leerlinge wat 'n sekondêre tegniese kursus by die tegniese kolleges volg, is toetse opgestel en opvolging studies is by die Pretoriase Tegniese Kollege uitgevoer. Die eerste groep wat hoofsaaklik op grond van die toetsresultate vir die kursus toegelaat is, het in November 1955 Std. VI voltooi. Die aantal druipeling is van 39.6% in 1954 verminder tot 15.6% in 1955.

Padveiligheidsnavorsing

'n Ontleding is gemaak van die antwoorde op 'n vraelys wat aan motorfietsryers uitgestuur is om uit te

and were thus not available for follow-up studies. Because the aim is to control nutritional, health, cultural and sociological factors, firstly in a group of pregnant women and thereafter in the offspring, for at least six years, it was necessary to find a township with a more stable population. Vlakte near Pretoria and Orlando near Johannesburg meet these requirements, and the work will now be continued in collaboration with the local clinics. During the year valuable experience was gained in the development of techniques for dietary surveys, the assessment of socio-economic factors in the urbanized Bantu-culture and the development of tests to measure the intelligence of adults and the development of children.

Developmental measurement is a specialized technique which is seldom used in the Union. It was, therefore, considered desirable, particularly with a view to comparative studies, to obtain the services of an American specialist. With the help of a grant made by the Carnegie Corporation to the C.S.I.R., it has been possible to offer a six months appointment to Dr. Katherine Cobb, who has carried out research in this field for many years. She will train members of the Institute's staff in the use of techniques and will also take part in the general project. Good progress has been made in one of the subsidiary studies of the project, namely the effect of kwashiorkor on the electrical function of the brain. In collaboration with the Infantile Malnutrition Research Group in Kampala, 146 electroencephalogram recordings were made of which 72 were kwashiorkor patients. At the Baragwanath Non-European Hospital a further 68 recordings were taken. An analysis of the recordings has led to the formulation of the hypothesis that kwashiorkor has a retarding or obstructive effect on the development of brain function, as recorded by the electroencephalogram. There are so many additional factors that a number of control studies will be necessary before the hypothesis can be verified. What is particularly necessary is a study of the development of the electroencephalogram of normal infants, toddlers and children in the different indigenous races in Africa. A start has already been made with these studies. For this type of field work the mobile laboratory donated by the Carnegie Corporation is indispensable.

Aptitude Tests for Technical Education

Tests are being constructed for pupils undergoing secondary technical education at the Technical Colleges. Follow-up studies have been carried out for a number of years at the Pretoria Technical College. The first group which was admitted to the College, largely on the basis of test results, completed Std. VI in November, 1955. The number of failures was reduced from 39.6% in 1954 to 15.6% in 1955.

Road-Safety Research

An analysis has been made of the replies to a questionnaire which was sent to motor-cyclists in order to deter-

vind wat hul houding is ten opsigte van die gevare verbode aan die ry van 'n motorfiets, en ten opsigte van die veiligheidsmaatreëls. Vierhonderd ingevulde vraelyste is ontvang. Hiervan was 40% van persone wat in motorfietsongelukke betrokke was.

Onder die vernaamste bevindings was die volgende: Die gebruik van beenskerms en valhelms moet vrywillig wees en nie deur wetgewing verplig word nie. 'n Meerderheid het hulself gewillig verklaar om valhelms te dra indien 'n goedkoop, betroubare en gemaklike artikel gereedlik verkrygbaar is. Die algemene mening is dat die bevoegdheidstoets vir motorfietsrybewyse strenger gemaak moet word en dat 'n toets afdelê moet word in die padkode en vir kennis van padtekens, voordat 'n leerlinglisensie uitgereik mag word.

Die vernaamste gevare vir motorfietsryers is: gebrek aan konsiderasie van die kant van motorkar-, vragmotor- of busdrywers (27.1%); die versoeking om die volle krag van die motorfiets te gebruik en om te vinnig te ry (25.3%), en nalatigheid van ander padgebruikers ten opsigte van tekens en verkeersregulasies (15.1%). In teenstelling hiermee word die spoed waarmee ander voertuie ry (0%), druk verkeer gedurende spitsure in digbewoonde gebiede (0.3%), en meganiese defekte van die motorfiets (0%) nie beskou as bronne van gevaar nie.

Waar motorfietsryers self verantwoordelik was vir ongelukke, word roekeloosheid (24.9%), die begeerte om te spog (21.2%) en gebrek aan ondervinding (20.5%) beskou as die mees algemene foute. Vermoeienis en gebrek aan vaardigheid word nie as belangrik beskou nie.

mine their attitudes towards dangers relating to motor-cycling and towards safety measures. Replies to 400 questionnaires were received and of these, 40% were from people who had been involved in motor-cycle accidents.

Some of the more important findings are: the use of crash-bars and crash-helmets must be voluntary and not legally enforced—the majority of motor-cyclists declared themselves willing to wear crash-helmets provided a cheap, reliable and comfortable article was readily available. It was generally agreed that the competence test for the motor-cyclist licence should be made more stringent and that a test on knowledge of the highway-code and road signs should be conducted before a learner's licence is issued.

The chief dangers to which motor-cyclists are subject, are: lack of consideration on the part of car, lorry and bus drivers (27.1%), the inclination to make use of the full power of the motor-cycle and to speed excessively (25.3%) and neglect on the part of other road users in the use of hand signals and traffic regulations (15.1%). In contrast, the speed of other vehicles (0%), congested traffic at peak hours in built-up areas (0.3%) and mechanical defects of motor-cycles (0%), are not considered hazardous.

Where motor-cyclists themselves are responsible for accidents: recklessness (24.9%), the desire to show off (21.2%) and lack of experience (20.5%) are the most usual faults. Fatigue and lack of skill are not considered important.

Nasionale Voeding- navorsingsinstituut

Direkteur: DR. A. W. LATEGAN

Die Instituut is nog in Impalagebou gehuisves, maar planne is reeds goedgekeur vir 'n nuwe laboratorium wat op die W.N.N.R.-terrein opgerig sal word. 'n Gedeelte van die kliniese Afdeling van die Instituut is by die Pretoriase Volkshospitaal gehuisves en die personeel daarvan is verkry van die W.N.N.R., die Provinsiale Administrasie, die Hospitaal en van die Universiteit van Pretoria. Die Afdeling werk ten nouste saam met laasgenoemde twee organisasies.

In hierdie tweede jaar van sy bestaan, het die Instituut hom hoofsaaklik toegelê op die uitbreiding en opbou van sy werksaamhede, veral wat betref opleiding van personeel, beskikbaarstelling van fasiliteite of dienseenhede, en die koördinerende van werksaamhede. Die Instituut bestee nog steeds die grootste deel van sy tyd aan ontledings, ondersoekwerk en navorsing ten behoeve van die Departement van Voeding. Baie tyd is gewy aan die standaardisering van metodes. 'n Afdeling vir mikrobiologie is gestig, terwyl 'n onderafdeling vir chromatografie en elektroforetiese ondersoek in wording is.

Aangesien die inrigting hom meer besonder toespits op toegepaste navorsing, moes fasiliteite geskep word om op al die verskillende terreine van voeding te kan optree.

'n Belangrike aspek van voedings- en voedselprobleme, is dat twee heeltemal verskillende bevolkingsgroepe bedien moet word, naamlik blank en nie-blank. Die voedingsprobleme van die naturel wat werksaam is in die nywerhede is sodanig dat dit moeilik is om die mees ekonomiese en noodsaaklike voedingselemente aan hulle te verskaf. Die voeding van die naturel onder toenemende verstedeliking skep besondere probleme.

Die Instituut het nog nie 'n doelbewuste poging aangewend om navorsingskontrakte namens die nywerheid uit te voer nie, maar is tog deur verskeie nywerhede genader en ondersteunde kontrakte is uitgevoer oor onderwerpe soos die voedingswaarde van voedselgis, die veredeling van wei, die bak van mosbeskuit, die voedingswaarde van gesteriliseerde melk en die biologiese waarde van proteïenhidrolisate.

Twee omvattende verslae is opgestel op versoek van die Nasionale Voedingsraad. Die eerste handel oor die rol van voeding in verskillende siektetoestande en bied 'n samevatting en bespreking van die huidige kennis van die onderwerp. Die tweede verslag handel oor die relatiewe voedingswaarde van bruin-teenoor witbrood. Die inligting hierin is deur eie ondersoek gevind, en aangevul met wat in die buiteland bekend is.

National Nutrition Research Institute

Director: DR. A. W. LATEGAN

The Institute is still accommodated in Impala House, but plans have been approved for a new laboratory to be erected on the C.S.I.R. site. Portion of the Clinical Division of the Institute is accommodated at the Pretoria General Hospital and the staff thereof is drawn from the C.S.I.R., the Provincial Administration, the Hospital and the University of Pretoria. The Section collaborates closely with the two latter organisations.

In this, its second year of existence, the Institute concentrated primarily on the expansion and advancement of its activities, with special emphasis on the training of staff, the creation of facilities or service units and the co-ordination of activities. The Institute continues to devote most of its time to analyses, investigation and research on behalf of the Department of Nutrition. Much time was devoted to the standardization of methods. A microbiology section has been established, while a subsection for chromatographic and electrophoretic research is being set up.

As this Institute is concentrating mainly on applied research, facilities have had to be created so as to cover all the various aspects of nutrition.

An important aspect of research on nutritional and food problems is that two totally different population groups have to be served, viz. the European and the non-European. The nutritional problems involved in the feeding of the Bantus employed in Industry make it difficult to supply the most economical and essential nutrients, and the increasing urbanization of the Bantu is creating particular problems in this respect.

The Institute has not yet actively sought research contracts from Industry, but was nevertheless approached by various firms and has undertaken sponsored investigations into such subjects as the nutritive value of food yeast, whey refining, the baking of „mosbeskuit” (must rusks), the nutritive value of sterilized milk and the biological value of protein hydrolysates.

At the request of the National Nutrition Council, two comprehensive reports were compiled. The first deals with nutrition in relation to various pathological conditions and gives a summary and discussion of the present knowledge of the subject. The second report deals with the nutritive value of brown bread as compared with that of white bread, and is based on information obtained by the Institute's own research, supplemented by information available from overseas.

Op versoek van die Departement van Handel en Nywerheid, is 'n landswye ondersoek oor die verbruik van wit- en bruinbrood deur die verskillende bevolkingselemente uitgevoer deur persoonlike ondervraging op 'n statisties-verteenvoordigende monster van alle bevolkingselemente. Die opname het 1,119 huise ingesluit, met 'n totaal van 6,681 bewoners, verteenwoordigend van vier blanke ekonomiese groepe, sowel as naturelle-, kleurling- en Indiërgroepe. Die monster is getrek uit 110 verskillende woonbuurtes van die vyf groot stedelike gebiede, naamlik Pretoria, Witwatersrand, Kaapstad, Durban en Port Elizabeth. Uit hierdie ondersoek het geblyk dat die naturel die beste verbruiker van bruin- en verrykte brood is (54.8 persent van sy totale verbruik), maar dat die naturel ook die kleinste broodverbruiker is. Die Kleurling is die tweede beste verbruiker van bruin- en verrykte brood (47 persent van sy totale verbruik), die Asiat is die swakste verbruiker van bruin- en verrykte brood (22.8 persent van sy totale verbruik), terwyl die verbruik van bruin- en verrykte brood deur die hoë ekonomiese groepe van die blanke bevolking effens laer is as die gemiddelde vir die hele Unie-bevolking.

Die Instituut het aansienlik gevorder met die beplanning van 'n nasionale opname van voedingstatus en dieetgewoontes. Sover bekend, het geen land nog so 'n opname gemaak onder bevolkingselemente wat so baie van mekaar verskil in hul leefwyse en dieetpatroon as wat in Suid-Afrika heers nie. Na 'n noukeurige studie van die metodiek wat in lande soos Italië, Frankryk, Holland, Engeland en die V.S.A. toegepas word, is die wat die beste geslaag het sodanig gewysig dat dit by plaaslike omstandighede en eie maatstawwe aangepas kan word.

Senior amptenare van die Instituut dien op talle voedingskomitees soos die Nasionale Voedingsraad, die Departement van Voeding se komitees vir Hartsiektes, Geestes- en Tandegesondheid en Kropgeswel, en die Suid-Afrikaanse Buro vir Standaarde se spesifikasiekomitees vir babavoedsel, weipoeier, ens.

Op die gebied van voedingsvraagstukke werk die Instituut nou saam met soortgelyke buitelandse organisasies en, in hierdie land, met verskeie afdelings van die Departement van Landbou (bv. die Westelike Provinsie-Vrugtenavorsingstasie), die mediese fakulteite van Universiteite, die Suid-Afrikaanse Instituut vir Mediese Navorsing, die Laboratorium vir Toegepaste Fisiologie van die Kamer van Mynwese, die Visnywerheidsnavorsingsinstituut, en verskeie afdelings van die Voedselnywerheid.

GRAANPRODUKTE

Brood- en Mielie-meelverryking

Gewysigde spesifikasies is opgestel vir die verrykingsmengsel vir bruinbrood. Gereelde toesig is gehou oor die chemiese samestelling van die mengsel. 'n Fisiologiese ondersoek oor die aanvullingswaarde van die

At the request of the Department of Commerce and Industries, a country-wide survey of the consumption of white and brown bread by the various sections of the population was carried out by means of personal interviews on a statistically representative sample of the population. The survey covered 1,119 dwellings with a total of 6,681 inhabitants, representing four European economic groups, in addition to Bantu, Coloured and Asiatic groups. The sample was drawn from 110 different residential areas of the five metropolitan regions of Pretoria, the Witwatersrand, Cape Town, Durban and Port Elizabeth. This survey indicated that the Bantu is the best consumer of brown and enriched bread (54.8% of his total consumption), but also that, *per capita*, he is the smallest consumer of bread. The Coloureds are the next best consumers of brown and enriched bread (47% of their entire consumption), and the Asiatics consume the least (22.8% of their consumption), while the consumption of brown and enriched bread by the higher economic groups of the European population is slightly lower than the average for the entire Union population.

The Institute has made considerable progress with the planning of a national survey of nutritional status and dietary habits. As far as is known, no country has yet undertaken such a survey amongst population sections differing so greatly from one another in way of life and dietary pattern as is the case in South Africa. After a careful study had been made of the methods applied in countries such as Italy, France, Holland, England and the U.S.A., those which appear to have been most successful are being modified in such a way as to be applicable to local conditions and to conform to our own criteria.

Senior officials of the Institute serve on various nutritional committees such as the National Nutrition Council, the Department of Nutrition's committees for heart disease, mental and dental health and goitre, and on the specification committees for baby food, whey powder, etc., of the South African Bureau of Standards.

The Institute works in close contact with overseas organisations in the field of nutrition and, in this country, with various sections of the Department of Agriculture (e.g. Western Province Fruit Research Station), the medical faculties of the Universities, the South African Institute for Medical Research, the Applied Physiology Laboratory of the Chamber of Mines, the Fishing Industry Research Institute, and various sections of the food industry.

CEREAL PRODUCTS

Bread and Maize-meal Enrichment

Amended specifications have been compiled for the enriching mixture for brown bread, and a regular check has been made on the chemical composition of the mixture. A physiological investigation into the supple-

verrykingsmengsel soos tans in gebruik, in vergelyking met ander moontlike verrykingstowwe, het getoon dat 'n verbetering wenslik is. As alleen in terme van proteïnaanvulling gedink word, het die huidige verryking nie die gewenste uitwerking nie, en die biologiese waarde van die proteïene van verrykte en onverrykte bruinbrood is ongeveer dieselfde. Heelwat beter resultate is egter behaal met vismeel wat deur die Visnywerheidsnavorsingsinstituut in Kaapstad berei is. 'n Byvoeging van 0.6 persent lisien by broodmeel kan ook moontlik nog beter resultate lewer. Lisien word egter nog nie in Suid-Afrika vervaardig nie en is ook nog nie ekonomies uit die buiteland verkrygbaar nie.

Op versoek van die Departement van Voeding is die voorkoms van 'n bloukleuring in verrykte brood ondersoek. Die oorsaak hiervan is die ysterware wat in bakkerie gebruik word. Aanbevelings is gemaak oor die wyse waarop sodanige besmetting en gevolglike kleuring voorkom kan word.

Wat mieliemeel-verryking betref, is spesifikasies opgestel vir sowel die verrykingsmengsel as vir dié verrykte mieliemeel. Chemiese ontledings word gereeld op hierdie verrykte mieliemeel gedoen, en biologiese proewe is aan die gang om die geskikste verryking vir mieliemeel te vind.

Galsterigwording van Mielie-meel

Mededelings van buitelandse deskundiges het die vermoede bevestig dat oksidatiewe agteruitgang van mieliemeel 'n geringe invloed het op die smaak, in vergelyking met verslegting ten gevolge van ensimatisiese afbreek-reaksies. Dat beide degeneratiewe prosesse by mieliemeel slegs langsaam plaasvind onder normale rakomstandighede, is afgelei van die stadige styging in die gehalte van vry vetsure wat in baie gevalle verantwoordelik is vir die onaangename smaak en reuk van galsterige produkte.

Deur chemiese en organoleptiese toetse is bewys dat ongewenste galsterigheid feitlik ewe stadig ontwikkel in onverrykte en verrykte, gesifte gegraneleerde mieliemeel.

Magou

Die ondersoek oor die tradisionele gefermenteerde Bantoe-mielie-meel drank, bekend as „magou” of „mahewu” is voortgesit. 'n Studie is gemaak van die vervaardiging van 'n droë produk wat, by menging met water, in smaak goed vergelyk met die normale produk. So 'n produk is van besondere waarde vir inrigtings wat op groot skaal gebruik maak van natuurleerarbeid, soos myne en fabriekke. So 'n produk bied ook 'n moontlikheid om 'n groot bykomstige afsetgebied vir mielies te skep en te behou.

Die bereiding van hierdie droë produk het belangrike mikro-biologiese aspekte. Deur proewe wat in samewerking met die Nasionale Chemiese Navorsingslaboratorium uitgevoer is, is 'n oplossing gevind vir die probleme van die versuringsproses. Die voorkoms van galsterigheid in hierdie droë produk is ook bestudeer en dit is

mentary value of the enriching mixture at present in use, as compared with other possible mixtures, showed that an improvement is desirable. Considering protein supplementation only, the present enrichment fails to have the desired effect and the biological value of the protein in enriched and unenriched brown bread is approximately the same. Far better results were, however, achieved with fish-meal prepared by the Fishing Industry Research Institute in Cape Town. An addition of 0.6 per cent. lysine to flour may produce even better results. Lysine is, however, not yet produced in South Africa, nor obtainable economically elsewhere.

At the request of the Department of Nutrition, the occurrence of blue colouration in enriched bread was investigated. It was found to be due to iron contamination caused by baker's equipment. Recommendations as to how this contamination and consequent discolouration might be avoided were made.

In regard to the enrichment of maize-meal, specifications were compiled for both the enriching mixture and the enriched maize-meal. Chemical analyses are regularly carried out on this enriched maize-meal, and biological experiments are in progress to determine the most suitable enrichment for maize-meal.

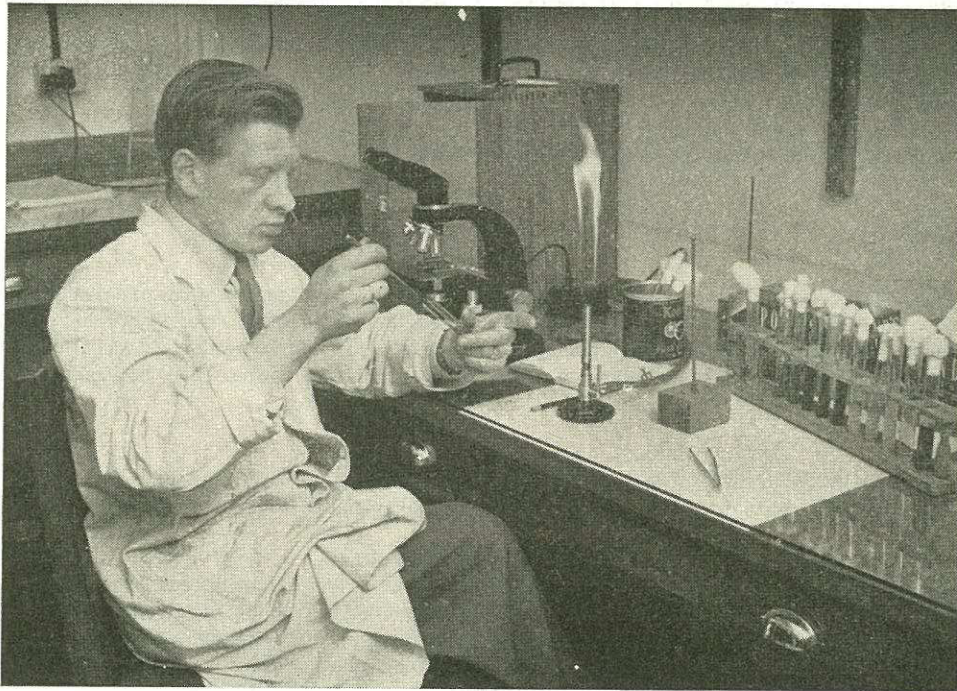
Development of Rancidity in Maize-meal

Reports from overseas experts confirmed the theory that oxidative deterioration of maize-meal has a negligible effect on the taste, in comparison with deterioration due to enzymatic catabolism. From the slow increase in free fatty acid content, which often is the cause of the unpleasant taste and odour of rancid products, it was deduced that both degenerative processes take place slowly in maize-meal under normal shelf conditions. Chemical and organoleptic tests have shown that undesirable rancidity develops almost equally slowly in unenriched and enriched, sifted granulated maize-meal.

Magou

The investigation of the traditional fermented Bantu maize-meal beverage known as „magou” or „mahewu” has been continued. A study has been made of the preparation of a dried product which, on reconstitution with water, compares favourably with the normal product. Such a product is of particular importance to large employers of Bantu labour such as mines and factories. Such a product also offers a possibility of creating and maintaining a vast additional market for maize.

The preparation of this dry product has important microbiological considerations and, in experiments carried out in collaboration with the National Chemical Research Laboratory, a solution has been found to the problems of souring. The rancidity of this product was also studied, and it was found that this could be prevented. A drying process, which was also developed in



Bereiding van gistingskulture in die studie van Magou.

Preparation of cultures for fermentation in studies of Magou.

bevind dat dit verhoed kan word. 'n Drogingsproses, wat ook ontwikkel is in samewerking met die Nasionale Chemiese Navorsingslaboratorium, het goed geslaag.

Die verryking van magou is nog slegs voorlopig ondersoek, maar dit lyk of daar in hierdie verband ook baie gedoen kan word om die voedingswaarde daarvan te verhoog, en gevolglik ook die voeding te verbeter van die natuurlike wat in die nywerhede werksaam is.

Die gebruik van magou as verfrissende drank, benevens sy voedingswaarde, pas aan by die dieetgewoontes van die Bantoe-bevolking, en indien die produk verryk word, mag dit 'n groter rol speel in die verbetering van hul voeding as wat op die oomblik die geval is met verrykte brood, aangesien die natuurlike groter hoeveelhede mielieprodukte gebruik as brood.

Bakproewe

Op versoek van die Departement van Voeding is die uitwerking van die byvoeging van meliemeel op brood ondersoek. Eers in laboratoriumproewe en later in groot-skaalse proewe by 'n kommersiële bakkerij, is gevind dat indien die bakproses effens verander word, daar met 'n toevoeging van 10 tot 15 persent meliemeel, 'n goeie brood gebak kan word. Die biologiese waarde van die proteïene van die koring-plus-mieliemeelbrood is laer as die van die koringbrood, maar 'n toevoeging van 2 persent afgeroomde melkpoeier by die „meliemeelbrood”

collaboration with the National Chemical Research Laboratory, proved successful.

The enrichment of magou has been studied on a preliminary scale only, but it would appear that much can be done in this respect to enhance its nutritive value and, consequently, to improve the nutrition of the Bantu employed by industry.

Quite apart from its nutritive value, the consumption of magou as a refreshing beverage is compatible with the dietary habits of the Bantu. If the product were enriched, it might well play a greater part in the improvement of their nutrition than is at present the case with enriched bread, since the Bantu still consumes larger quantities of maize products than bread.

Baking Tests

At the request of the Department of Nutrition, a study was made of the effect of the addition of maize-meal to bread. Initially in laboratory experiments and subsequently in large-scale experiments in a commercial bakery, it was shown that, provided the baking process is modified slightly, a good bread can be baked with the addition of up to 10 to 15 per cent. maize-meal. The biological value of the proteins in wheat-plus-maize-meal bread is lower than those of the wheaten bread, but if 2 per cent. skimmed-milk powder is added to the former,

bring die biologiese waarde van die proteïene op dieselfde hoogte as die van gewone koringbrood.

Die uitwerking van 'n byvoeging van kalsiumsoute en organiese oksisure op die hidrolise van fitynsuur in die bakproses word ook ondersoek.

Baktoetse is uitgevoer om die optimale byvoeging van kalsiumasetaat as bestrydingsmiddel van leng in brood te bepaal.

PEULGEWASSE

Droëbone

Die proteïengehalte van kafferbone en haricot (geel), is ondersoek. Laasgenoemde variëteit skyn 'n ietwat hoër voedingswaarde te hê. 'n Aansienlike verhoging in die verteerbaarheid van kafferbone kan verkry word deur dit vooraf te outoklaaf.

Boontjiemelk

Suksesvolle proewe is uitgevoer om kunsmelk te vervaardig uit grondbone en sojabone.

Sojabone

Aangesien daar uit verskillende oorde aanduidings gekom het van 'n begeerte om sojaproduksie in Suid-Afrika te verhoog, is op versoek van die Departement van Voeding biologiese proewe met sojaboontjies aan die gang om die aanvullingswaarde daarvan in brood en mieliemeel te bepaal.

SUIWELPRODUKTE

Gesteriliseerde Melk

Die toename in die vervaardiging en gebruik van gesteriliseerde melk en in gesteriliseerde en gekeurde melkdranke het 'n ondersoek na die voedingswaarde van hierdie produkte as proteïenbronne noodsaaklik gemaak. Voorlopige biologiese proewe en chemiese ontleding toon dat gesteriliseerde melk slegs in 'n geringe mate van gewone gepasteuriseerde melk verskil wat betref proteïene en B-vitamiengehalte. Gekeurde melkdranke word nog verder ondersoek met die oog op die gebruik daarvan by skoolvoeding.

Melkproteïene

Verskillende monsters Suid-Afrikaanse weipoeiers, afgeroomde melkpoeier (rollergedroog en sproeigedroog) en kommersiële kasien is biologies getoets vir proteïengehalte en ook chemies en fisies ontleed.

ANDER BELANGRIKE VOEDSELBRONNE

Voedselgis

Ontledings van individuele monsters Amerikaanse Torula-gis het getoon dat dit 'n aansienlik hoër kalsiuminhoud het as plaaslik vervaardigde produkte. Dit geld

the biological value of the proteins reaches the same level as in ordinary wheat bread.

The effect of the addition of calcium salts and organic oxy-acids on the hydrolysis of phytic acid in the baking process is also being studied.

Baking tests were carried out in order to determine the optimum addition of calcium acetate to control ropiness in bread.

LEGUMES

Dried Beans

The protein quality of cowpeas and haricot (yellow), was studied. The latter variety appears to have a somewhat higher nutritive value. It was also found that the digestibility of cowpeas may be increased considerably by autoclaving.

Bean Milk

Successful experiments were conducted to produce a vegetable milk from peanuts and soya beans.

Soya Beans

As various authorities consider that soya production in South Africa should be extended, it was decided, at the request of the Department of Nutrition, to conduct biological experiments in order to determine the value of soya as a bread and maize-meal supplement. This work is in progress.

DAIRY PRODUCTS

Sterilized Milk

The increase in the production and consumption of sterilized milk and of sterilized flavoured milk beverages necessitated an investigation into the nutritive value of these products as protein sources. Preliminary biological tests and chemical analyses indicated that the protein and vitamin B content of sterilized milk differs only very slightly from that of ordinary pasteurized milk. Studies of flavoured milk beverages are being continued with a view to their inclusion in school feeding.

Milk Proteins

Different samples of South African whey powders, skimmed-milk powder (roller-dried and spray-dried) and commercial casein were tested biologically for protein quality and were also analysed chemically and physically.

OTHER IMPORTANT FOOD SOURCES

Food Yeast

Analyses of individual samples of American Torula yeast showed their calcium content to be appreciably higher than that of the local product. This was also true

ook vir die koolhidraat- en riboflaviengehaltes, maar die omgekeerde is die geval met die proteïen- en tiamien-gehaltes.

Die bepaling van die biologiese waarde van voedselgis op albine-rotte is gedurende die jaar afgehandel. Kliniese waardebeoordeling van voedselgis op 'n aantal gevalle van kwashiorkor is gedoen en voorlopige resultate het getoon dat 2 persent en selfs 5 persent voedselgis in die dieet van die pasiënte geen nadelige gevolge het nie. 'n Volledige verslag is vir die Food Yeast Development Company opgestel. Die betreklik lae gehalte aan swavelbevattende aminosure is die vernaamste voedingsgebrek in voedselgis, en die resultate van proewe met rotte het getoon dat die byvoeging van 0.5 persent dl-metionien 'n groeireaksie veroorsaak wat goed vergelyk met dié wat verkry is met kaseïen.

Monsters voedselgis, vitamien-vrye kaseïen en vismeel is na die National Institute of Arthritis and Metabolic Diseases, Bethesda, Md., V.S.A., gestuur vir bepaling van die Faktor 3-gehalte van hierdie produkte. Voedselgis het geen beskerming gegee teen nekrose van die lewer nie—'n verskynsel wat bevestig is deur die feit dat daar geen Faktor 3 in die gis aanwesig was nie. Dit is van belang om op te merk, by wyse van vergelyking, dat kaseïen 'n geringe mate van beskerming verleen het, terwyl vismeel aansienlik ryker aan Faktor 3 blyk te wees, en gevolglik 'n groter mate van beskerming bied teen nekrose van die lewer.

Vismeele

Semi-kommersiële vervaardigde, sowel as laboratoriummonsters verwerkte reuklose vismeel is ondersoek vir proteïengehalte. Hieronder was een besonder geslaagde monster „reuklose” maasbankermeel wat verskaf is deur die Visnywerheidsnavorsingsinstituut in Kaapstad, met 'n biologiese waarde van 87 persent (dieselfde as onverwerkte vismeel).

Die proteïen van visperswater blyk egter nie van 'n hoë gehalte te wees nie.

Heelwat bakproewe met vismeel in brood is uitgevoer om die aanneemlikheid vir en die invloed van vismeel op die bakproses te ondersoek. Dis gevind dat soveel as 4 tot 6 persent vismeel by gewone bruinbrood gevoeg kan word sonder om sy bakeienskappe of byval nadelig te beïnvloed.

BESTANDDELE VAN VOEDSEL

Voedseltabelle

By afwesigheid van 'n bruikbare handboek met analitiese gegewens oor Suid-Afrikaanse voedsel, het 'n komitee van die Instituut onder voorsitterskap van dr. F. W. Fox, besluit om die Amerikaanse „Agriculture Handbook No. 8” (1950), met „Agriculture Handbook No. 34” (1952) as aanvulling, voorlopig aan te beveel vir algemene gebruik deur belanghebbendes. Hierdie handboeke is tans reeds aangevul met 'n verdere lys van die

of the carbohydrate and riboflavin content, but the reverse was true of the protein and thiamin contents.

The biological evaluation of food yeast, using albino rats, was completed during the year. Clinical evaluation of food yeast was done on some kwashiorkor cases, and preliminary results indicated that 2 and even 5 per cent. food yeast in the diet of patients did not produce any harmful effects. A comprehensive report was prepared for the Food Yeast Development Company. The relatively low sulphur-containing amino acid proved to be the main deficiency in the composition of food yeast, and the results of experiments with rats indicated that the addition of 0.5 per cent. dl-methionine caused a growth reaction which compared favourably with that obtained with casein.

Samples of food yeast, vitamin-free casein and fish meal were sent to the National Institute of Arthritis and Metabolic Diseases, Bethesda, Md., U.S.A., for the assessment of their Factor 3 content. Food yeast gave no protection against necrosis of the liver—a finding confirmed by the fact that no Factor 3 was present in the yeast. It is interesting to note, by way of comparison, that casein gave a slight degree of protection, whilst fish meal appeared to be richer in Factor 3 and consequently offers a greater degree of protection against necrosis of the liver.

Fish Meal

Both semi-commercially-manufactured and experimental samples of odourless processed fish meals were examined for protein quality. Amongst these was one most successful sample of “odourless” flour from Cape mackerel, supplied by the Finishing Industry Research Institute in Cape Town, with a biological value of 87 per cent. (the same as unprocessed fish meal).

The protein of fish “stick water” does not, however, appear to be of high quality.

Numerous baking tests were conducted to assess the acceptability of fish meal in bread and its effect on the baking process. It was established that as much as 4 to 6 per cent. fish meal may be added to ordinary brown bread without detriment to the baking qualities or acceptability.

FOOD COMPOSITION

Food Tables

In the absence of a handy manual with analytical data on South African food, a committee of the Institute, under the chairmanship of Dr. F. W. Fox, decided to recommend, as a preliminary measure, the American “Agriculture Handbook No. 8” (1950) supplemented by “Agriculture Handbook No. 34” (1952), for general use by interested parties. These manuals have now been supplemented with a further schedule of the available

beskikbare ontledingsyfers van tipies Suid-Afrikaanse voedsels wat nie in genoemde publikasies voorkom nie. Die strewende is om deur 'n langtermynprogram van navorsing steeds meer van die buitelandse syfers met Suid-Afrikaanse gegewens te vervang vir sowel vars as verwerkte produkte. Die ontledingsresultate wat deur 'n groot aantal firmas en navorsingsinrigtings beskikbaar gestel is, word vir gebruik verwerk en aangevul met resultate wat verkry word uit eie ondersoek. Mielie en mielieprodukte, brood en tipiese natuurelvoedsel is nou onder behandeling.

'n Stelselmatige opname oor die fitynsuurgehalte van koringvariëteite is ook aan die gang.

analyses for a number of typically South African foods which do not appear in the publications mentioned. The ultimate object is, in the course of a long-term research programme, to replace more and more of the overseas figures with South African data in respect of both fresh and processed products. Analytical results, which have been made available by a large number of firms and research institutes, are being digested and supplemented with results obtained by the Institute's own research. Maize and maize products, bread and typical Bantu foods are now being dealt with.

A systematic survey of the phytic acid content of wheat varieties is also being conducted.



Metabolisme studies met rotte vir die bepaling van die biologiese waarde van proteïenes.

Rat metabolism studies for the determination of the biological value of proteins.

Metodiek

Metodes vir die bepaling op roetinebasis van die volgende voedselbestanddele is ondersoek en aangepas: vet, vesel, vog, as, kalsium, fosfor, yster, proteïen, tiamien, niasien, riboflavin, askorbiensuur, laktose, reduserende suikers en looistof (in broodverrykingsmengsels). Daar is nog geen geskikte metode vir die kwantitatiewe bepaling van ge-outoklaafde sojameel in voedselmengsels beskikbaar nie, omdat dit geblyk het dat die presipitien-reaksie met 'n gesensitiseerde serum nie akkuraat genoeg is nie.

Methodology

Methods for the routine assay of the following food ingredients have been studied and adapted: fats, fibre, fluid, ash, calcium, phosphorus, iron, protein, thiamin, niacin, riboflavin, ascorbic acid, lactose, reducing sugars and tannin (in bread-enriching mixtures). No suitable method is as yet available for the quantitative assessment of autoclaved soya meal in food mixtures, because it appears that the precipitin reaction with sensitised serum is not accurate enough.

Kleurstowwe in Voedsel

Die Instituut werk saam met verskeie buitelandse organisasies, o.a. die Wêreldgesondheidsorganisasie en die Voedsel- en Landbou-organisasie van die V.V.O., en die Deutsche Forschungsgemeinschaft, wat geïnteresseerd is in die langtermyn-uitwerking van chemikalieë (bv. kleurstowwe, smaakstowwe, ens.) wat dikwels gebruik word in die voedselnywerheid. 'n Program van navorsing in verband met kleurstowwe, wat nog nie as onskadelik bewys is nie veral in verband met kanker-navorsing, is opgestel en vir kommentaar voorgelê aan verskeie deskundiges in die buiteland sowel as in Suid-Afrika.

VOEDING EN KWASHIORKOR

Kliniese Onderzoek

'n Aanvang is reeds gemaak met kliniese en biochemiese studies in verband met die voeding van kwashiorkor-pasiënte. Tot op datum is 52 pasiënte bestudeer. In sommige gevalle is die bevindings gekorreleer met die histologiese beeld van lewerbiopsiemateriaal.

Die uitwerking van afgeroomde melk met aanvullings van proteïen en Carob-boontjemeel op die voorkoms van diarree, en die spoed op herstel daarvan, is nagegaan.

Die voorkoms van patogeen-organismes in die maagdermkanaal van gevalle van kwashiorkor en kontrolepersone, is nagegaan in samewerking met dr. J. N. Coetzee, Instituut vir Siektkunde, Universiteit van Pretoria.

'n Bevredigende formule om vismeel in 'n geskikte vorm te kry vir bottelvoeding is opgestel, sodat dit klinies getoets kan word as 'n bron van proteïen. Aanneemlikheidstoetse word uitgevoer op gedeeltelik hergestelde kwashiorkor-pasiënte, met die oog op verdere werk.

Balansproewe

Die praktiese en tegniese probleme wat balansstudies opgelewer het, is nou in groot mate opgelos. Twee metabolismebeddens is ingerig vir die versameling van urien en stoelgange. Hierdie beddens sal in die nuwe kliniese saal gebruik word en die pasiënte sal gedurig onder die strenge toesig van verpleegstershulp wees.

Ystermetabolisme

Bepalings van serumyster is gedoen op kwashiorkor-gevalle. Volledige hematologiese ondersoek, insluitende retikulosiet-tellings, word op al die gevalle uitgevoer, en die invloed van parenterale en orale yster op die bloedbeeld is nagegaan. Beenmurgsmere van alle nuwe gevalle is ondersoek. Die organe van alle pasiënte wat te sterwe kom, word mikroskopies ondersoek en histochemies gekleur vir yster.

VOEDING EN DEGENERATIEWE HARTSIEKTES

Vergelykende Dieetstudie

Met die toestemming van die Minister van Justisie word 'n gesamentlike langtermynproef met vrywillige

Dyes in Foodstuffs

Contact is being maintained with various overseas organisations, such as the World Health Organisation, the Food and Agriculture Organisation of the United Nations and the Deutsche Forschungsgemeinschaft, which are interested in the long-term effects of additives (e.g. dyes, flavouring, etc.) often employed by the Food Industry. A programme of research into dyes which have not yet been proved harmless, particularly with reference to cancer research, has been drawn up and submitted for comment to several overseas and South African experts.

NUTRITION AND KWASHIORKOR

Clinical Research

A start has been made with clinical and biochemical studies relating to the feeding of kwashiorkor patients. To date, 52 patients have been studied. In some cases the findings were correlated with the histological picture of liver biopsy material.

The effect of skimmed milk with additions of protein and Carob beanmeal on the incidence of diarrhoea and the rate of recovery therefrom, has been studied.

The occurrence of pathogenic organisms in the gastrointestinal tract of kwashiorkor patients and controls was studied in collaboration with Dr. J. N. Coetzee of the Institute of Pathology, University of Pretoria.

A satisfactory formula for rendering fish flour into a form suitable for bottle-feeding, was developed in order to test it clinically as a source of protein. Acceptability tests are being carried out on partially recovered kwashiorkor patients, with a view to future research.

Balance Tests

The practical and technical problems connected with balance studies have to a large extent been solved. Two metabolic beds were designed for the collection of urine and faeces. These beds will be used in the new clinical ward which is nearing completion, and the patients will be constantly under the strict supervision of a nursing assistant.

Iron Metabolism

Assessments of serum iron were performed on kwashiorkor cases. Complete haematological examinations, including reticulocyte counts, are being carried out on all patients, and the influence of parenteral and oral iron on the blood picture has been investigated. Bone-marrow smears of all new cases were examined. The organs of all patients who succumb are examined microscopically and stained histochemically for iron.

NUTRITION AND DEGENERATIVE HEART DISEASE

Comparative Diet Study

With the consent of the Minister of Justice, a long-term experiment with volunteer European and non-

blanke en nie-blanke gevangenes beplan met die Departement van Voeding, prof. P. J. Kloppers van die Universiteit van Pretoria, die Menslik-Biochemiese Eenheid, die Ernest Oppenheimer-Instituut vir Kardio-vaskulêre Siektes, en die Gevangenisowerheid. 'n Volledige dieet-, kliniese en biochemiese ondersoek sal uitgevoer word om die invloed van die dieetpatroon en vetgehalte en aard van vette vas te stel. 'n Begin is gemaak met weeklikse dieet- en bloedontledings, en die resultate sal rigtinggewend wees vir die verdere uitbouing van die projek.

Aorta-onderzoek

Met die goedgegunste toestemming van die betrokke owerhede word die aortas van persone onder 20 jaar verkry vanaf die Little Flower Mission-Hospitaal, die Instituut vir Patologie en van die lykhuis van die Suid-Afrikaanse Polisie.

Die aortas, afkomstig van beide blankes en nie-blankes, word gefotografeer, histologies ondersoek en gegradeer in verskillende grade van ateroos. 'n Aanvang is ook gemaak met die biochemiese ondersoek van hierdie aortas. Aangesien die metodiek identies is, sal die resultate in alle opsigte vergelykbaar wees met dié wat verkry word deur die W.N.N.R. se Menslik-Biochemiese Eenheid in Johannesburg op persone ouer as 20 jaar.

Cholesterolhoogtes

Met hierdie ondersoek is reeds 'n aanvang gemaak, deur die serum van personeellede van sekere W.N.N.R.-afdelings en van die Departement van Voeding te ondersoek vir cholesterol- en fosfolipiedgehalte. Hierdie ondersoek sal geleidelik uitgebrei word na vrywilligers in ander groepe, en dan gekorreleer word met die dieetpatrone.

Cholesterolmetabolisme

In samewerking met prof. Snyman van die Universiteit van Pretoria, word 'n studie oor die cholesterolmetabolisme by blanke en nie-blanke pasiënte, wat aan verskillende hartsiektes ly, uitgevoer met behulp van radioaktiewe koolstof in die vorm van natriumasetaat.

VOEDING EN VROEGGEBOORTES

In hierdie projek word verskillende aspekte van kinderonwikkeling bestudeer. Die Instituut bepaal hom net by die voedingsaspekte, terwyl die ander aspekte deur die Nasionale Instituut vir Personeelnavorsing, die Departement van Voeding en die Mediese Skool van Pretoria behartig word.

Bloedmonsters van 130 swanger naturellevroue wat geneem is gedurende verskillende trimesters, is biochemies ondersoek vir serumproteïen-komponente, cholesterol, hemoglobien, rooiseltelling, vitamien C, karoteen, ureum en uriensuur.

'n Totaal van 31 postmortem-ondersoeke is gedurende die jaar uitgevoer op kinders wat te vroeg en op andere wat op normale tyd gebore is. Die ondersoek het aange-

European prisoners is being planned jointly with the Department of Nutrition, Prof. P. J. Kloppers of the University of Pretoria, the Human-Biochemistry Research Unit, the Ernest Oppenheimer Institute for Cardiovascular Disease, and the Prisons' Department. A complete dietary, clinical and biochemical investigation will be carried out to determine the influence of dietary pattern, fat content and nature of fats. A start has already been made with weekly diet and blood analysis and the results will indicate the direction for the further development of the project.

Aortas Research

With the consent of the authorities concerned, the aortas of persons under 20 years of age are being obtained from the hospital of the Little Flower Mission, the Institute of Pathology and mortuary of the South African Police. The aortas, taken from both Europeans and non-Europeans, are being photographed, examined histologically and graded according to degrees of atheroma. Work has begun on the biochemical examination of these aortas, and, as the methods are identical, the results will be comparable in every respect with those obtained by the C.S.I.R. Human-Biochemistry Research Unit in Johannesburg on persons of over 20 years of age.

Serum Cholesterol Levels

A start has been made with this research by examining the serum of members of the staffs of certain C.S.I.R. divisions and of the Department of Nutrition for cholesterol and phospholipid contents. Gradually this research will be extended to volunteers in other groups, and then correlated with the dietary patterns.

Cholesterol Metabolism

In collaboration with Prof. Snyman of the University of Pretoria, a study of the metabolism of cholesterol in European and non-European patients suffering from various heart diseases is being carried out with the aid of radioactive carbon in the form of sodium acetate.

NUTRITION AND PREMATURE BIRTH

Various aspects of childbirth and child development are being studied under this project. The Institute is only concerned with nutritional considerations, while the other aspects are being dealt with by the National Institute for Personnel Research, the Department of Nutrition and the Pretoria Medical School.

Blood samples from 130 Bantu women in various stages of pregnancy were examined biochemically for serum protein components, cholesterol, haemoglobin, red cell count, vitamin C, carotene, urea, and uric acid.

During the year, 31 post-mortem examinations were performed on premature and full-term babies. The research indicated that foetal anoxia is the most prevalent

dui dat fetale anoksie 'n baie belangrike oorsaak van dood is, veral by vroeggebore kinders. 'n Uitgebreide projek word beplan om die sitologiese en histochemiese veranderinge na te gaan wat in anoksieweefsels ontstaan.

Volledige hematologiese ondersoek is uitgevoer op die bloed van alle gevalle wat onder hierdie studie ingesluit is.

FISIOLOGIESE VOEDINGSTUDIES

Metodiek

Vir die uitvoering van die verkorte metode van Bender en Miller vir die biologiese waardebeoordeling van proteïene is dit noodsaaklik om die aminostikstof in die karkas van die proefdier (die rot) te bepaal. Eenvoudige maar doeltreffende metodes, gebaseer op die bepaling van die liggaamsvog van die albinorot, is uitgevoer.

Die verhouding van kreatinienstikstof tot totale urienstikstof word aangewend om die assimileerbaarheid van die proteïene te bepaal. Sukses is behaal met honde, maar weens gebrek aan 'n sensitiewe metode vir die bepaling van kreatinien, is die rot uitgeskakel. Onlangs is syfers met 'n nuwe sensitiewe kreatinienmetode verkry. Die resultate lyk sover baie bemoedigend.

In samewerking met die werkplaas van die W.N.N.R. is 'n nuwe metabolismekou ontwerp wat meer doel-

cause of death, especially in the case of prematures. An extensive project is being planned for investigating the cytological and histochemical changes occurring in anoxic tissue.

Complete haematological examinations were performed on the blood of all cases included under this study.

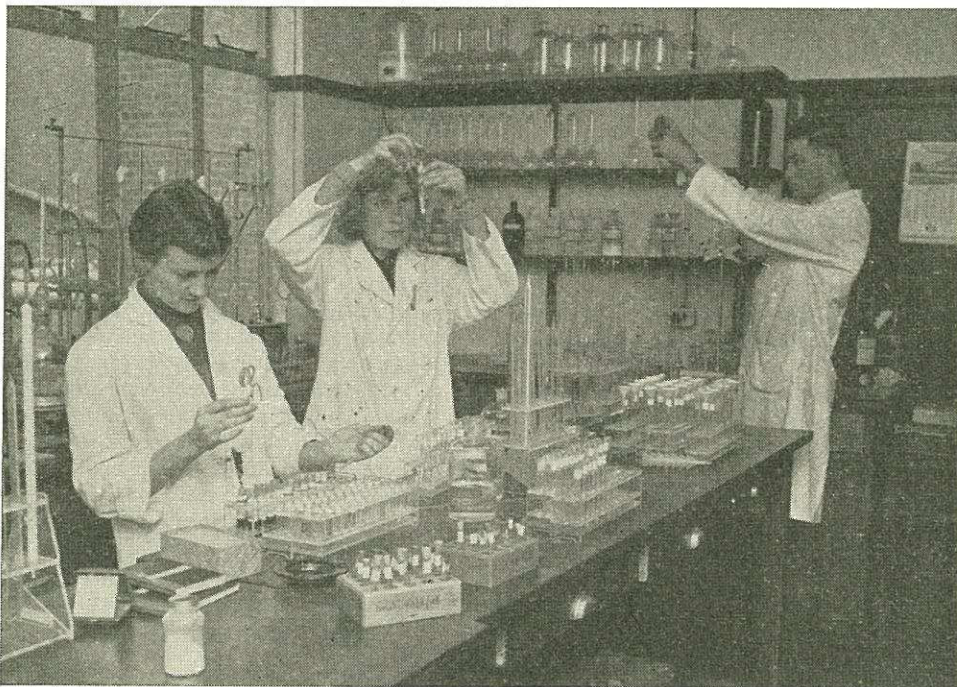
PHYSIOLOGICAL NUTRITION STUDIES

Techniques

For the application of the abridged Bender and Miller method for the biological evaluation of proteins, it is imperative that the amino-nitrogen in the carcass of the test animal (the rat) be determined. A simple but effective method, based on the determination of the body fluid of the albino rat, has been worked out.

The ratio of creatinine nitrogen to total urinary nitrogen, has been used as a criterion for determining the assimilability of protein. This method was successful with dogs, but the lack of a sensitive method for determining creatinine eliminated the rat. Recently, values have been obtained with a new sensitive creatinine method. The results thus far are encouraging.

New metabolism cages were designed and constructed with the assistance of the C.S.I.R. workshop. They can



Ontleding van liggaamsvloeistowwe in die fisiologiese chemiese laboratorium.

Analysis of body fluids in the physiological chemistry laboratory.

treffend en makliker gehanteer kan word as dié wat tans in gebruik is. Hierdie koue, tesame met nuwe verkorte metodes, sal die koste van die biologiese waardebeoordeling aansienlik verlaag en 'n groot tydbesparing meebring.

Bestaande metodes vir die bepaling van verskillende bestanddele van serum, urien, ens., is aangepas by omstandighede in die laboratorium en word, waar nodig, verander of vervang deur nuwe metodes. Waar moontlik word mikro- of semi-mikrometodes gebruik. Hersaamgestelde gedroogde serum word gereeld gebruik om resultate wat verkry word, met hierdie metodes te vergelyk. Die metodes word ook verder vergelyk deur duplikaatmonsters aan ander erkende laboratoria te stuur vir ontleding en om dan die resultate met mekaar te vergelyk.

Piridoksien en Ysterabsorpsie

Proewe by varke het aangedui dat daar met 'n piridoksien-gebrek 'n besonder hoë ysterkonsentrasie in die serum is, tesame met 'n uitgebreide hemosiderose van die lewer en die milt. Die Bantoe het 'n betreklik hoë konsentrasie van serum-yster, en gedurende swangerskap is daar aanduidings van 'n piridoksien-gebrek.

Om die invloed van piridoksien op die konsentrasie van serum-yster na te gaan, is ysterabsorpsietoetse uitgevoer op 36 swanger Bantoevroue. Dis bevind dat die parenterale toediening van piridoksien die absorpsie van yster uit die dermkanaal aansienlik onderdruk.

'n Studie oor die invloed van piridoksien op ysterabsorpsie word tans ook in „normale” gevalle (studente) uitgevoer en tot sover is dit reeds op 20 uitgevoer. Die piridoksiengehalte van die bloed word bepaal deur die xanturiensuur-uitskeiding in die urien te meet na 'n dosis van 10 g. dl-tryptofaan. Piridoksien het blykbaar nog 'n invloed op ysterabsorpsie in hierdie gevalle, maar voorlopige resultate dui daarop dat die invloed baie minder is as in die geval van swanger Bantoevroue.

Maagsap-afskeiding en Vitamien C

In samewerking met prof. Meyer van die Universiteit van Pretoria, word ondersoek ingestel na die moontlike invloed van vitamien C of ander voedingstowwe op die normale funksie van die maag en die bynierskors. Heelwat tyd is bestee aan die standaardisering van metodes van maagsapversameling en ontleding, asook met toetse om die bynierskorsfunksie te bepaal. 'n Aantal gevalle met die eintlike ondersoek is reeds voltooi en nuwe gevalle word bestudeer. Omdat dit nie maklik is om genoeg vrywilligers vir die eksperiment te vind nie, is dit nodig om ook van proefdiere, bv. honde, gebruik te maak, maar tot op datum beskik die Instituut nog nie oor die fasiliteite om groter proefdiere as rotte te gebruik nie.

Fitiensuur

Die ondersoek op die invloed van fitiensuur op die kalsium-metabolisme en die invloed wat organiese oksisure in hierdie verband kan uitoefen, gaan voort. 'n

be handled and cleaned with greater ease and efficiency than those at present in use. Used in conjunction with the new abridged method, these cages will reduce the cost of biological evaluation considerably and save much time.

Existing methods for determining different ingredients of serum, urine, etc., have been adapted to laboratory conditions, and modified or replaced by new methods where necessary. Micro- or semi-micro-methods are employed wherever possible. Reconstituted dried serum is used regularly as a check on the results obtained by these methods. The methods are subjected to additional checks by sending duplicate samples to other recognised laboratories for analysis and comparison of results.

Pyridoxine and Iron Absorption

Experimental work on pigs indicated that a pyridoxine deficiency coincides with an extremely high iron-concentration in the serum, together with an extensive haemosiderosis of the liver and the spleen. The Bantu have a relatively high serum-iron concentration, and during pregnancy there are indications of pyridoxine deficiency.

Iron-absorption tests were performed on 36 pregnant Bantu females in order to establish the effect of pyridoxine on serum-iron. It was found that parenteral administration of pyridoxine considerably suppresses the absorption of iron from the intestinal tract.

A study of the effect of pyridoxine on iron absorption is now also being made of “normal cases” (students), some twenty having been tested to date. The pyridoxine content of the blood is determined by measuring the excretion of xanthurenic acid in the urine after a dose of 10 g. dl-tryptophane. Apparently pyridoxine still affects iron-absorption in these cases, but preliminary results seem to indicate that the effect is far less than in the case of pregnant Bantu women.

Secretion of Gastric Juice and Vitamin C

In collaboration with Prof. Meyer of the University of Pretoria, a programme was launched to investigate the possible effect of vitamin C or other nutrients on the normal function of the stomach and the adrenal cortex. A considerable amount of time has been devoted to the standardization of methods for collecting and analysing gastric juice, and tests for determining the function of the adrenal cortex. Some cases have been completed and all available new cases are being studied. Because it is not easy to find volunteers for the experiment, it will be necessary also to make use of test animals such as dogs, but the Institute at present lacks the facilities to use test animals larger than rats.

Phytic Acid

The investigation into the effect of phytic acid on calcium metabolism and the influence of organic oxo-acids in this connection is continuing. A method has been

Metode is uitgewerk vir die bepaling van fitiensuur. Dit berus op die presipitering van fitiensuur as ysterfitaat en die bepaling van die yster met behulp van natrium-salisilaat.

Gesplenektomeerde Rotte

Dis bevind dat vetinfiltrasie, sirrose en nekrose van die lewer in rotte wat op diëte met voedselgis as die enigste bron van proteïene gevoer is, enigszins gelokaliseer is en in erger graad voorkom in die linkerlob van die lewer. Die enkele linkerlob van die lewer se vernaamste bloedvoorsiening kom direk van die milt, terwyl die drie regterlobbe bloed vanaf die spysverteringskanaal ontvang. Himsworth en Glynn het in 1944 beweer dat die milt 'n rol mag speel in die ontwikkeling van patologiese veranderinge in die lewer. Om hierdie hipotese te ondersoek is die milte van vyf volwasse albino-mannetjierotte verwyder, en hulle is daarna saam met vyf nie-gesplenektomeerde kontroles van dieselfde ouderdom, gewig en geslag op die nekrogeniese dieet van Gillman gevoer. Na 'n periode van ses weke is al die rotte gedood, en dis gevind dat gesplenektomeerde rotte sonder uitsondering duidelike nekrose van die lewer toon, veral in die linkerlob. Die kontroterotte het beslis minder nekrose getoon en die vetgehalte van hul lewers was laer as dié van die gesplenektomeerde rotte.

Rol van Antioksideermiddels in Nekrose van die Lever

Vitamiën E het 'n beskermende werking teen nekrose van die lewer. Die vraag is eger of hierdie werking nie slegs te danke is aan sy funksie as antioksideermiddel nie. Twee antioksideermiddels, naamlik gebutileerde hidroksitolueen en difeniel-para-fenileendiamien (D.P.P.D.) is uitgetoets in 'n dieet bevattende 30 persent voedselgis. In die geval van die toluenverbinding was daar tussen die proef-groep (voedselgis plus antioksideermiddel) en die kontrole-groep (voedselgis alleen) geen noemenswaardige verskil nie; dog in die geval van D.P.P.D. is die voorkoms van lewernekrose met 24.5 persent verminder deur die byvoeging van die antioksideermiddel. Die diagnose van lewernekrose berus op makroskopiese ondersoek van die lewer en mikroskopiese evaluering van snitte van al die lobbe van die lewer.

Nadelige Uitwerking van Voedsel

Van die swak reaksie van die publiek op 'n landswe navraag oor die nadelige uitwerking van die gelyktydige gebruik van bepaalde voedselsoorte, is afgelei dat daar nie voldoende wesenlike bewyse vir die voorkoms van so 'n verskynsel is nie.

VOEDING EN INTELLIGENSIE

Fenielketonurie

In opvolging van werk wat in die buiteland gedoen is, is urienmonsters van 193 kinders van die Bellevueskool vir Verstandelik-vertraagde kinders ondersoek, met die

worked out for determining phytic acid by precipitating it as ferrophytate and determining the iron with the aid of sodium salicylate.

Splenectomized Rats

It has been found that the fat infiltration, cirrhosis and necrosis of the liver occurring in rats fed on diets in which food yeast constituted the sole source of protein, is somewhat localized and occurs to a greater degree in the left lobe of the liver. The single left lobe of the liver receives its main blood supply directly from the spleen, whereas the three right lobes are supplied primarily from the alimentary canal. In 1944, Himsworth and Glynn suggested that the spleen might play a part in the development of pathological changes in the liver. For further investigation of this hypothesis, the spleens of five full-grown male albino rats were removed. Along with five unsplenectomized control animals of the same age, weight and sex, they were fed on Gillman's necrogenic diet. After a period of six weeks all the rats were killed, and it was found that, without exception, the splenectomized rats all had pronounced necrosis of the liver mainly in the left lobe. The control rats showed significantly less necrosis, and the fat content of their livers was lower than that of the splenectomized rats.

Role of Anti-oxidants in Necrosis of the Liver

Vitamin E affords protection against necrosis of the liver, but the question is whether this effect is not merely due to its function as an anti-oxidant. Two anti-oxidants, butylated hydroxytoluene and diphenyl-para-phenyldiamine (D.P.P.D.), were tested in a diet containing 30 per cent. food yeast. In the case of the toluene compound there was no appreciable difference between the experimental group (food yeast plus anti-oxidants) and the control group (food yeast only). However, in the case of D.P.P.D. the incidence of liver necrosis was reduced by 24.5 per cent. by adding the anti-oxidant. The diagnosis of hepatic necrosis was based on macroscopic examination of the liver and microscopic evaluation of sections of all liver-lobes.

Harmful Interaction of Foods

From the poor reaction of the public to a country-wide enquiry into the harmful effect of the simultaneous consumption of certain types of food, it was deduced that there is really no adequate proof of the occurrence of such a phenomenon.

NUTRITION AND INTELLIGENCE

Phenylketonuria

In extension of work done abroad, urine samples from 130 children of the Bellevue School for Mentally Retarded Children were examined with a view to deter-

oog op die vasstelling van die voorkoms van die metaboliese stoornis, fenielketonurie. Geen positiewe resultate is egter verkry nie. Die ondersoek word uitgebrei na ander inrigtings vir verstandelik-vertraagde persone, waarvoor toestemming verkry is van die Kommissaris vir Geestesgesondheid.

Voedingsgebreke en Leervermoë

In samewerking met die Nasionale Instituut vir Personeelnavorsing, is 'n reeks proewe beplan om vas te stel watter invloed voedingstekorte op leervermoë het, in enige stadium van ontwikkeling, en indien so 'n invloed gevind word, of die uitwerking omkeerbaar is. Die proewe word eers met albino-rotte uitgevoer as voorbereiding vir 'n latere ondersoek op die mens.

Ook is proewe aan die gang om vas te stel watter hoogte van proteïen-inname 'n grenstoestand by die wyfierot verteenwoordig, maar nogtans normale voortplanting sal toelaat. Diëte met 10, 14 en 20 persent proteïen onderskeidelik, maar origens goed gebalanseerd, word aan verskillende groepe rotte gevoer in 'n poging om hierdie probleem op te los. Op die oomblik word normale rotte in 'n spesiaal ontwerpte doolhof uitgetoets om vas te stel wat die normale spreiding van die resultate is soos verwag kan word met 'n willekeurige groep rotte.

HISTOPATOLOGIE EN SITOLOGIE

Dit is nou besluit dat hierdie afdeling voortaan ook sal konsentreer op die histochemiese en sitologiese veranderinge wat in die weefsels van mens en dier ontstaan met verskillende voedingsgebreke. Wat betref die histochemiese veranderinge, is 'n begin gemaak met die standaardisering van verskillende metodes vir die kleuring van vette, koolhidrate, vitamien (bv. vitamien C) en hormone (bv. ketosteroïde). Sommige van die metodes is reeds toegepas in 'n ondersoek van die histochemie van die fetale bynierskors. 'n Vergelykende studie van die bloed van kwashiorkorgevalle en van normale gevalle het ook 'n aanvang geneem, en sommige van die histochemiese metodes vir die kleuring van ensieme het hier toepassing gevind.

Sitologiese ondersoeke sal uitgevoer word met die elektronmikroskoop by die Nasionale Fisiese Navorsingslaboratorium. Heelwat tyd word bestee aan die voorlopige voorbereiding van weefsels vir elektronmikroskopiese ondersoek.

mining the incidence of the metabolic disturbance known as phenylketonuria. No positive results were obtained. With the sanction of the Mental Hygiene Commissioner, the research is being extended to other institutions for mentally retarded persons.

Deficient Nutrition and Learning Ability

In collaboration with the National Institute for Personnel Research, a series of experiments has been planned to determine what effects nutritional deficiencies have on the learning ability at any stage of development, and whether such effects, if any, are irreversible. The tests are first being conducted with albino rats, preparatory to subsequent research on humans.

Experiments to determine the minimum protein consumption, consistent with normal reproduction are in progress. Diets with 10, 14 and 20 per cent. protein respectively, but otherwise well balanced, are being fed to different groups of rats in an attempt to solve this problem. At present normal rats are being tested in a specially designed maze to determine the distribution of results likely to be obtained with a random sample.

HISTOPATHOLOGY AND CYTOLOGY

It has been decided that this Division will henceforth also concentrate on the histochemical and cytological changes occurring in the tissue of humans and animals suffering from different nutritional deficiencies. With regard to histochemical changes, a start has been made with the standardization of various methods for staining fats, carbohydrates, vitamins (e.g. vitamin C) and hormones (e.g. ketosteroid). Some of the methods have already been used in research into the histochemistry of the foetal adrenal cortex. A comparative study of the blood of kwashiorkor cases and normal people has also been launched, and some of the histochemical methods for the staining of enzymes were applied in this study.

Cytological research-work will be performed with the electron microscope at the National Physical Laboratory. A considerable amount of time is being devoted to the preliminary preparation of tissue for the electron-microscopic examination.

Nasionale Padnavorsings- instituut

Direkteur: DR. P. J. RIGDEN

Ontwikkelinge in die Instituut gedurende die afgelope jaar het hoofsaaklik bestaan in die uitbreiding van die verskillende onderafdelings. Aktiewe werk is begin in die Grondmeganika- en Ekonomiese afdelings en voorlopige ondersoeke word daarop toegespits om aanvanklik 'n studie te maak van die navorsingsveld wat deur die onderskeie afdelings gedek sal word. Daarbenewens is 'n begin gemaak met ondersoeke van beide toegepaste en fundamentele aard.

Aangesien 'n gebou om die Instituut te huisves nog nie beskikbaar is nie, is tydelike huisvesting vir die Grondmeganika-afdeling by die Nasionale Bounavorsingsinstituut verkry. Navorsingspersoneel in die Ekonomiese afdeling word tans in die Administratiewe afdeling van die Instituut gehuisves.

Die werwing van personeel het 'n moeilike probleem geblyk en alhoewel die Direkteur wat vir 'n tydperk van omtrent sewe maande oorsee was, 'n paar senior personeellede gewerf het, word die ontwikkeling van die Instituut nog gestrem deur 'n tekort aan die nodige personeel.

BITUMINEUSE AFDELING

Fisiese Eienskappe van Bindstowwe

Die vasstelling van die veranderinge in die viskositeit van bindstowwe op die pad gedurende verwerking, is van belang vir die verbetering van die padbou-eienskappe van hierdie materiale en die ontwikkeling van tegnieke vir hulle gebruik. 'n Verbeterde Mikro-balviskosimeter, wat oorspronklik in hierdie afdeling ontwikkel is, is gebruik vir die bepaling van die viskositeit van monsters van bindstowwe wat van verskeie padproewe verkry is. Hierdie resultate word tans gebruik in die ontwerp van nuwe padproewe om sodoende die beste tegniek van bolaagkonstruksie uit te vind. Hierdie bepaling is verder waardevol vir die verklaring van sekere chemiese struktuurveranderinge wat tydens verwerking plaasvind.

'n Kleinskaalse prototipe-model van 'n bindstofverhitter is gebruik om die uitwerking van langdurige verhitting van bindstowwe by hoë temperature te ondersoek. Aanvanklik is slegs die verandering in viskositeit bepaal, maar tans word 'n verskeidenheid van eienskappe bepaal en waardevolle inligting word ingewin wat van nut kan wees in aanbevelings vir die veilige hantering van bindstowwe in die praktyk.

Aangesien 'n groot gedeelte van die belastings op padoppervlaktes van tydelike aard is, is 'n werksprogram

National Institute for Road Research

Director: DR. P. J. RIGDEN

Development in the Institute during the past year consisted mainly of extending the various subsections. Active work was started in the Soil Mechanics and Economics Sections and the preliminary investigations are aimed at making an initial study of the fields of research to be covered by the various sections. In addition, a start has been made with investigations of both an applied and a fundamental nature.

As no building is yet available to house the Institute, temporary accommodation was obtained from the National Building Research Institute for the Soil Mechanics Section. The research staff of the Economics Section is at present accommodated with the Administrative Section of the Institute.

The recruiting of staff proved a difficult problem and although the Director, who has been overseas for a period of seven months, recruited a few senior members of staff, the development of the Institute is still being retarded by a shortage of staff.

BITUMINOUS SECTION

Physical Properties of Binders

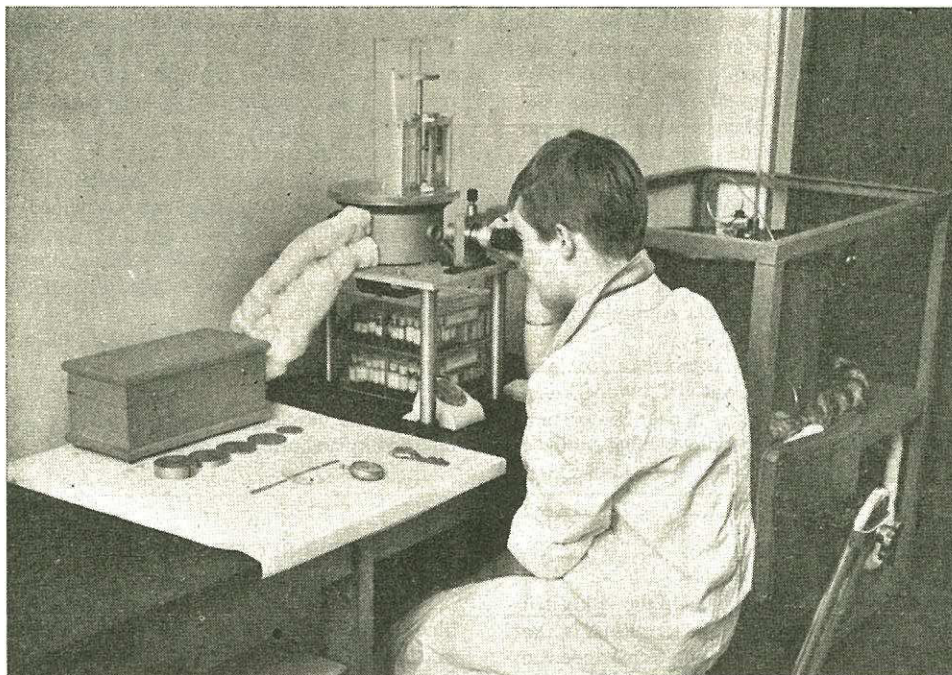
The determination of changes in the viscosity of binders, during weathering on the road, is of importance in connection with the improvement of the properties of these materials for road construction and the development of techniques for their use. An improved micro ball-viscometer, originally developed in this Section, was used for determining the viscosity of samples of binders obtained from various road experiments. These results are at present being used in the design of new road experiments to find the best technique of surface treatment. They are further of value in explaining certain chemical structural changes which take place during weathering.

A small-scale prototype model of a binder heater was used for studying the effects on binders of prolonged heating at high temperatures. Initially, only the change in viscosity was determined, but now a variety of properties are being determined and valuable information which will be of value in recommendations for the safe handling of binders in practice is being obtained.

Because most of the loads to which a road is subjected, are of a transient nature, a programme of work was undertaken with the object of determining the viscoelastic properties of binders under vibrational loading

aangepak om die elastiese en viskose eienskappe van bindstowwe onder trillingsbelasting te bepaal. Metings word ook tans gedoen van die tydsduur en omvang van die normale en tangensiale eenheidsbelasting wat deur bewegende wiele op die pad veroorsaak word. Aangesien vars sowel as verweerde bindstowwe in hierdie toetse ondersoek word, sal die resultate uiteindelik bydra tot die opklaring van die werkverrigtingseienskappe van bindstowwe in die praktyk, onder hierdie bepaalde belastingstoestande.

conditions. Measurements were also made of the duration and incidence of the normal and tangential stresses under moving wheels on the road. Both fresh and weathered materials are being investigated and the results will eventually contribute towards the determination of the performance characteristics of binders subjected to these loading conditions in practice.



Die bal-viskometer wat gebruik word vir die meet van die viskositeit van baie klein monsters bitumen en teer van hoë viskositeit.

The ball viscometer used for measuring the viscosity of very small samples of bitumen and tar of high viscosity.

Chemiese Eienskappe van Bindstowwe

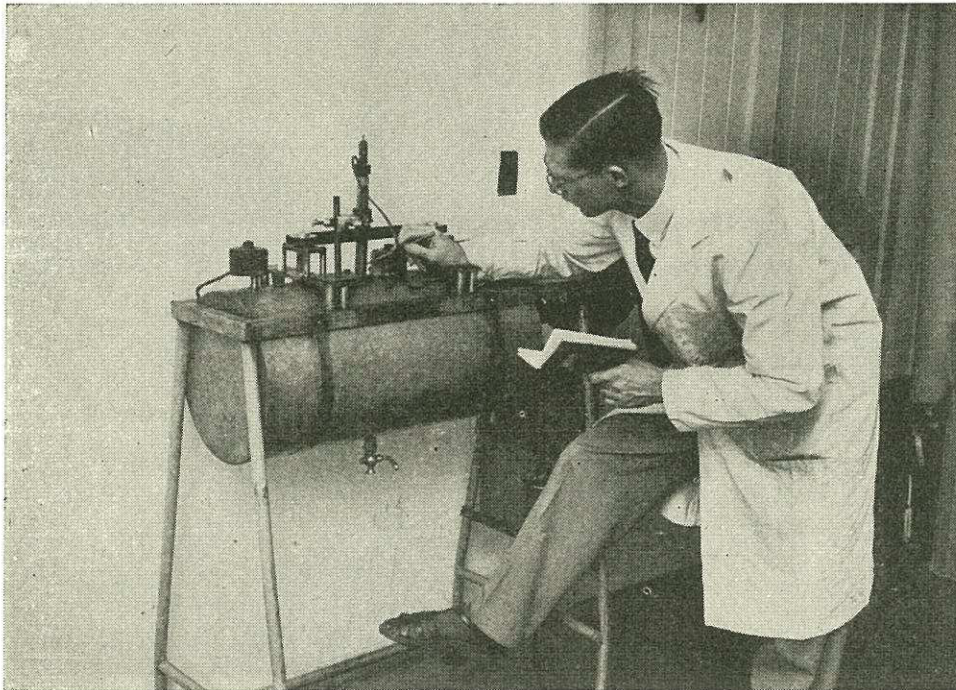
Dit is van die allergrootste belang om nie alleen die chemiese struktuur van bindstowwe te bepaal nie, maar ook die veranderinge in die chemiese eienskappe wat gedurende verwerking plaasvind. 'n Spesiale apparaat is ontwerp om die vlugtigheidseienskappe van bindstowwe te bepaal. Van die resultate wat met verskeie tipes bindstowwe verkry is, is aanbevelings gedoen wat vervaardigers in staat gestel het om bindstowwe aansienlik te verbeter. Hierdie verbeterings is deur middel van volskaalse padproewe gestaaf.

'n Ander eienskap van bindstowwe wat aandag geniet het, is die oksidasievatbaarheid, en verskeie metodes is uitgetoets om verbeterings in hierdie rigting te bewerkstellig. Hoewel aanvanklik nie veel sukses behaal is nie,

Chemical Properties of Binders

It is essential to determine not only the chemical structure of binders but also the changes in chemical properties occurring during weathering. A special apparatus for the determination of the volatile properties of binders has been designed. From the results obtained on various types of binders the Institute was able to make recommendations which enabled manufacturers to improve the binders considerably. These improvements were verified by means of full-scale road experiments.

Another property of binders studied was their susceptibility to oxidation, and different methods were tried to bring about improvements in this direction. Although not much success was achieved initially, good results are now being obtained by the pre-oxidation of binders



'n Model-verhittingstank vir 'n studie van die skadelike uitwerking van langdurige verhitting van groot massas bitumens en tere.

Model heating tank for studying the deleterious effect of prolonged heating of bitumens in tars in bulk.

word daar tans goeie resultate verkry deur middel van die voor-oksidasie van bindstowwe met behulp van die deurblanding van lug onder druk by hoë temperature. Verdere ondersoek van bitumenfraksies met 'n spektrofotometer word tans onderneem.

Volskaalse Padproewe en die Werkverrigting van Bindstofsproeiers

Inligting wat ingewin is deur studies van die werkverrigting, hantering en yking van bindstofsproeiers, is ontleed en 'n pamflet is hieroor gepubliseer om te dien as handleiding by die gebruik van hierdie masjiene. Waarnemings op verskeie volskaalse padproewe is ook voltooi en aanbevelings sowel as koste-ontleding in verband met die aanwending van oppervlaktebehandelings op paaie word tans in pamfletvorm saamgevat vir publikasie.

GRONDMEGANIKA-AFDELING

Werkzaamhede in hierdie afdeling het in Februarie begin, en hoewel die omvang daarvan nog beperk is as gevolg van 'n personeeltekort, is alreeds begin met ondersoek op verskeie projekte. Addisionele navorsing word in samewerking met die Nasionale Bounavorsingsinstituut en die Universiteit van die Witwatersrand onderneem.

Die ondersoek van vraagstukke in die praktyk het reeds 'n aanvang geneem by wyse van studies van 'n paar

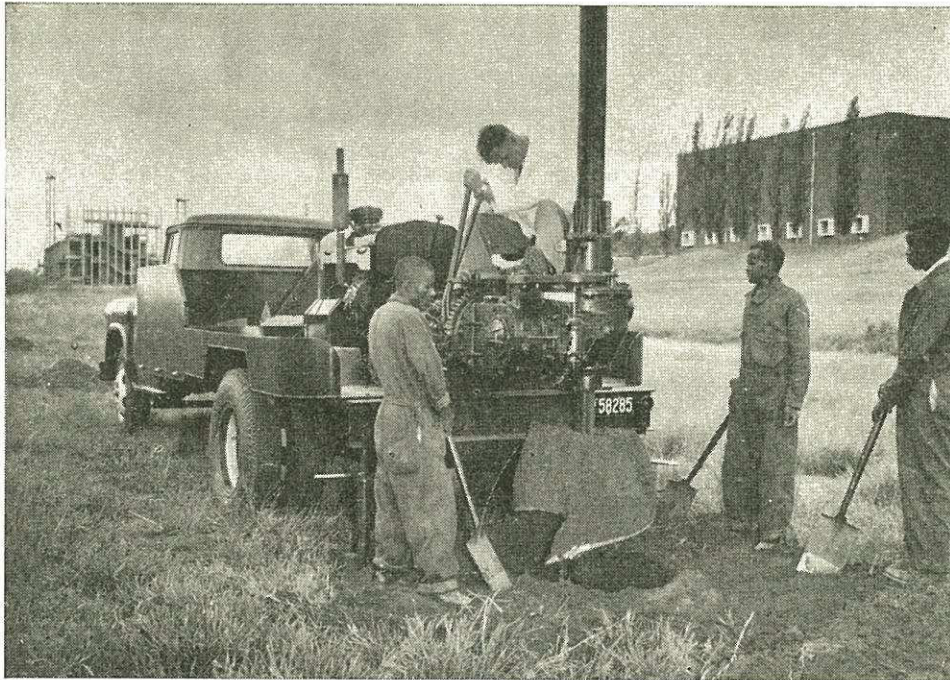
with compressed air at high temperatures. Further investigation of the bitumen fractions is at present being undertaken with the aid of a spectrophotometer.

Full-scale Road Experiments and the Performance of Binder Distributors

Information obtained from studies on the performance, handling and calibration of binder distributors was analysed. A bulletin which will serve as a guide in the use of these machines has been published. Observations taken on several full-scale road experiments have also been completed. A cost analysis together with recommendations on the application of surface treatments on roads are now being completed for publication in bulletin form.

SOIL MECHANICS SECTION

Activities in this Section started in February, and although the extent of the work that can be undertaken at present is limited by a shortage of staff, investigations into several projects have been started. Additional research is being undertaken in co-operation with the National Building Research Institute and the University of the Witwatersrand.



'n Grondboormasjien wat 'n gat van 30-duim deursnee kan boor tot 'n diepte van 20 voet, en gebruik word vir ondersoek van grondtoestande vir padfonderings.

The earth boring machine, capable of drilling a 30-inch diameter hole to a depth of 20 feet, used for investigating road foundation soils.

mislukkings van padfondamente. In die laboratorium het eksperimentele werk oor die verwerking van rotsmateriale deur middel van die bepaling van klei-aktiwiteit, 'n belangrike rigting aangedui vir die benadering van hierdie probleem. Fundamentele werk oor die skeurweerstand van gedeeltelik versadigde gronde is ook begin. 'n Publikasie oor hierdie werk is opgestel vir die Internasionale Konferensie oor Grondmeganika wat in September 1957 in Londen gehou word.

Werk in verband met die beweging van grondwater word tans in samewerking met die Nasionale Bounavorsingsinstituut gedoen, terwyl 'n studie van die ontwerpmetodes vir padfondamente sowel as fundamentele werk in verband met die spannings in fondamentlae in medewerking met die Universiteit van die Witwatersrand gedoen word.

EKONOMIESE EN STATISTIESE AFDELING

Daar is nog geen werk in hierdie verband gedoen nie, maar 'n studie van die kostestruktuur van padbou sal eersdaags onderneem word in medewerking met die ekonomiese navorsingseksie van die Skakelafdeling.

Investigation of practical problems has already been started in the form of studies of a few road foundation failures. In the laboratory, experimental work on the weathering of rock materials by determination of the clay activity indicated an important line of approach to this problem. Fundamental work on the shear strength of partially saturated soils has also been started. A publication on this work is at present being prepared for the International Conference on Soil Mechanics to be held in London in September, 1957.

Work in connection with the movement of ground water is at present being undertaken jointly with the National Building Research Institute, while a study of the design methods for road foundations and fundamental work on the stresses in foundation layers is being done in collaboration with the University of the Witwatersrand.

ECONOMICS AND STATISTICS SECTION

No work has been done in this field, but a study of the cost structure of road construction will shortly be undertaken in collaboration with the economic research section of the Liaison Division.

Sentrale Werkplaas

Verantwoordelike Beampte: MNR. J. VAN DER STAAY

Die afgelope jaar was 'n jaar van groot betekenis vir die Sentrale Werkplaas, aangesien die gebou wat vir die Werkplaas op die nuwe terrein van die W.N.N.R. opgerig is, op 14 November 1955 in gebruik geneem kon word.

Hierdie gebou wat ontwerp is met die oog op die groots moontlike doeltreffendheid, het, na 'n tydperk van slegs nege maande, reeds bewys dat dit aan alle verwagtings voldoen en die W.N.N.R. het nou 'n Werkplaas tot sy beskikking wat alle moderne werksgeriewe verskaf. 'n Konserwatiewe beraming dui daarop dat die verbeterde geriewe van die nuwe gebou die werksverrigting van die Sentrale Werkplaas met minstens 15 persent vermeerder het.

Toerusting ter waarde van ongeveer £12,000 is gedurende die jaar aangekoop, en die masjinerie wat in die Instrumente-werkplaas beskikbaar is, stel die personeel in staat om instrumentonderdele tot op 1/10,000ste van 'n duim noukeurig te vervaardig.

Central Workshops

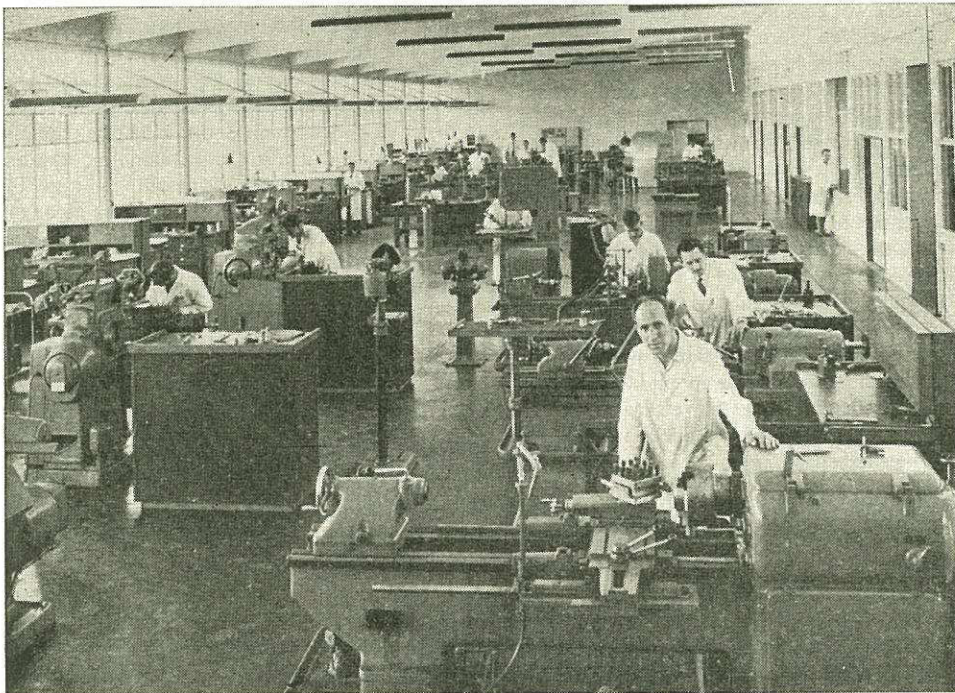
Officer in Charge: MR. J. VAN DER STAAY

The past year has been one of great significance to the Central Workshops, since the building erected for the Workshops on the new site of the C.S.I.R. became available for occupation on 14th November, 1955.

This building, designed with the object of ensuring the greatest measure of efficiency, has, after a period of only nine months, fully justified expectations and the C.S.I.R. now has at its disposal Workshops which fulfil all modern requirements. A conservative estimate indicates that the improved facilities provided by the new building have increased the output of the Central Workshops by about 15 per cent.

During the year, equipment to the value of about £12,000 was bought and the machinery now available in the Instrument Workshop will enable the staff to construct component parts to an accuracy of 1/10,000th of an inch.

The Central Workshops is composed of the following sections: Instrument Workshop, Wood Workshop, Electrical Workshop, Sheet Metal Workshop, Cyclotron



Die masjienkamer in die nuwe gebou van die Sentrale Werkplaas.

The machine hall in the new Central Workshops building.

Die Sentrale Werkplaas bestaan uit die volgende afdelings: Instrumentewerkplaas; Skrynwerkerswinkel; Elektrotegniese Werkwinkel; Plaatmetaalwinkel; Siklotronwerkplaas; Magasyn en Optiese Werkplaas. Sy totale personeel bestaan tans uit 48 blankes en 13 nie-blankes, waarvan 26 blankes en 4 nie-blankes werksaam is in die Instrumentewerkplaas.

Om te voorsien in die daaglikse behoeftes van die Nasionale Instituut vir Meganiese Ingenieurswese en die Nasionale Fisiese Navorsingslaboratoriums, het die Sentrale Werkplaas 'n klein laboratorium-werkplaas opgerig vir hul spesiale gebruik in die gebou in Visagiestraat en drie instrumentmakers tot hul beskikking gestel.

Die vakleerling-opleiding in die Instrumente-werkplaas is so gewild dat vir hierdie kursus die getal aansoeke reeds baie groter is as wat daar poste beskikbaar is.

Die totale waarde van kapitaaluitrusting wat gedurende die jaar deur die Sentrale Werkplaas vervaardig is, bedra £16,462.

Onder die belangrikste instrumente wat vir die Raad se laboratoriums vervaardig is, is 'n Funksie-ontwikkelaar vir gebruik in die elektroniese differensiaalontleder (Heiden), 'n klanksnelheidsmeter vir die meet van die snelheid van klank in seewater by verskillende temperature en dieptes, 'n klankpulsapparaat vir metings van akoestiese golwe in sale, 'n outomatiese skyfmeganisme vir die verwydering van skywe uit die siklotron sonder dat dit nodig is om die vakuum te verbreek, 'n polariskoop met 'n 12-duim lens wat beskou word as die grootste van sy soort in die wêreld en gebruik word vir die bepaling van spanningsverspreiding in verband met rotsstortingsprobleme in diep myne, 'n stofskei-apparaat vir die afskeiding van asdeeltjies uit 'n lugstroom, 'n grondvolume meter vir die bepaling van die vogtigheidsgehalte en invloed daarvan op die uitsetting van grondmonsters, 'n waterontsoutingstroefinstallasie vir die ontsouting van water met behulp van positiewe en negatiewe membrane, 'n lugdinamiese sleepkragbalans om die lugdinamiese weerstandskoeffisiënt van draadgaas in baie lae lugvloei-snelhede te bepaal, 'n vlugtigheidsapparaat vir die versnelde bepaling van die vlugtigheid van bitumiese bindstowwe in verskillende atmosfeer (bv. suurstof, stikstof en lug), en 'n reeks kosinus- en kleurgekorregerde fotoselle om dagligmetings in volskaalse geboue te doen sowel as ligmetings in skaalmodelle van kamers om venstergroottes te bepaal.

Heelwat werk is volgens kontrak vir buite-organisasies en firmas verrig, soos byvoorbeeld, 'n massaspektrometer wat vir die S.A. Steenkool, Olie en Gasmaatskappy (Sasol) vervaardig is.

Workshop, the Stores Section and the Optical Section. Its total staff consists of 48 Europeans and 13 non-Europeans, of which 26 Europeans and 4 non-Europeans are engaged in the Instrument Shop.

To provide for the daily requirements of the National Mechanical Engineering Research Institute and the National Physical Research Laboratory, the Central Workshops has equipped a small laboratory workshop in the building in Visagie Street for their special use and placed 3 instrument-makers at their disposal.

The training of apprentices in the Instrument Shop has proved to be so popular that the number of applications for apprenticeship already exceeds the number of posts available.

The total value of capital equipment constructed by the Central Workshops during the year, amounted to £16,462.

Among the more important instruments constructed for the Council's laboratories were a function generator for use in the electronic differential analyser (Heiden); a sound measuring instrument for measuring sound velocity in sea water at different temperatures and depths; a sound pulse apparatus for measuring acoustic waves in halls; an automatic target-mechanism for removing targets from the cyclotron without breaking the vacuum, a polariscope with a 12 inch lens which is believed to be the largest of its type in the world and is used for determining stress distributions in connection with rock burst problems in deep mines; a dust separator for separating ash particles from air current; a soil volume meter for determining the moisture content and its effect on the expansion of soil samples; a water demineralization pilot plant for the desalting of water by means of positive and negative membranes; an aerodynamic drag balance to determine the aerodynamic resistance coefficient of wire gauze in very low air velocities; a volatility device for the accelerated determination of the volatility of bituminous binders in different atmospheres (e.g. oxygen, nitrogen and air), and a series of cosine and colour-corrected photo cells for use in daylight measurements in full scale buildings and also for light measurements in scale models of rooms for determining window size.

A considerable amount of work was also done under contract for outside organizations and firms, for example, a mass spectrometer was constructed for S.A. Coal, Oil and Gas Company (Sasol).

Mediese Navorsing

Ere-Adviseur: PROF. S. F. OOSTHUIZEN

Komitees

Die Raad spreek sy diepe meegevoel uit met die afsterwe van dr. T. B. Davie, Voorsitter van die Mediese en Tandheelkundige Navorsingskomitee. Dr. Davie het dienste van onskatbare waarde gelewer met die ontwikkeling van mediese navorsing onder beskerming van die Raad. Prof. S. F. Oosthuizen is in die plek van dr. Davie benoem tot permanente voorsitter van die komitee.

Die Raad spreek sy waardering uit aan die lede van die Mediese en Tandheelkundige Navorsingskomitee en aan die lede van die subkomitees vir mediese navorsing vir hul voortdurende belangstelling en vir hul leiding ten opsigte van die navorsingsprogramme van die mediese navorsingseenhede.

Dr. A. J. Orenstein en prof. J. T. Irving het aan die einde van 1955 uitgetree as lede van die Mediese en Tandheelkundige Navorsingskomitee, en in ooreenstemming met die bepalings van die konstitusie van die komitee, is hulle vir een jaar nie weer verkiesbaar nie. Hul plekke is gevul deur dr. J. F. Murray van die Suid-Afrikaanse Instituut vir Mediese Navorsing en prof. H. H. Louw van die Tandheelkundige Fakulteit van die Universiteit van Pretoria. Drr. J. H. S. Gear en W. H. Craib is tot die komitee benoem as plaasvervangende lede in die plekke van drr. J. F. Murray en G. W. Gale.

Fondse

Vir die boekjaar 1956/57 is sowat £100,500 vir mediese en tandheelkundige navorsingswerk toegeken. Hiervan was sowat £20,700 vir individuele mediese en tandheelkundige navorsers aan universiteite, £7,500 vir die Suid-Afrikaanse Instituut vir Mediese Navorsing en sowat £72,300 vir die mediese navorsingseenhede (met uitsluiting van die Navorsingseenheid vir Pneumokoniose).

Navorsing oor Narkosesterftes

Vanaf 1 Julie 1956 is 'n beursoouer aangestel uit die jaarlikse toekenning van £2,000 wat die Transvaalse Provinsiale Administrasie vir drie jaar beskikbaar gestel het.

'n Begin is gemaak met die versameling en statistiese ontleding van narkosesterftes oor die afgelope drie jaar. Navorsingswerk oor die elektrolitiese balans in chirurgiese operasies word ook aangevoer.

Navorsingseenheid vir Pneumokoniose

Die Navorsingseenheid vir Pneumokoniose, wat ondersteun word deur die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese, die Departement van Mynwese, die Gesamentlike Komitee van die Mynwerkersunies en

Medical Research

Hon. Advisor: PROF. S. F. OOSTHUIZEN

Committees

The Council records its deep regret at the death of Dr. T. B. Davie, Chairman of the Medical and Dental Research Committee, who played an invaluable part in the establishment of medical research under the aegis of the Council. Prof. S. F. Oosthuizen was appointed permanent Chairman of the Committee in Dr. Davie's place.

The Council expresses its appreciation to the members of the Medical and Dental Research Committee and members of the medical research sub-committees for their continued interest and for their guidance on the research programmes of the medical research units.

Dr. A. J. Orenstein and Prof. J. T. Irving relinquished membership of the Medical and Dental Research Committee at the end of 1955 and, in accordance with the Committee's constitution, were for one year not eligible for re-election. Their places were taken by Dr. J. F. Murray of the South African Institute for Medical Research, and Prof. H. H. Louw of the Dental Faculty of the University of Pretoria. Drs. J. H. S. Gear and W. H. Craib were appointed to the Committee as alternate members in the places of Drs. J. F. Murray and G. W. Gale.

Funds

A sum of about £100,500 was allocated for medical and dental research during the financial year 1956/57; some £20,700 being allocated to individual medical and dental research workers at universities, £7,500 to the South African Institute for Medical Research, and about £72,300 to medical research units (excluding the Pneumokoniosis Research Unit).

Research into Anaesthetic Deaths

A bursar was appointed as from 1st July, 1956, under the annual grant of £2,000 which the Transvaal Provincial Administration agreed to make available for three years.

Work has started on the compilation and statistical analysis of anaesthetic deaths over the past three years. Research is also being initiated into the electrolytic balance in surgical operations.

Pneumoconiosis Research Unit

The Pneumoconiosis Research Unit, sponsored by the Transvaal and O.F.S. Chamber of Mines, the Department of Mines, the Mining Union's Joint Committee, and the South African Institute of Medical

die Suid-Afrikaanse Instituut vir Mediese Navorsing, is gedurende die jaar gestig onder beskerming van die W.N.N.R.

Dr. A. J. Orenstein is benoem tot direkteur van die eenheid vanaf 1 Maart 1956.

Navorsingseenheid vir Gesinsgesondheid

Die Raad het op 31 Maart 1956 ondersteuning aan die Navorsingseenheid vir Gesinsgesondheid gestaak. Die navorsingswerk wat onderneem word deur dr. H. Kuper, senior beurshouer in die eenheid, sal egter vir nog 'n jaar, naamlik tot 31 Maart 1957, deur die Raad ondersteun word.

Endokrien-navorsingsgroep

Die Raad het besluit om erkenning te verleen aan 'n groep navorsers aan die Universiteit van Kaapstad wat navorsingswerk gedoen het op die gebied van endokrinologie en metabolisme, en wat in die verlede ondersteuning ontvang het by wyse van *ad hoc*-toekennings. Gevolglik is nou 'n Endokrien-navorsingsgroep in die lewe geroep onder leiding van prof. F. Forman.

Die navorsingswerk wat deur die groep onderneem word, sluit in: bepaling van plasma-hidrokortisoon, aldosteron en ander steroïde, deur middel van chromatografiese metodes; bepaling van plasma-insulienwerking, deur middel van 'n rot-diafragmategniek; ondersoek van die voordiabetiese toestand en 'n breedvoerige opname van suikersiekte-pasiënte wat die kliniek besoek; ondersoek van bloedsuikerverlagingsmiddels wat deur die mond toegedien word; ondersoek van abnormale ontwikkeling van geslagsorgane, geslagsonderskeiding en hipertekose van ovaria; studies van kalsium- en fosformetabolisme; en, laastens, studies van watermetabolisme in endokrien- en ander toestande.

Navorsingseenheid vir Artropode-gedraagde Virussiektes

Die Raad het ingestem om 'n eenheid te ondersteun wat toegespits is op artropode-gedraagde virussiektes in Suidelike Afrika. Hierdie eenheid wat in die laboratorium van die Polio-navorsingstigting gevestig is, is ondersteun deur die Rockefeller-stigting, die Onderstepoortse laboratoria vir veeartsenykundige navorsing, die Suid-Afrikaanse Instituut vir Mediese Navorsing en die Polio-navorsingstigting, en is nou deur die W.N.N.R. erken as 'n mediese eenheid, met dr. J. H. S. Gear as direkteur.

Die werk van die eenheid sluit in laboratorium- en veldondersoeke oor artropode-gedraagde virussiektes in Suidelike Afrika met spesiale aandag aan Noord-Natal, waar verskeie gevalle van hierdie siekte voorgekom het.

Die doel van die eenheid se navorsingsprogram is om 'n beskrywing te gee van die artropode-gedraagde virusse wat voorkom, om die veroorsakende agens te isoleer en te identifiseer, om hul patogeniese en immunologiese eienskappe te bestudeer, om vas te stel of wilde diere of voëls belangrike draers is van daardie siektes in die natuur, en om die oordraers op te spoor en om beheermetodes te vind.

Research was established during the year under the aegis of the C.S.I.R.

Dr. A. J. Orenstein was appointed Director of the Unit as from 1st March, 1956.

Family-health Research Unit

The Council terminated its support of the Family-health Research Unit on 31st March, 1956. The research being done by Dr. H. Kuper, Senior Bursar in the Unit, will, however, be supported by the Council for a further year, to 31st March, 1957.

Endocrine Research Group

The Council decided to grant recognition to a group of research workers at the University of Cape Town who had been working in the fields of endocrinology and metabolism and who had received support in the past by means of *ad hoc* grants. The Endocrine Research Group under Prof. F. Forman was therefore established.

Research work being done by the Group includes the estimation of plasma hydrocortisone, aldosterone and other steroids by chromatographic techniques; estimation of plasma insulin activity by a rat diaphragm technique; the investigation of the prediabetic state and a detailed survey of diabetic patients attending clinic; investigation of oral hypoglycaemic agents; investigation of gonadal dysgenesis, sexual differentiation and ovarian hyperthecosis; studies in calcium and phosphorus metabolism; and, finally, studies in water metabolism in endocrine and other states.

Arthropod-borne Virus Diseases Unit

The Council has agreed to support a unit devoted to the arthropod-borne virus diseases of Southern Africa. This Unit, which has been functioning in the laboratories of the Poliomyelitis Research Foundation, was sponsored by the Rockefeller Foundation, the Onderstepoort Laboratories for Veterinary Research, the South African Institute for Medical Research and the Poliomyelitis Research Foundation. It has now been recognised as a C.S.I.R. Medical Unit under the directorship of Dr. J. H. S. Gear.

The work of the unit involves laboratory and field investigations on arthropod-borne virus diseases in Southern Africa with special attention being given to Northern Natal where several of these diseases have been found to be present.

The aim of the Unit's research programme is to define the arthropod-borne viruses which occur, to isolate and identify the agents which cause them, to study their pathogenic and immunological properties, to determine whether wild animals or birds are important hosts of those diseases in nature, and to discover their vectors and seek methods for control.

Skakeling

Dr. Robert M. Kark en dr. Graham Bull, die Raad se mediese ere-skakelbeamptes in die Verenigde State en die Verenigde Koninkryk onderskeidelik, het weereens waardevolle hulp verleen aan mediese en tandheelkundige navorsings in Suid-Afrika, deur die W.N.N.R. op die hoogte te hou van ontwikkelinge op die gebied van mediese en tandheelkundige navorsingswerk in Brittanje en Noord-Amerika.

Gedurende die jaar het prof. Oosthuizen die Verenigde State van Amerika, die Verenigde Koninkryk en Europa besoek, asook verskillende sentrums in Suid-Afrika. Sy verslae hieroor is baie waardevol.

Mediese Navorsingseenhede

Verslae deur die direkteure van die mediese navorsingseenhede verskyn hieronder. Die bystand van provinsiale en staatsowerhede, die S.A. Instituut vir Mediese Navorsing, universiteite en individue wat meegehelp het met die werk, word met dank erken.

AMEBIASE-NAVORSINGSEENHEID

Hoof van die Eenheid: DR. R. ELSDON-DEW
Koning-Edward VIII-hospitaal, Durban

Gedurende die jaar is die Eenheid vereer deur twee belangrike besoekers uit die buiteland. Dr. D'Almeida Franco van die Instituto de Medicina Tropical, Lissabon, en 'n beurshouer van die Wêreldgesondheidsorganisasie, het van September tot Desember 1955 in die laboratoriums, die verpleegsale en in die lykskouingskamers gewerk aan die studie van die immobilisering van *Entamoeba histolytica* deur immuunserum.

Die tweede besoeker was professor W. W. Frye, Dekaan van die Mediese Skool van die Universiteit van die Staat Louisiana, Voorsitter van die Afdeling Tropiese Siektes van die Verenigde State se Openbare Gesondheidsdiens, en 'n wêreldbekende outoriteit op die gebied van amebiase. As deel van 'n wêreldreis van drie maande, het hy Desember 1955 aan die Eenheid deurgebring. As een van die ontwerpers van die Shaffer-Frye-tegniek van monokseenkultuur, het hy ondersoek ingestel na hierdie Eenheid se mislukking met dié tegniek, maar sonder enige welslae. Professor Frye was baie verras oor die kliniese materiaal wat in hierdie Eenheid beskikbaar is.

Faktore wat *E. histolytica in vivo* Beïnvloed

'n Studie oor die uitwerking van verskillende stowwe op die verloop van die siekte, het voortgeduur. 'n Belangrike feit is dat die resultate wat met tetrasiklaan verkry is, maar min verskil van die van sy derivate, oksitetrasiklaan en chloortetrasiklaan.

Opnamewerk

'n Opname word gemaak van die personeel van 'n plaaslike fabriek om die persone wat inwoon te vergelyk

Liaison

Dr. Robert M. Kark and Dr. Graham Bull, the Council's honorary medical liaison officers in the United States and the United Kingdom respectively, have continued to give valuable help to medical and dental research workers in South Africa by reporting to the C.S.I.R. on developments in the field of medical and dental research in Great Britain and North America.

During the year Prof. Oosthuizen visited the United States of America, the United Kingdom and Europe, and also various centres in South Africa. His reports were of great value.

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 S.A. Institute for Medical Research, Universities and individuals who have co-operated in this work is gratefully acknowledged.

AMOEBIASIS RESEARCH UNIT

Head of the Unit: DR. R. ELSDON-DEW
King Edward VIII Hospital, Durban

During the year the Unit was honoured by two important visitors from overseas. Dr. D'Almeida Franco, a World Health Organization Fellow of the Instituto de Medicina Tropical of Lisbon, spent from September to December, 1955, working in the laboratories, the wards and in the *post mortem* rooms, studying the immobilization of *Entamoeba histolytica* by immune sera.

The second visitor was Professor W. W. Frye, Dean of the Medical School of the Louisiana State University, Chairman of the Tropical Diseases Study Section of the United States Public Health Service, and a world authority on amoebiasis. Of a three months' world tour, he spent the month of December, 1955, with this Unit. One of the originators of the Shaffer-Frye technique of monoxenic culture, he investigated this Unit's failure with his technique, but had no greater success. Professor Frye was very impressed with the clinical material available in this Unit.

Factors Influencing *E. histolytica in vivo*

Study of the effects of various substances in the course of the disease has been continued. An interesting fact is that the results from tetracycline differ but little from those of either of its derivatives, oxytetracycline and chlortetracycline.

Surveys

A survey of the staff of a local factory is in hand with the object of a comparison of those living in with those

met dié wat buite woon. Hoewel die opname nog nie klaar is nie, is 'n interessante kenmerk die baie hoë voorkoms van *Taenia saginata*.

In medewerking met die plaaslike *ad hoc*-komitee vir bilharzia, is 'n begin gemaak met 'n opname van plaaslike skoolkinders. Van die eerste 271 seuns wat ondersoek is, was daar 145 gevalle met *Schistosoma haematobium* in die urine, twee gevalle met *S. mansoni*, en twee gevalle met *Taenia sp.* Van 203 dogters, het 37 die eiers van *S. haematobium* getoon, nege die van *Taenia sp.*, ses die van *Enterobius*, en twee die van *Ascaris*. Die teenwoordigheid van groot getalle epiteelselle, neerslae, skimmels, ens. maak die getalle vir dogter-positiewes beslis te laag. Die voorneme is om die belangrikheid van bilharziase in hierdie gebied te beoordeel voordat ondersoekwerk van 'n meer uitgebreide aard onderneem word. Volkome skakeling met die Bilharzia-Navorsingseenheid word gehandhaaf.

Laboratoriumondersoeke

'n Nuwe benadering is aangevoer vir die aanlê van monokseenkulture. Die enigste plek waar *E. histolytica* groei, sonder tussenkoms van bakterieë, is in die lewer. Na 'n paar pogings is sukses behaal met twee substamme, en hopelik sal dit, met 'n verandering van antibiotika, moontlik wees om die amebas van *Clostridium*-kultuur na ander organismes oor te plaas. Dit sal geleentheid bied vir verdere studie van die antigeniese struktuur van die ameba.

Proefnemings is uitgevoer op enkistering. Dit is gedoen om 'n teorie van die Direkteur en andere te toets. Vorige ondervinding was dat die Eenheid se stamme van *E. histolytica*, wat in hoofsaak van akute gevalle geïsoleer was, nie *in vitro* enkister nie. Dit het die teorie laat ontstaan dat as *E. histolytica* eers eenmaal indringend geword het, dit nie langer in staat is om te enkister nie. Deur die trofosoïete met water te vernietig, kon aangetoon word dat sommige van die Eenheid se stamme gereeld kiste vorm, maar aangesien hulle in die eerste plek van ontlastings verkry is, was daar nie sekerheid of die Eenheid nie besig is met die afstammeling van kiste wat met die aanvanklike entstof ingevoer is nie. Dog die produksie van die nuwe lewerstam het aangetoon dat, in verbinding met M. flora, d.w.s. 'n gemengde flora wat van 'n ontlasting geïsoleer is, die lewer-amebas wel kiste veroorsaak. Dit is slegs een enkele waarneming en sal herhaal moet word voordat enige definitiewe gevolgtrekkings gemaak kan word, maar dit is tog van belang as 'n verwerping van 'n teorie.

Daar is ook 'n begin gemaak met 'n reeks proefnemings met elektrotaksis in *Trichomonas vaginalis*.

'n Reeks proefnemings is begin oor die ontwikkeling en uitbroei van die eiers van *Ascaris lumbricoides*; maar dit is 'n langtermynprojek.

Gedurende die jaar is 'n wurm, wat uit die boonste kanaaltjie van die oog gekruip het, geïdentifiseer as 'n jong *A. lumbricoides*.

living out. Though the survey is not as yet complete, an interesting feature is the very high incidence of *Taenia saginata*.

In conjunction with the local *ad hoc* Committee on Bilharzia, a survey of local school children has been commenced, and of the first 271 boys surveyed, 145 showed *Schistosoma haematobium* of the urine, 2 showed *S. mansoni*, and 2 *Taenia sp.*; and of 203 girls, 37 showed the ova of *S. haematobium*, 9 *Taenia sp.*, 6 *Enterobius* and 2 *Ascaris*. Large numbers of epithelial cells, debris, fungi, etc., make the figures on girl-positives certainly too low. It is proposed to assess the importance of bilharzia in this area before undertaking any wider work. A complete liaison is being maintained with the Bilharzia Research Unit.

Laboratory Investigations

A new approach was attempted in the establishment of monoxenic cultures. The only place where *E. histolytica* grows without the intervention of bacteria is in the liver. After a number of attempts, success was obtained with two sub-strains, and it is hoped that by an antibiotic switch, it will be possible to transfer the amoebae from *Clostridium* culture to other organisms. This will provide an opportunity for further study of the antigenic structure of the amoeba.

Experiments have been carried out on encystment. These were done to test a theory propounded by the Director and others. Previous experience has been that the Unit's strains of *E. histolytica*, isolated in the main from acute cases, did not encyst *in vitro*. This raised the theory that once *E. histolytica* had become invasive it was no longer able to encyst. By destroying the trophozoites with water it was possible to demonstrate that some of the Unit's strains regularly form cysts but, as these had been derived in the first place from stools, it was not possible to be sure that the Unit was not dealing with descendants of cysts introduced with the initial inoculum. However, the production of the new liver strain has indicated that in conjunction with M flora—that is, a mixed flora isolated from a stool—the liver amoebae do produce cysts. This is but an isolated observation and will have to be repeated before any definite conclusions can be drawn; it is, however, of interest in disposing of a theory.

A series of experiments on electrotaxis in *Trichomonas vaginalis* have also been started.

A series of experiments on the development and hatching of the ova of *Ascaris lumbricoides* has been started, but this is a long-term project.

During the year a worm crawling out of the upper canaliculus of the eye was identified as a young *A. lumbricoides*.

NATUURHISTORIESE BILHARZIA-EENHEID, JOHANNESBURG

Hoof van die Eenheid: DR. B. DE MEILLON
Suid-Afrikaanse Instituut vir Mediese
Navorsing, Johannesburg

Bilharziase in Proefdiere

Navorsing in verband met verskillende projekte is vertraag of heeltemal gestaak omdat die Eenheid se histopatoloog, dr. H. I. Lurie, van die S.A. Instituut vir Mediese Navorsing, wat in die verlede sulke waardevolle diens gelewer het, nie meer tyd tot sy beskikking het om met hierdie werk voort te gaan nie. Verslae oor projekte wat voltooi of byna voltooi is, soos immunisering, patologie van herbesmetting na genesing, herhaalde langtermynherbesmetting in ape en muise, patologie van bilharziase in diere met 'n tekort aan proteïen, ens., word nou vir publikasie opgestel.

Biologiese Prestasie van Bilharzia-besette Muiskolonies

'n Studie oor die uitwerking van bilharziase op muisebevolkings is voortgesit. Baie tyd en arbeid word aan hierdie navorsingswerk gewy omrede van die groot aantal muise wat daarvoor gebruik word.

'n Paar van die vraagstukke wat volgens hierdie tegniek ondersoek word, is:

- (i) Verskille tussen groot en klein aanvangsdosisse van serkarië.
- (ii) Die immuniserende uitwerking van 'n klein aanvangsdosis.
- (iii) Immuniserende uitwerking van herhaalde klein dosisse.
- (iv) Invloed van bykomende las op besette muise, bv. 'n dieet met gebrek aan proteïen.
- (v) Invloed van bilharziase op die voorkoms van kanker in *Mastomys*.

Hierdie proewe is nog nie voltooi nie, maar 'n paar voorlopige gevolgtrekkings kan gemaak word, bv.:

- (a) 'n Aanvanklike besmetting met 'n klein aantal serkarië het 'n baie opvallende immuniserende uitwerking teen daaropvolgende herbesmettings.
- (b) Herhaalde herbesmettings, met tussenposes van 'n week, deur middel van 'n klein aantal serkarië het gelei tot 'n skynbaar volkome immunisering van ongeveer 50% van die muise. Uit proefnemings met ape is bekend dat weeklikse herbesmettings oor 'n tydperk van sowat 24 maande nie die toestand van die lever of bloed op enige manier vererger nie, maar aan die ander kant is dit bekend dat herbesmetting in 'n chemoterapeuties-genese dier as 'n primêre besmetting optree.
- (c) Tot dusver toon die bykomende las van 'n proteïentekort in muise wat met bilharzia besmet is geen onverwagte gevolge nie.

BILHARZIA NATURAL HISTORY UNIT, JOHANNESBURG

Head of the Unit: DR. B. DE MEILLON
South African Institute for Medical Research,
Johannesburg

Bilharziasis in Experimental Animals

Work on several projects has been slowed down or completely stopped, because the Unit's honorary histopathologist, Dr. H. I. Lurie, of the S.A.I.M.R., who has rendered such valuable service in the past, can no longer find the time to continue with the work. Such projects as are completed or nearly completed, e.g. immunization, pathology of reinfection after cure, repeated long-term reinfection in monkeys and mice, pathology of bilharziasis in protein deficient animals, etc., are being written up for publication.

Biological Performance of Bilharzia-Infested Mouse Colonies

The study on "bilharzial effect" in populations of mice has been continued. Much time and labour are spent on this work because of the large numbers of mice employed.

Some problems which are being investigated by this technique are:

- (i) Differences between large and small initial doses of cercariae.
- (ii) Immunizing effect of a small initial dose.
- (iii) Immunizing effect of repeated small doses.
- (iv) Influence of additional strain on infected mice, e.g. protein deficient diet.
- (v) Influence of bilharzia on the incidence of cancer in *Mastomys*.

The experimental work has not been completed, but some tentative conclusions are permissible, e.g.:

- (a) An initial infection with a small number of cercariae has a most striking immunizing effect against subsequent infections.
- (b) Repeated reinfections at weekly intervals with small numbers of cercariae result in apparent complete immunization of $\pm 50\%$ of mice. From experiments in monkeys it is known that weekly reinfections over a period of about 24 months do not in any way aggravate the liver pathology or blood chemistry. On the other hand, it is known that reinfection in a chemotherapeutically cured animal behaves as a primary infection.
- (c) Thus far, the additional strain of protein deficiency in bilharzia-infected mice has produced no untoward results.

'n Nuwe Antigeen vir Komplementbindingsreaksie van Bilharziase

Omdat dit so moeilik is om tred te hou met die aanvraag vir die komplementbindingsreaksie-toetse, is ander bronne van antigeen ondersoek. Die metodes wat in die verlede gebruik is vir die bereiding van antigeen uit serkarië het baie nadele. Die belangrikste hiervan is die probleem om die nodige hoeveelheid te verkry. Met die hulp van dr. Wolstenholme, van die Rietfontein-Laboratoriums van die S.A. Instituut vir Mediese Navorsing, word dus 'n ondersoek ingestel na die moontlike gebruik van antigene wat berei is van volwasse wurms wat in muise geteel word. Die resultate tot dusver is baie belowend.

Die Komplementbindingsreaksie-toets op Skoolkinders

Die langtermyn-waarnemings van die gedrag van hierdie toets op skoolkinders duur voort.

Parasitisme en die Voedingstatus

In medewerking met die Navorsingseenheid vir Menslike Biochemie is 'n langtermyn-ondersoek oor hierdie vraagstuk aan die gang, maar tot dusver is nog baie min noukeurige inligting beskikbaar. 'n Projek wat tans ook ondersoek word is die bestudering van 'n groep swak gevoede Bantoe-kinders naby Rustenburg wat aan bilharziase ly.

Die Gevolg van Onbehandelde Bilharziase

Hierdie studie word onderneem in medewerking met sekere goudmyne aan die Witwatersrand en die Navorsingseenheid vir Menslike Biochemie. Kortliks: Bantoe-werkers uit tropiese gebiede word ondersoek met betrekking tot bloedbiochemie, bloedbeeld, parasitisme en voedingstatus aan die begin van die kontrak en weer nadat dit verstryk is.

Om verskeie redes vorder die ondersoek maar langzaam, en tot dusver is nog slegs 15 sulke gevalle volledig ondersoek. Oor die resultate kan baie min gesê word. Een baie interessante en onverwagte verskynsel wat egter gedurende die ondersoek aan die lig gekom het, is die afwykings in die spoed van rooisedimentasie in Bantoe-werkers by hul aankoms en die ommekeer na die normale by repatriasie. Hierdie ommekeer is slegs die gevolg van die verandering na 'n gebalanseerde en toereikende dieet wat deur die myne verskaf word.

Afsonderlike Eenhede op Bilharzia-navorsing

Slakopname in riviere van die Laeveld

Dr. R. J. Pitchford, Onder-direkteur van die Natuur-historiese Bilharzia-eenheid, wat op Nelspruit gestationeer is, berig dat twee veldassistente van die Departement van Gesondheid oorgeneem is. Een van hulle wat in Desember diens aanvaar het, hou toesig oor die kontroleskema by Boulders Greenstone Tonetti, en hy doen weeklikse kontrolewerk by 'n stroom in Komatipoort. Die

A New Antigen for the Bilharzia Complement Fixation Reaction

Because of the difficulty in keeping up with the demand for the B.C.F. test, other sources of antigen have been explored. The preparation of antigen from cercariae—the techniques used in the past—has many disadvantages, chief amongst which is the difficulty of obtaining the necessary bulk. Therefore, with the help of Dr. Wolstenholme of the Rietfontein laboratories of the S.A. Institute for Medical Research, the possible use of antigens from adult worms which are cultured in mice has been investigated. The results so far obtained are very promising indeed.

The B.C.F. Test on School Children

The long-term observations on the behaviour of the B.C.F. test in school children continue.

Parasitism and the Nutritional State

In collaboration with the Human Biochemistry Research Unit, a long-term investigation of this problem is in progress, but as yet very little precise information is available. A project under immediate investigation related to a group of poorly nourished, bilharzia-infested Bantu children near Rustenburg.

Fate of Untreated Bilharziasis

This study is being undertaken in collaboration with certain Witwatersrand gold mines and the Human Biochemistry Research Unit. Briefly, tropical Bantu labourers are examined with regard to blood biochemistry, blood picture, parasitism and nutritional state on commencement of contract and again on termination.

The investigation is slow for many reasons, and to date only 15 subjects have gone through the complete "before and after" investigation. Little can be said about results. One very interesting and unsuspected feature which has, however, emerged from this investigation has been the abnormalities detected in the erythrocyte sedimentation rate of Bantu workers on arrival and the reverse to normality on repatriation. This reversal, be it noted, is solely due to the change to a balanced and adequate diet provided by the mines.

Detached Units for Bilharzia Research

Snail survey in Lowveld rivers

Dr. R. J. Pitchford, Sub-Director of the Bilharzia Natural History Unit, who is stationed at Nelspruit, reports that two field assistants have been taken on from the Health Department. One of these who commenced work in December is supervising the control scheme at Boulders Greenstone Tonetti, and is doing weekly control work on a stream at Komatipoort. The Boulders scheme

Boulders-skema is nou reeds vier jaar aan die gang, en 'n paar resultate op die menslike bevolking kan miskien later vanjaar getoon word. Die Komatipoort-skema word slegs aan die gang gehou om te sien watter uitwerking klein hoeveelhede kopersulfaat (sowat 3 d.p.m.) op die slakke het. Die mense is ongelukkig nou uit die gebied verwyder.

Die ander veldassistent is aan die begin van Junie 1956 aangeneem en sal toesig hou oor kontrolewerk in die Lebombo-reservaat suid van Komatipoort. Hy sal ook die huidige Komatipoort-skema van die ander assistent oorneem sodat hy vry kan wees om toesig te hou by Malelane, sodra die sementwerk van die kanale in die gebied voltooi is. Die kontroleskema in die Sigasi-reservaat moes laat vaar word weens gebrek aan resultate op die slakbevolking as gevolg van 'n te groot volume water en omdat daar nie genoeg plantegroei verwyder kon word nie. Voor die einde van die jaar sal daar met 'n ander skema begin word onder toesig van die veldassistent by Boulders.

Die opname by vee duur voort. Tot dusver is 479 diere ondersoek. Hiervan was 76 afkomstig uit die distrik Ermelo en hul resultate was negatief. Van die res was 287 positief vir schistosome. Van die aantal skape, is honderd uitgesoek, en van die 62 afkomstig uit die distrik Ermelo was die resultate negatief. Van die res was agt positief. Van die klein knaagdiere van die Laeveld wat ondersoek is, was geeneen positief nie, maar die siekte is wel in Laeveldse bokke gevind. Skape sowel as bokke van die Laeveld is baie moeilik bekombaar.

Ekologiese opname van slakverblyfplekke in die Laeveld

Dr. G. H. Frank, 'n beursoouer van die Transvaalse Administrasie vir bilharzia-navorsing op Nelspruit, berig dat die voorlopige ekologiese opname in die Laeveld van die verblyfplekke van die draers van bilharziase nou byna voltooi is. 'n Volledige verslag word opgestel. Soos voorheen berig, is 14 verskillende slakverblyfplekke uitgekie en hulle word eenkeer per maand besoek vir roetine-ontledings van 'n chemiese en biologiese aard. Hierdie werk is voortgesit. Die versameling van plante wat geassosieer is met water, is voorlopig laat vaar. Beperkte proefnemings met die aanhou van slakke in akwariums word voortgesit.

Volgens hierdie ondersoek is die toleransiegebied van bilharziadraers soos volg:

Temperatuur	: 11—34°C.
pH	: 6.3—8.7
Totale alkaliniteit	: 10—370 d.p.m. CaCO ₃
Opgeloste Koolstofdioksied	: 1—16 d.p.m.
Nitrate	: 0—1.2 d.p.m. N
Kloriede	: 1—58 d.p.m. Cl.
Sulfate	: 0—22 d.p.m. SO ₄
Yster	: 0—4.2 d.p.m. Fe
Totale Hardheid	: 4—540 d.p.m. CaCO ₃

has been in operation now for four years and some results may be shown on the human population later this year. The Komatipoort scheme is kept in operation merely to see the effect of small amounts of copper sulphate (about 3 ppm.), on the snails. The human population has unfortunately been moved out of the area.

The other field assistant was taken on at the beginning of June, 1956, and will be used to supervise control work in the Lebombo Reserve south of Komatipoort. He will also take over the present Komatipoort scheme, leaving the other free to supervise control at Malelane as soon as the cementing of the canals in the area is complete. The control scheme in the Sigasi Reserve has had to be abandoned because of lack of results on the snail population, due to too large a water volume and inability to clear sufficient vegetation. Another scheme will be set in operation there before the end of the year under the supervision of the field assistant at Boulders.

The survey of cattle is continuing. So far 479 beasts have been examined. Of these, 76 came from the Ermelo district and were negative. Of the remainder, 287 were positive for schistosomes. Of the sheep, 100 were examined, 62 came from the Ermelo district, and were all negative; of the remainder, 8 were positive. No small rodents examined from the Lowveld were positive, but the disease has been found in Lowveld goats. Both sheep and goats from the Lowveld are very difficult to obtain.

Ecological survey of snail habitats in the Lowveld

Dr. G. H. Frank, Transvaal Provincial Administration Bilharzia Research Fellow at Nelspruit, reports that the preliminary ecological survey of the Lowveld habitat of the vectors of bilharzia is now almost concluded and a full report is being compiled. As previously reported, 14 different types of snail habitat were selected and these have been visited once a month for routine chemical and biological analyses. This work has continued. The collection of plants associated with water has been abandoned for the time being. Limited experiments on snail maintenance in aquaria are being continued.

The tolerance range of bilharzia vectors according to this investigation is as follows:

Temperature	: 11—34°C.
pH	: 6.3—8.7
Total Alkalinity	: 10—370 p.p.m. CaCO ₃
Dissolved Carbon-dioxide	: 1—16 p.p.m.
Nitrates	: 0—1.2 p.p.m. N
Chlorides	: 1—58 p.p.m. Cl.
Sulphates	: 0—22 p.p.m. SO ₄
Iron	: 0—4.2 p.p.m. Fe
Total Hardness	: 4—540 p.p.m. CaCO ₃

Die resultate word natuurlik nie beskou as die grense van die toleransiegebied nie.

Die volgende is 'n paar van die gevolgtrekkings wat gemaak is:

- (1) Dat fosfate, nitrate en ammoniak byna sonder uitsondering afwesig is in slakverblyfplekke.
- (2) Dat daar geen besondere besoedeling is in die gemiddelde slakverblyfplek nie.
- (3) Dat twee spesies van eendagsvlieë sonder uitsondering saam met bilharziadraers gevind word.
- (4) Dat dit tot dusver lyk asof stroomsnelheid die belangrikste beperkende faktor vir slakke is.

Varswaterslakke

Dr. J. A. van Eeden, Potchefstroomse Universiteit vir C.H.O., meld dat sedert die begin van die jaar navorsingswerk toegespits was op die nasionale versameling van Suid-Afrikaanse Varswaterslakke, en op hul taksonomie.

Aangesien een van die eerste vereistes in sodanige program die doeltreffende doodmaak en bewaring van sodanige materiaal is om geskik te wees vir die vereistes van die versameling, sowel as vir die daaropvolgende disseksie en mikrotomerig, was die eerste taak om die beste tegniek hiervoor te probeer vind. Die resultate wat behaal is, was beperk, deels vanweë gebrek aan lewende materiaal, en deels omdat verskillende slakspesies nie eenders op dieselfde behandeling reageer nie. Van 'n versamelaar kan nie verwag word om elke afsonderlike spesie op 'n ander manier te behandel nie, en dus moet hy tans vasstel hoe die tegniek wat tot dusver met *Bulinus tropicus* en *Lymnaea natalensis* toegepas is, die suksesvolste gewysig kan word om dit op 'n groter verskeidenheid van spesies toepasbaar te maak. In 'n beperkte mate is reeds sukses behaal met *Physopsis africana* en *Biomphalaria pfeifferi* wat nie in die omgewing van Potchefstroom voorkom nie, maar uit ander lokaliteite verkry is.

Aangesien betroubare identifikasie een van die oogmerke van die projek is, is 'n beperkte begin gemaak met 'n ondersoek na ander metodes van spesie-onderskeiding, byvoorbeeld deur die gebruik van kromatografie wat nie afhanklik van anatomiese en conchologiese variasies is nie.

KARDIO-PULMONALE NAVORSINGSEENHEID

Hoof van die Eenheid: PROF. G. A. ELLIOTT

Universiteit van die Witwatersrand, Johannesburg

Hart-bloedvat-navorsing

Serotonien

Daar is ses maande lank gewerk in 'n poging om 'n noukeurige biologiese metode te ontwikkel vir die berekening van 5-Hidroksietriptamien (serotonien). Ná die bou van besonder vernuftig ontwerpte apparate, is tog bevind dat die resultate nie heeltemal bevredigend is

The results are of course not considered as the limits of the tolerance range.

The following are some of the conclusions arrived at:

- (1) That phosphates, nitrates and ammonia are almost without exception absent from snail habitats.
- (2) That there is no pollution to speak of in the average snail habitat.
- (3) That two species of may-fly are invariably found associated with bilharzia vectors.
- (4) That so far the main limiting factor for snails seems to be the speed of the water current.

Fresh-water Snails

Dr. J. A. van Eeden of the Potchefstroom University states that since the beginning of the year research has been focussed on the national collection of South African fresh-water snails and on their taxonomy.

As one of the first requirements in such a programme is the efficient killing and storage of material in order that it should be suitable for collection requirements and the subsequent dissection and microtomy, the first task was to evolve the best technique for this purpose. The results achieved were limited, partly due to the lack of live material, and partly on account of the variable reaction of the different snail species to the same kind of treatment. As it cannot be expected from a collector to treat each individual species in a different way, the method employed at present is to ascertain how the technique used with *Bulinus tropicus* and *Lymnaea natalensis* could be applied successfully to a greater variety of species. A limited success has been obtained thus far with *Physopsis africana* and *Biomphalaria pfeifferi*, which are not found in the vicinity of Potchefstroom, but obtained from other localities.

As reliable identification is one of the aims of the project, a limited start has been made with research into methods of species identification, e.g. by using chromatography, which does not depend on anatomical and conchological variations.

CARDIO-PULMONARY RESEARCH UNIT

Head of the Unit: PROF. G. A. ELLIOTT

University of the Witwatersrand, Johannesburg

Cardio-Vascular Research

Serotonin

Six months have been spent in an attempt to develop an accurate biological method of assay of 5-Hydroxytryptamine (serotonin). After the construction of a considerable amount of ingenious apparatus, the results have been found to be not entirely satisfactory and, as chemical

nie, en aangesien daar onlangs chemiese toetse vir die bepaling van serotonien ontwikkel is, sal hulle in die toekoms gebruik word, liever as die biologiese bepalingsmetodes. Die biologiese tegniek is dus laat vaar.

Ballistokardiografie

Die opneem van verdere ballistokardiogramme is teen die tweede helfte van 1955 tydelik gestaak weens 'n defek in die masjiene. Die ontleding van talle ballistokardiogramme duur egter voort en nader voltooiing. Die resultate van hierdie ontleding word vir publikasie opgestel.

Hartgrootte en hartkamervergroting

Hierdie studie, in medewerking met die Departement van Radiologie, duur voort. Die voordeel van die liggende houding in die radiologiese diagnose van vergroting van die linkervoorkamer is vasgestel, en nou word gepoog om deur middel van 'n rotasietegniek die vergroting van die linkerhartkamer met groter noukeurigheid te bepaal.

Ateroom—Studie van binnevliedikte

Hierdie studie het in Maart 1955 begin, en sedertdien is materiaal van 164 gevalle versamel en verwerk. Hierdie gevalle sluit blankes en Bantoes van albei geslagte en alle ouderdomme in. Aangesien segmente van vyf verskillende bloedvate geneem word, en van elke segment sewe seksies deur 'n verskillende metode voorberei word, is die werk verbonde aan hierdie studie van baie groot omvang. Vyftig gevalle is tot dusver bestudeer.

Hipertensie

Navorsingswerk oor die behandeling van hipertensie met hipotensiewe middels is beskou as 'n studie van die fisiologie van hipertensie eerder as die van die geneeskunde. Die vraagstuk van vogterughouding as gevolg van Rauwolfia, is deur dr. McGregor in Boston voortgesit, en was vanjaar die onderwerp van 'n verslag aan die Vereniging vir Eksperimentele Biologie.

Pulmonale Navorsingswerk

Alveolêre druk

Navorsingswerk oor 'n liggaamspletismograafmetode vir die berekening van alveolêre druk, is kragdadig voortgesit. Dit is 'n studie wat van fundamentele belang is en behoort tot gevolg te hê dat die Eenheid in staat gestel kan word om die verskillende faktore te skei wat tot die asemhalingsmeganisme bydra. Die metode sal moontlik 'n oombliklike bepaling van alveolêre druk deur die hele asemhalingsiklus verskaf. Terwyl hierdie navorsingswerk in Suid-Afrika aan die gang was, het dr. Arthur du Bois aan die Universiteit van Pennsylvania 'n liggaamspletismograaf gebruik en 'n metode ontwikkel waarvolgens alveolêre druk deur afleiding bepaal word. Die relatiewe verdienstelikheid van die twee metodes moet nog bewys word, maar dit lyk asof die metode van ontwikkeling in

tests have recently been evolved for the estimation of serotonin, these rather than the biological technique assays are the method of the future. The biological technique has therefore been abandoned.

Ballistocardiography

The recording of further ballistocardiograms was temporarily suspended in the later part of 1955, owing to a breakdown in the machines. The work of analysis of numerous records is, however, continuing and nearing completion, and the results of this analysis are in the process of being prepared for publication.

Heart-size and chamber enlargement

This study, in collaboration with the Department of Radiology, is continuing. The value of the recumbent posture in the radiological diagnosis of left atrial enlargement has been assessed, and at present an attempt is being made to determine left ventricular enlargement with greater accuracy by a rotation technique.

Atheroma—Study of intimal thickness

This study commenced in March, 1955. During this period, material from 164 cases was collected and processed. These cases include European and Bantu subjects of both sexes and all ages. Since segments are taken from five different arteries and from each segment seven sections are prepared by a different method, the work involved in this study is considerable. Fifty cases have so far been studied.

Hypertension

Work on the treatment of hypertension by hypotensive drugs has been regarded as a study of the physiology of hypertension rather than of therapeutics. The question of fluid retention due to Rauwolfia has been continued by Dr. McGregor in Boston and was the subject of a report to the Society for Experimental Biology this year.

Pulmonary Research

Alveolar pressure

Work on a body plethysmographic method for the estimation of alveolar pressure has been energetically pursued. This is a study that is of fundamental importance, and should result in the Unit's being able to separate the various factors which contribute to the work of breathing. The method is showing promise of providing an instantaneous measure of alveolar pressure throughout the respiratory cycle. Whilst this work has been in progress here, Dr. Arthur du Bois at the University of Pennsylvania has been using a body plethysmograph and has evolved a method in which alveolar pressure is obtained by inference. The relative merits of the two methods remain to be proved, but it would seem that the method of development in the Cardio-Pulmonary Unit here shows

die Kardio-Pulmonale Eenheid hier te lande 'n sterk moontlikheid inhou om 'n noukeurige en bruikbare tegniek te verskaf. Hierdie navorsingswerk is tans een van die belangrikste bydraes van die Kardio-Pulmonale Eenheid.

Die asemhalingsmeganisme

Die meting van die toegewing en weerstand van die longe, het nou roetine geword en is 'n waardevolle bydrae tot die reeks longfunksietoetse wat tans gebruik word. Werk oor die ontwikkeling en toepassing van hierdie tegniek het dwarsdeur die jaar voortgeduur en studies van druk-volume is op 'n groot aantal persone uitgevoer. Die studies het ingesluit: normale persone, en persone met emfiseem, silikose, fibrose en gevalle van vergiftiging met nitrosegasse. Hierdie werk sal voortgesit word.

Normale waardes

'n Studie van die normale waardes van verskillende longfunksietoetse, soos deur die Eenheid uitgevoer by hierdie hoogte bo seespieël, het dwarsdeur die jaar voortgeduur en nader nou voltooiing.

Voorspellingsformules, gebaseer op hierdie resultate, is uitgewerk vir albei geslagte en vir verskillende ouderdomme en liggaamsgroottes. Soortgelyke werk oor sekere ander toetse (die asemhalingsreaksie op inspanning en normale meegewings en weerstandswaardes) moet volgende jaar gekorreleer word.

Silikose

In die navorsingstudie van 200 mynwerkers wat tans aan die Silikose-buro onderneem word, het hierdie Eenheid ook 'n klein aandeel gehad. Hulp is aan die Buro verleen met die ontwikkeling van 'n toets van die werkverrigting van asemhaling, en hierdie toets is deur die Eenheid uitgevoer op die eerste ses gevalle. Die buro is nou besig met sy eie volledige studie op dié gebied.

Hierbenewens word alle mynwerkers wat in hul laboratoriums getoets is, deur die Geneeskundige Departement van die Universiteit gefotografeer vir liggaamtipering met die doel om die hipotese op die proef te stel dat mynwerkersilikose miskien in verband mag staan met liggaamsbou.

Vergiftiging van mynwerkers deur nitrosegasse

Dwarsdeur die jaar is voortgegaan met 'n studie, wat nou voltooiing nader, van mynwerkers wat herstel het van die akute uitwerking van blootstelling aan nitrosegasse. Die gebruik van kortikoïde, wat kort gelede ingevoer is vir die behandeling van akute aantasting, was deels verantwoordelik vir die feit dat herstelde gevalle vir studie beskikbaar geword het. Hoewel nog nie afdoende bewys nie, is dit reeds duidelik dat chroniese versteuring van funksie nog vir baie maande na die aanvanklike aantasting kan voortbestaan. Dit is nie tevore besef nie.

great promise of supplying an accurate and usable technique. This research work is one of the present major contributions of the Cardio-Pulmonary Unit.

The work of breathing

Measurement of pulmonary compliance and resistance have now become a routine and valuable addition to the battery of lung function tests at present employed. Work on the development and application of this technique has proceeded throughout the year, and pressure-volume studies have been made on a large number of subjects. The type of subject include normals, emphysematous persons, silicotics, fibrotics, and cases of post-nitrous fume poisoning. The work will be continued.

Normal values

A study of the normal values of various lung function tests, as performed by the Unit at this altitude, have continued throughout the year and is nearing completion.

Prediction formulae based on these results have been worked out for both sexes for various ages and body sizes. Similar work on certain other tests (the respiratory response to effort and normal compliance and resistance values) have to be correlated next year.

Silicosis

The Unit has taken a small part in the present research study of 200 mineworkers which is in progress at the Silicosis Bureau. Assistance was given to the Bureau in the development of a test of work of breathing, and this test was carried out by the Unit on the first half-dozen cases. The Bureau is now doing a complete study of its own in this field.

In addition, all miners tested in their laboratories are being photographed in the Department of Medicine of the University for somato-typing, with the intention of testing the hypothesis that miners' pneumoconiosis may be related to body build.

Nitrous fumes in miners

A study has continued throughout the year, and is nearing completion, of miners who have recovered from the acute effects of exposure to nitrous fumes. The fairly recent introduction of corticoids for the treatment of acute effects has been partly responsible for the fact that recovered cases have been available for study. Though not yet complete, it is already apparent that chronic disturbances of function may exist for many months after the initial injury. This has not been realized heretofore.

NAVORSINGSEENHEID VIR KLINIESE VOEDING

Hoof van die Eenheid: PROF. J. F. BROCK
Universiteit van Kaapstad

Kwashiorkor en Proteïenwanvoeding

Met die geldelike hulp van die Williams Waterman-fonds vir die Bestryding van Dieetsiektes in die Verenigde State, is in 1953 'n program begin om vas te stel watter essensiële bestanddele daar in afgeroomde melk is wat dit so doeltreffend maak in die genesing van kwashiorkor. 'n Kliniese toets wat deur die Eenheid ontwikkel is vir gevalle van kwashiorkor, word „inleiding van genesing” genoem. Die maatstawwe is noukeurig omskryf, maar kan as volg opgesom word: onderbreking van die afwaartse verloop, deur 'n kliniese herstel wat gekenmerk word deur verandering van persoonlikheid, verdwyning van edeem, verbetering van eetlus, gewigstoename en styging in serum-albumien. Hierdie toets kan binne twee tot drie weke uitgevoer word, en stem in sommige kenmerke ooreen met die kliniese geneeskundige toets vir die doeltreffendheid van lewerekstrakte wat toegepas word op pasiënte met kwaadaardige bloedarmoede. Hierdie kliniese toets maak dit moontlik om die afsonderlike voedingstowwe in afgeroomde melk apart te toets en sodoende te bepaal watter basiese tekort deur kwashiorkor veroorsaak word. Dit is nodig om te onderskei tussen „inleiding van genesing” en „bevestiging van genesing”. Slegs voorlopige proewe is met laasgenoemde uitgevoer en dit is dus nie onredelik om te veronderstel dat elke bekende voedingstof in 'n geskikte hoeveelheid en kombinasie nodig sal wees nie.

In die verslag vir 1954/55 is verklaar dat genesing van kwashiorkor ingelei kan word met kaseïen, in die afwesigheid van laktalbumien en bekende vitamïene. Ook is gemeld dat die resultate wat verkry is op 'n klein groepie gevalle wat behandel is met 'n kombinasie van sintetiese aminosure wat ooreenstem met die patroon van kaseïen, saam met glukose en 'n soutmengsel, tot die voorlopige gevolgtrekking gelei het dat genesing minstens in sommige gevalle ingelei kan word deur hierdie kombinasie van aminosure, in die afwesigheid van vitamïene en vette. Hierdie voorlopige resultate is nou bevestig. 'n Baie merkwaardige resultaat is die verbetering van strawwe pellagra-huidsiekte deur aminosuurmengsels wat nóg niasien nóg enige ander vitamien bevat. Dit dui aan dat die vermoë van die liggaam om niasien van triptofaan te berei selfs groter is as wat gemeen is. Resultate tot dusver toon dat die herstelproses wat deur aminosure teweeggebring kan word sonder vitamïene, 'n baie definitiewe beperking het, soos aangedui deur vermindering van eetlus en weiering van voedsel.

Navorsingswerk is nou daarop toegespits om die getal en hoeveelheid individuele aminosure aan te toon wat vereis word in die teenwoordigheid van voldoende vloei-

CLINICAL NUTRITION RESEARCH UNIT

Head of the Unit: PROF. J. F. BROCK
University of Cape Town

Kwashiorkor and Protein Malnutrition

With the financial assistance of the Williams Waterman Fund for the Combat of Dietary Diseases of the United States, a programme was started in 1953 to determine the essential constituents in skimmed milk which led to its great effectiveness in the cure of kwashiorkor. A clinical test developed by the Unit on cases of kwashiorkor has been called “initiation of cure”. The criteria have been carefully defined, but they can be summarized as follows: interruption of the downward course by a clinical remission characterized by change of personality, resolution of oedema, improvement in appetite, gain in weight, and rise in serum albumen. This test can be carried out in two to three weeks and has some features in common with the clinical therapeutic test for the efficacy of liver extracts as carried out on patients with pernicious anaemia. This clinical test makes it possible to test separately the individual nutrients in skimmed milk and, therefore, determine the basic deficiency which is responsible for the development of kwashiorkor. It is necessary to differentiate between “initiation of cure” and “consolidation of cure”. Only pilot experiments have been carried out in the latter, for which it is not unreasonable to postulate that every known nutrient should be required in appropriate quantity and combination.

In the 1954/55 report, it was stated that cure can be initiated in kwashiorkor with casein, in the absence of lactalbumen and known vitamins; also that the results obtained with a small group of cases treated with a combination of synthetic amino-acids reproducing the pattern of casein, plus glucose and salt mixture, allowed the tentative conclusion that, at least in some cases, cure could be initiated by this combination in the absence of vitamins and fat. These tentative results have been confirmed. A very remarkable result is the clearing of severe pellagroid dermatosis by amino-acid mixtures containing neither niacin, nor any other vitamin. This suggests that the capacity of the body to produce niacin from tryptophane is even greater than has been supposed. Results to date suggest that the process of remission which can be induced by amino-acids without vitamins has a very definite limit, indicated by decline in appetite and refusal of feeds.

Work has turned now to clarification of the number and quantity of individual amino-acids which are required in the presence of adequate fluid, vitamins, minerals and

stof, vitamieë, minerale en kalorieë wat uit glukose verkry is. 'n Formule vir die tien essensiële aminosure, plus tirosien, in konsentrasies soos aanbeveel deur Albanese, het baie minder doeltreffend geblyk as 'n formule wat die 18 aminosure van afgeroomde melk bevat. Tussenformules sal ook getoets moet word. Dit is ook verder aangetoon dat die 18 aminosure betreklik doeltreffend is vir die inleiding van genesing in die afwesigheid van vitamieë, terwyl die doeltreffendheid van die 11 aminosure grootliks verminder word deur die onttrekking van vitamieë. Hierdie waarnemings open 'n baie interessante studiegebied oor die kwantitatiewe onderlinge verwantskap tussen een aminosuur en 'n ander, en ook oor die kwantitatiewe verwantskappe tussen vitamieë en aminosure.

Die Eenheid was baie gelukkig om die hulp van die Departemente van Kingergeneeskunde van die Universiteit van Pretoria, en van die McCord-Zoeloe-hospitaal, Durban, in 'n samewerkende program te hê. Vier groot reekse gevalle is sedertdien aan die Universiteit van Pretoria met verskillende melk-formules behandel om vas te stel in watter mate die verskillende doeltreffendheid van die verskillende formules vir „inleiding van genesing” op 'n kwantitatiewe grondslag geplaas kan word, en of die byvoeging van vitamieë of proteïene by afgeroomde melk enige voordeel bied. In die algemeen was die resultate vir kwantitatiewe ontleding teleurstellend, weens duidelike verskil in die strafheid en omvang van komplikasies tussen die verskillende gevalle van kwashiorkor. Die toets het egter die belangrikheid van verskillende metodes vir die droogmaak van afgeroomde melk getoon. Sekere gedroogde afgeroomde melkpoeiers is baie doeltreffender as ander, miskien vanweë verskille in die graad van denaturering wat tussen rollergedroogde en spreidgedroogde melkpoeiers voorkom. Die Nasionale Voedingnavorsingsinstituut is besig om hierdie ondersoek verder te voer. Geen voordeel is gevind in die byvoeging van vitamieë of proteïene by afgeroomde melk nie.

Kroonslagaarkwaal, Bloedcholesterol en Vetvoedsel

In die vorige jaarverslag is melding gemaak van 'n opname wat in Kaapstad uitgevoer is, in medewerking met dr. Ancel Keys. Kortliks het dit aangetoon dat in die drie hoofbevolkingsgroepe van die Kaap daar 'n noue verwantskap bestaan tussen die voorkoms van kroonslagaarkwaal, die gemiddelde peil van serumcholesterol, die vetkalorieverhouding en die mate van dierlike vet in die dieet. Hierdie verwantskappe het nie alleen binne elke rassegroep gegeld nie, maar ook binne die lae-, middel- en hoë-inkomstesubgroepe binne elke rassegroep. Met ander woorde, die verwantskap is bepaal, nie deur genotipe nie, maar deur omgewing.

Met die voortsetting van die ondersoek op Bantoes, in die metabolismesaal van die Eenheid, is aangetoon dat die peil van bloedcholesterol gewysig kan word deur die hoeveelheid en kwaliteit van vet in die dieet te verander.

calories drawn from glucose. A formula containing the ten essential amino-acids plus tyrosine in concentrations recommended by Albanese, proves to be very much less efficient than a formula containing the 18 amino-acids of skimmed milk. Intermediate formulae will also have to be tested. It has been shown further that the 18 amino-acids are comparatively efficient in initiating cure in the absence of vitamins, whereas the efficiency of the 11 amino-acids is very greatly reduced by withdrawing vitamins. These observations open up a very interesting field for study in the quantitative interrelationships between one amino-acid and another, and in quantitative relationships between vitamins and amino-acids.

The Unit has been very fortunate in having the assistance of the Departments of Paediatrics at Pretoria University and at McCord Zulu Hospital, Durban, in a collaborative programme. At Pretoria University, four large series of cases have since been treated on different milk formulae in order to assess the extent to which differences in efficiency of different formulae for “initiation of cure” can be put on a quantitative basis, and whether the addition of vitamins or proteins to skimmed milk gives any advantage. Results in general have been disappointing for quantitation because of marked variation in the severity and extent of complications from one case of kwashiorkor to another. The test has, however, shown the importance of different methods of drying of skimmed milks. Certain dried skimmed milks are very much more efficient than others, perhaps because of differences in the extent of denaturation which occur between roller-dried and spray-dried milks. The National Nutrition Research Institute is pursuing this investigation further. No advantage was found in the addition of vitamins or protein to skimmed milk.

Coronary Heart Disease, Blood Cholesterol and Dietary Fat

In last year's report mention was made of a survey carried out in Cape Town with the co-operation of Dr. Ancel Keys which, in brief, showed that in the three main population groups of the Cape there was close parallelism between the incidence of coronary heart disease, the mean level of serum cholesterol, the fat calorie ratio, and the level of animal fat in the diet. These relationships held not only between the racial groups, but also between the low, medium, and high income sub-groups within each racial group. In other words, the relationships were determined, not by genotype, but by environment.

Pursuing this investigation on Bantu subjects in the metabolism ward of the Unit, it has been shown that the level of blood cholesterol can be manipulated by varying the quantity and quality of fat in the diet. In general,

In die algemeen is dierlike vet geneig om die bloedcholesterol te laat styg, terwyl plantaardige vette geneig is om dit te verlaag. Die graad van versadiging of onversadiging van die vetsuurinhoud van die vet is egter baie belangriker as die dierlike of plantaardige oorsprong van die vet of olie. Grondboontjie-olie het byvoorbeeld 'n omgekeerde uitwerking in die verlaging van bloedcholesterol wanneer die olie gehidrogeneer (of versadig) word. Die betekenis hiervan met betrekking tot nywerheidsprosesse, wat afhang van die hidrogenering van olies vir die produksie van eetbare vet, is duidelik. Voorlopige werk met blankes, met of sonder kroonslagaarkwaal, het weer getoon watter vermoë sekere olies het om bloedcholesterol te verminder en ander olies en vette om bloedcholesterol te laat styg. Die jongste navorsingswerk in die metabolismesaal dui sterk daarop dat as 100 gram van olieryke en hoogs onversadigde vetsure in die dieet by 100 gram versadigde vet gevoeg word, dit die neiging van laasgenoemde om die bloedcholesterol te laat styg, heeltemal kan neutraliseer.

Die Eenheid erken die beperkings van die gevolgtrekkings wat van hierdie proefnemings gemaak kan word; en erken ook dat baie faktore betrokke moet wees in die ontwikkeling van ateroom van die kroonslagare sowel as in die neiging van bloed om binne die aangetaste vate te stol. Die Eenheid glo nie dat daar 'n eenvoudige antwoord is op die vraagstuk van kroonslagaarkwaal nie, maar glo egter dat in die algemeen diëte wat die neiging het om die bloedcholesterolpeil te verlaag, waarskynlik voordelig sal wees. Die Eenheid glo dat hy aangetoon het dat die peil van bloedcholesterol beheer kan word deur die hoeveelheid en gehalte vet in die dieet te verander, en dat 'n belangrike faktor in die verskil tussen verskillende vette en olies te vinde is in die graad van onversadiging of versadiging van die vetsuurbestanddeel.

Ander Projekte

Die volgende is 'n kort vorderingsverslag oor 'n paar ander aspekte van die werk van die Eenheid:

Die nefrotiese sindroom

Navorsingswerk op hierdie gebied is voortgesit. Die studie sluit in nierbiopsie, elektrolietbalans en kwantitatiewe bepaling van die daaglikse uitskeiding van proteïen in die urine. Die reaksie van verskillende tipes nefrotiese sindrome op steroïedhormone is ook nou-noukeurig bestudeer.

Vloeistof- en elektrolietbalans in kwashiorkor

Die Eenheid se studie oor hierdie onderwerp, met spesiale verwysing na die belangrike rol van kaliumtekort, is verder voortgesit en sal binnekort aangevul word met studies van magnesium- en kalsiumbalans. Die Eenheid is dank verskuldig aan die Williams Waterman-fonds wat dr. Schendel, 'n navorsingskeikundige gestuur het om vir twee jaar lank te help met die ontwikkeling van hierdie projek.

animal fats tend to raise, while vegetable fats tend to lower the blood cholesterol. Far more important, however, than the animal or vegetable origin of the fat or oil is the degree of saturation or unsaturation of its fatty acid content. The effect of peanut oil, for instance, in lowering blood cholesterol is reversed when the peanut oil is hydrogenated (or saturated). The significance of this in relation to industrial processes, which depend upon hydrogenation of oils for the production of edible fat, is obvious. Preliminary work on European subjects, with or without coronary heart disease, has again shown a capacity of certain oils to reduce blood cholesterol and of other oils and fats to raise blood cholesterol. The most recent work in the metabolism ward suggests strongly that 100 grams of oil, rich in polyunsaturated fatty acids can, when added in the diet to 100 grams of saturated fat, entirely neutralize the tendency of the latter to raise the blood cholesterol.

The Unit recognizes the limitations on the conclusions which can be drawn from these experiments. It recognises the many factors which must be involved, both in the development of atheroma of the coronary arteries, and in the tendency of blood to coagulate within atheromatous vessels. It does not believe that there is any simple answer to the problem of coronary heart disease. It does believe, however, that in general those diets which tend to lower blood cholesterol levels, are likely to be advantageous. It believes that it has shown that the level of blood cholesterol can be manipulated by altering the quantity and quality of fat in the diet, and that one important factor in the difference between different fats and oils is the degree of unsaturation or saturation of the fatty acid component.

Other Projects

The following is a brief progress report on some other aspects of the work of the Unit:

The nephrotic syndrome

Work in this field has been continued. The study includes renal biopsy, electrolyte balance and quantitative determination of the daily output of protein in the urine. The response of various types of nephrotic syndrome to steroid hormones has been carefully studied.

Fluid and electrolyte balance in kwashiorkor

The Unit's study of this subject, with particular reference to the important role of potassium deficiency, has been further continued and will be supplemented in the near future with studies of magnesium and calcium balance. The Unit is indebted to the Williams Waterman Fund for sending Dr. Schendel, a research chemist, to co-operate for a two-year period in the development of this work.

Hematologie en ondervoeding

'n Studie oor die hemorragiese verskynsels van kwashiorkor word onderneem. Dit is aangetoon dat hierdie verskynsels te wyte is aan 'n gebrek aan faktor 7, naamlik protrombien, en soms aan bloedplaatjies. Dit skyn asof vitamien K 'n essensiële element in die behandeling van hierdie toestand is. 'n Studie oor die uitwerking van anti-stollingsmiddels in die voorkoming van koronêre trombose word ook onderneem.

Porfiria

Een van die lede van die Eenheid se personeel is reeds vir 'n paar jaar besig met 'n studie oor hierdie siekte en sy reaksie op steroidbehandeling. 'n Verdere program is onlangs aan die gang gesit.

Siekte- en sterfiesyfer onder die bevolkingsgroepe van die Kaapse Skiereiland

Die voorlopige opname wat in 1948 uitgevoer is oor hierdie aangeleentheid het die grondslag gevorm vir die program van hierdie Eenheid se studie. Die buitengewone verskille, veral in „sociale siektes” tussen die drie hoof-rassegroepe van die Kaapse Skiereiland, is verder ontleed en tot op datum gebring.

TANDHEELKUNDIGE NAVORSINGSEENHEID

Hoof van die Eenheid: PROF. J. T. IRVING
Universiteit van die Witwatersrand, Johannesburg

Die vernaamste navorsingsprojek wat gedurende die jaar onderneem is, was die ondersoek oor die verwantskap tussen vrye terminale en ϵ -aminogroepe van dentienkollageen, en die graad van ontkalking van die weefsel. Dentien wat nie ont kalk is nie het geen vrye α -aminogroepe bevat nie. Met drie verskillende metodes van ont kalking, insluitende etilediamientetrasetaat by pH 7.3, is 'n lineêre verwantskap tussen die vrystelling van hierdie aminogroepe en die graad van ont kalking gevind. Behandeling van huidkollageen met ont kalkingsmiddels het geen verandering in die aantal vrye aminogroepe veroorsaak nie. Die gevolgtrekking was dus dat die terminale aminogroepe en die ϵ -aminogroepe (van lisien en hidroksilisien) in noue verband staan met die binding van mineraalkomponente aan die proteïen-grondstof. Navorsing duur verder voort in verband met die vraagstuk van die verbinding van mineraalkomponente en organiese grondstof in been, en oor die rol van koolhidrate in die proses.

In 'n studie oor die verwantskap van vitamien E en proteïen vir die beskerming van die glasuurorgaan, is met knaagdiere gevind dat eier-albumien die glasuurorgaan beskerm, maar nie die tandkleur in die snytande nie. Bloedfibrin het geen van beide beskerm nie. Hiervolgens lyk dit asof 'n bepaalde aminosuurgroepering nodig is

Haematology and malnutrition

A study of the haemorrhagic phenomena of kwashiorkor is being made. It has been shown to be due to a defect of factor 7, prothrombin, and occasionally blood platelets. Vitamin K appeared to be an essential element in the treatment of this state. A study of the effect of anti-coagulant drugs in the prevention of coronary thrombosis is also being made.

Porphyria

One of the members of the Unit's staff has been studying this disease and its response to steroid therapy for some years. A further programme has recently been initiated.

Inter-racial morbidity and mortality in the Cape Peninsula

The pilot survey carried out in 1948 under this heading constituted the ground work on which the programme of the Unit was based. The extraordinary differentials, particularly in "social diseases" between the three main racial groups of the Cape Peninsula have been further analyzed and brought up to date.

DENTAL RESEARCH UNIT

Head of the Unit: PROF. J. T. IRVING
University of the Witwatersrand, Johannesburg

The principal research project undertaken during the year has been an investigation of the relationship between free terminal and ϵ -amino groups of dentin collagen, and the degree of decalcification of the tissue. Undecalcified dentin contained no free ϵ -amino groups. Using three different methods of decalcification, including ethylene diamine tetracetate at pH 7.3, a linear relationship was found between the liberation of these amino groups and the extent of decalcification. Treatment of hide collagen with decalcifying agents caused no change in the number of free amino groups. It was thus concluded that the terminal amino groups and the ϵ -amino groups (of lysine and hydro-xylysine) were intimately concerned with the binding of mineral matter to the protein matrix. The research is progressing further into the question of the combination of mineral matter and organic matrix in bone, and the part that carbohydrates may play in the process.

In a study of relationship of vitamin E and protein to the protection of the enamel organ, it was found that egg albumin protected the enamel organ, but not tooth colour in the rodent incisor. Blood fibrin protected neither of these. It appears from this that a particular amino-acid

om die glasuurorgaan te beskerm, en hierdie aangeleentheid word dus verder ondersoek.

Die uitwerking van 'n vitamien E-tekort, en die aanvulling daarvan in die dieet, word bestudeer. Voorlopige waarnemings toon dat terwyl 'n tekort in sowat 20 dae teweeggebring kan word, dit baie langer duur om die uitwerking van so 'n tekort weer te herstel (in teenstelling met bevindings in verband met vitamien A en D).

Gedurende die tydperk waaroor hierdie verslag handel, is aan die Hoof van die Eenheid verlot toegeken om die Verenigde State te besoek vir 'n studie van die jongste ontwikkelings op hierdie gebied. Terwyl hy in San Francisco was, het hy saamgewerk met dr. H. E. Frisbie, van die Universiteit van Kalifornië, in verband met proewe oor genesing van wonde in die mond en oor die invloed van fluoor op tande. Hiervoor is gebruik gemaak van Grenz (sagte) X-strale. Hierdie proewe word voortgesit as 'n gesamentlike projek tussen die Eenheid en die Universiteit van Kalifornië. Die Raad spreek sy dank uit aan prof. Staz van die Mond- en Tandheelkundige Hospitaal van die Universiteit van die Witwatersrand vir sy dienste as Waarnemende Hoof van die Eenheid gedurende die afwesigheid van prof. Irving.

HARTNAVORSINGSEENHEID

Hoof van die Eenheid: PROF. H. W. SNYMAN
Departement van Interne Medisyne,
Universiteit van Pretoria.

Hierdie navorsingseenheid is gehuisves in die Kliniesegebou van die Universiteit by die Volkshospitaal, Pretoria, waar blanke en nie-blanke pasiënte ondersoek kan word en dus geleentheid bied om die belangrikste gevalle uit beide groepe te verkry vir vergelykende studies. Die werksaamhede van die Eenheid is gedurende die jaar in 'n mate gestrem deurdat die beskikbare personeel nie voltyds aandag aan die navorsingsprojekte kon gee nie.

Apparaat

Die basiese toerusting vir die diagnostiese en navorsingswerk is nog onvoldoende en word geleidelik aangevul. Pogings word aangewend om 'n nuwe deurstromingsmetode te gebruik sodat die neiging tot stolling in die fyn kateters en drukkane vermy word. Verder word gewerk aan 'n metode om 'n deurlopende suurstofversadiging te registreer. Die oponthoud wat meegebring word deur bloed te trek is soms hinderlik en verleng die volledige ondersoek. Die bepaling van dergelike bloedmonsters bring mee dat die resultaat meesal pas beskikbaar is na die kateterisasie van 'n pasiënt. Hierdie tegnieke

grouping is needed to protect the enamel organ, and this is being further investigated.

The effects of vitamin E deficiency and replacement in the diet are being studied. Preliminary observations show that while deficiency can be induced in about 20 days, it takes much longer than this to cure the effects of lack of the vitamin (in contrast with findings with vitamins A and D).

During the period under review the Head of the Unit was granted leave of absence to visit the United States to study the latest developments in the field. While in San Francisco he collaborated with Dr. H. E. Frisbie of the University of California in experiments on wound healing in the mouth and the action of fluorine on the teeth using Grenz (soft) X-rays. These experiments are being continued as a joint project between the Unit and the University of California. The Council expresses its gratitude to Professor Staz of the Oral and Dental Hospital of the University of the Witwatersrand for acting as Head of the Unit during Professor Irving's absence.

HEART RESEARCH UNIT

Head of Unit: PROF. H. W. SNYMAN
Department of Internal Medicine,
University of Pretoria

This Research Unit is accommodated in the Clinical Building of the University at the Pretoria General Hospital, where European and non-European patients can be examined, thus affording an opportunity to select the most important cases out of both groups for comparative studies. The activities of the Unit during the year were to some extent retarded as the available staff could not give full-time attention to the research projects.

Apparatus

The basic apparatus for the diagnostic and research work is still inadequate, but is gradually being supplemented. An attempt is being made to use a new method of oxygen determination by passing blood through a cuvette, to prevent blood clotting in the small catheters and pressure channels. A study is also being made of a method to record a continuous oxygen saturation. The delay which is caused by drawing blood is sometimes troublesome and this tends to protract the duration of the complete examination. The testing of such blood samples causes so much delay that the results usually only

verbeterings behoort 'n kateterisasie en sy resultate te bespoedig, te vergemaklik en uit te brei. Die histologiese ondersoek van die materiaal wat geleidelik verkry word, gaan 'n nuwe stoot vorentoe kry met die aankoop van 'n mikrotroom. Die tegniek om kontrasstudies van die koronêre vate te maak, is ook enigszins gewysig.

Navorsingsprojek

Daar word beplan om 'n hersieningsondersoek van die kroonslagarstelsel te doen—makro-anatomies sowel as histologies. Hierdie ondersoek sal dien om verder te bevestig of anderszins, dat daar wesenlike verskille bestaan tussen die vate van die Blankes en die van Bantoes. Die histologiese ondersoek lê hom veral toe op die aard van die vaatwand, veral ook die dikte van die intima.

Pulmonêre hipertensie kom soms voor waarby geen duidelike etiologiese faktor aantoonbaar is nie. Uit die kliniese materiaal wat deur die Eenheid gaan, duik daar soms dergelike gevalle op wat verder uitgepluis en as groep verwerk sal word.

'n Lid van die Eenheid sal hom spesiaal toelê op 'n verdere ontleding van 'n aansienlike groep pasiënte, veral uit die Bantoegeleedere met negatiewe T-golwe. Hierdie ondersoek wat eerste by normale Bantoe kinders en volwassenes sal plaasvind, word later aangevul met 'n groep met patologiese toestande: voedingstoestande (by kwashiorkor) en ander belangrike groepe wat beskikbaar is by die volwassenes in die Interne Geneeskunde afdelings.

Met die ontleding van die hart-pasiënte van die hospitaal elke jaar, is vasgestel dat 'n groep met hart-versaking voorkom waarby geen duidelike etiologie aangedui is nie. Dit word veronderstel dat 'n stofwisselingsfout in die hartspeer by dergelike pasiënte aanwesig is. Deur middel van chemiese bepalinge van die proteïen- en koolhidraat-stofwisseling word gepoog om 'n beter insig in dié verband te verkry. In dié verband sal die rol van fermente in die stofwisseling ondersoek moet word.

Dit is welbekend dat daar groot verskille bestaan in die voorkoms van koronêre aandoenings tussen Blankes en Bantoes. Hierdie verskil het die tema gevorm van verskeie ondersoekke in die biochemiese afwykings, veral van cholesterol en verwante stowwe. Met die hulp van 'n biochemikus, 'n biofisikus, tesame met die gebruik van radioaktiewe stowwe, en die nodige meet-apparate, word cholesterol-stofwisseling in die Bantoe in vergelyking met dié in die Blankes gevolg. Vir so 'n ondersoek moet staat gemaak word op die toevoer van die radioisotope uit die buiteland.

Vir 'n deel van bogenoemde ondersoek is die Eenheid afhanklik van outopsie-materiaal, maar is hierin gekortwiek deur 'n tekort aan geskikte weefsels vir die studies.

become available after the catheterization of a patient. These technical improvements should expedite, facilitate and extend a catheterization and its results. The histological investigations of the material gradually becoming available will be facilitated by the acquisition of the microtome now on order. The technique of contrast study of coronary arteries, has also been modified somewhat.

Research Project

A review investigation is being undertaken of the coronary artery system—macro-anatomic as well as histological. This study will serve to confirm or disprove the assertion that there are substantial differences between the blood vessels of the European and the Bantu. The histological study will be directed mainly on the nature of the artery wall and on the intimal thickness.

Pulmonary hypertension sometimes occurs where no clear etiological factor can be indicated. In the clinical material handled by the Unit, such cases sometimes occur and they will be investigated and evaluated as a group.

A member of the Unit will undertake a study analysis of a large group of patients, particularly from the Bantu with negative T-waves. It will first be carried out on normal Bantu children and the adult Bantu, to be supplemented later by a group with pathological conditions: nutritional states (e.g. kwashiorkor) and other important groups of adults available in the Department of Internal Medicine.

From the examinations carried out every year on heart patients in the hospital, it has been determined that there is a group which suffers from heart failure where no clear etiology is indicated. It is postulated that in such cases there is a metabolic fault in the myocardium, and by means of chemical determinations of the protein and carbohydrate metabolism and attempt is being made to obtain a better understanding in this connection. The role of enzymes in the metabolism will then have to be investigated.

It is well known that there are great differences in the incidence of coronary artery disease between Europeans and the Bantu. This difference formed the subject of various investigations in the chemical abnormalities in the blood, particularly of cholesterol and related substances. With the aid of a biochemist and a biophysicist radioactive substances with the necessary measuring apparatus, the cholesterol metabolism of the Bantu is being compared with that of the European. Such an investigation depends on the supply of the radioisotopes from abroad.

For a part of the above investigation, the Unit is dependent on autopsy material, but the work is restricted by a shortage of suitable tissue for the studies.

NAVORSINGSEENHEID VIR MENSLIKE BIOCHEMIE

Hoof van die Eenheid: DR. A. R. P. WALKER
Suid Afrikaanse
Instituut vir Mediese Navorsing, Johannesburg

Die Kalsiummetabolisme van die Suid-Afrikaanse Bantoe

Vordering is gemaak met die verkryging van inligting oor die chemiese samestelling en digtheid van been, en van die voorkoms van ragitis in stedelike, omstedelike en plattelandse gebiede, veral in laasgenoemde. Die inligting wat ingewin is, word egter as onvoldoende beskou vir byvoeging by die wat reeds in die vorige jaarverslag verstrekkend is.

Die Ystermetabolisme van die Suid-Afrikaanse Bantoe

Abnormale ysterafsetting in kinders

Die verslag uit Suid-Rhodesië dat siderose algemeen in Bantoe kinders voorkom, is teenstrydig met waarnemings aan die Witwatersrand wat deur drie verskillende groepe werkers, insluitende hierdie Eenheid, onderneem is. Om hierdie verskil op te klaar, is ysterbepalings op die lewers van Bantoe babas uitgevoer volgens drie metodes: naamlik chemies, histopatologies en volgens die Berlynsblou-reaksie op bruto monsters. Met die Berlynsblou-toets was siderose gewoonlik positief, maar die ander metodes het nie abnormaal hoë konsentrasies yster aangetoon nie. 'n Positiewe Berlynsblou-reaksie op die bruto monster toon dus nie noodwendig die aanwesigheid van 'n oormaat yster nie. Die toets met die blote oog is dus slegs betekenisvol indien yster in alle weefsels en op alle ouderdomme op gelyke wyse vrygestel kan word.

Proteïenvereistes vir bloedvorming

Weens wanbegrippe oor hierdie onderwerp, is bestaande inligting ondersoek en die volgende gevolgtrekkings is gemaak:

- (a) Gepaard met verlies aan gewig, verminder die hemoglobienproduksie in 'n vroeë stadium van dieetbeperking wanneer die voorraad liggaamsproteïen nog maar min uitgeput mag wees en wanneer proteïeninname nie noodwendig laag is nie.
- (b) Hoewel die sirkulerende hemoglobienmassa in langdurige ernstige ondervoeding baie verminderd word, is dit waarskynlik dat die hoeveelheid nie tot dié peil daal waar duidelike kliniese simptome verwag kan word nie.
- (c) In ernstige ondervoeding is proteïenvereistes vir bloedvorming baie klein in vergelyking met die totale liggaamsproteïenmassa en proteïeninname.
- (d) In ernstige ondervoeding is verminderde hemoglobienproduksie nie juis te wyte aan 'n tekort aan proteïen of ander voedingstowwe nie, maar eerder aan die algemene lae snelheid van metabolisme wat daarmee gepaard gaan.

HUMAN BIOCHEMISTRY RESEARCH UNIT

Head of the Unit: DR. A. R. P. WALKER
South African Institute for Medical
Research, Johannesburg

The Calcium Metabolism of the South African Bantu

Progress has been made in respect of obtaining information about the chemical composition and bone density, and of the incidence of rickets in urban, periurban, and rural areas, particularly in the latter. Insufficient further information has, however, been obtained to warrant adding to that given in the previous report.

The Iron Metabolism of the South African Bantu

Abnormal iron deposition in children

The report from Southern Rhodesia that siderosis is common in native children is at variance with observations on the Rand, undertaken by three different groups of workers, including this Unit. To clarify this anomaly, iron estimations on Bantu baby livers were carried out by three methods: chemical, histopathological, and by the Prussian Blue reaction on gross specimens. Siderosis was found to be usually positive by the Prussian Blue test, but the other methods did not indicate abnormally high iron concentrations. Hence, a positive Prussian Blue reaction on the gross specimen does not necessarily indicate the presence of excessive iron. The naked eye test has therefore significance, only if iron in all tissues and at all ages is equally releasable.

Protein requirements for haemopoiesis

Due to misconceptions on this subject, existing information has been examined and the following conclusions have been reached:

- (a) As a normal accompaniment to loss in weight, haemoglobin production diminishes at an early stage of dietary restriction when body protein stores may be little depleted and when protein intake is not necessarily low.
- (b) In prolonged severe undernutrition, although circulating haemoglobin mass is greatly reduced, it is probable that the amount does not fall to that level where obvious clinical stigmata would be expected.
- (c) In severe undernutrition, protein requirements for haemopoiesis are very small in comparison to total body protein mass and protein intake.
- (d) In severe undernutrition, diminished haemoglobin production is due, not to deficiency of protein or other nutrients *per se*, but rather to the concomitant low tempo of metabolism prevailing.

Korreksie van hematologiese gegewens vir hoogte bo Seespieel

Hierdie onderwerp is veral van toepassing op baie van die binnelandse bevolking van Suidelike Afrika, veral in streke soos die Witwatersrand. Beskikbare gegewens toon dat met 'n styging in hoogte die rooi-bloedsel telling slegs effens toeneem, hemoglobien-konsentrasie aansienlik toeneem, terwyl gepakte sel-volume 'n tussenposisie inneem.

Aterosklerose en Kroonslagaarsiekte

'n Vergelyking van patologiese gradering en chemiese samestelling van aortas van Bantoes en Blankes

Sodra die versameling van monsters en chemiese ontleding volledig is, sal histopatologiese ondersoek van seksies onderneem word. Kortliks kan gesê word, dat die persentasie-samestelling van aortas van albei rasse nie betekenisvol in die ouderdomsgroep 20 tot 29 jaar verskil nie, maar daarna is die toename in droë gewig, as, kalsium, fosfor, totale vet, cholesterol, en afname in elastienkonsentrasies, baie hoër in die blankebevolking as in dié van die Bantoe. Slegs wat kollageen betref, bly die persentasiesamestelling in albei rasse onveranderd met ouderdom. Een punt wat beklemtoon moet word, is dat die verskille in die strafheid van aterosklerotiese letsels in aortas van albei rasse kleiner is as die verskille in sterftesyfers as gevolg van die letsels.

Die geslagsfaktor in aterosklerose en kroonslagaarsiekte

Onder wit bevolkingsgroepe het die verskille tussen mans en vroue wat betref die strafheid van aterosklerotiese letsels en sterftesyfers van kroonslagaarsiekte, heelwat teorieë laat ontstaan. Die feit dat gegewens vir mans, selfs tot op hoë ouderdom, 'n groter strafheid en hoër sterftesyfer aandui as vir vrouens, het gelei tot die mening dat 'n endokrienfaktor in vroue 'n beskermende uitwerking mag hê wat ook tot lank na die menopouse optree, hoewel in mindere mate. 'n Ondersoek van die beskikbare gegewens oor die Bantoes, onder wie strawwe komplikasies van aterosklerose baie seldsaam is, het aangetoon dat daar *geen* verskil bestaan ten opsigte van geslag sowel in graad van aterosklerotiese letsels as in sterftesyfers as gevolg van kroonslagaarsiekte nie. Gevolglik blyk dit dat in degeneratiewe hartkwaal, die geslagsfaktor 'n sekondêre eerder as 'n primêre rol speel.

Parasitisme en Voedingstoestand

Hierdie omvattende en belangrike onderwerp is nog maar deur die Eenheid aangeroei slegs vir sover dit betref die bepaling van die bloedverlies in urinêre en ingewand-bilharzia (*Schistosoma haematobium* en *mansoni*) en in haakwurmsiekte (*ancylostomiasis*).

Bloedverlies in kinders wat aan S. haematobiumbesmetting ly

In medewerking met die hospitaalsuperintendent en die distriksgeneeshere van Rustenburg is ses Bantoe-

Correction of haematological data for altitude

This subject is one of considerable relevance to much of the inland population of Southern Africa, particularly in regions such as the Witwatersrand. Available evidence indicates that with rise in altitude, red cell count is increased only slightly, haemoglobin concentration considerably, with packed cell volume occupying an intermediate position.

Atherosclerosis and Coronary Artery Disease

Comparison of pathological grading and chemical composition of aorta from Bantu and White subjects

When the collection of samples and chemical analysis is complete, histopathological examination of sections will be undertaken. Briefly, the percentage composition of aortae from both races does not differ significantly in the 20—29 year age group, but thereafter, the increases in dry weight, ash, calcium, phosphorus, total fat, cholesterol, and decreases in elastin concentrations are much higher in the white population than in native. Only in respect of collagen is the percentage composition unaffected by age in both races. One point to be stressed, is that the differences in the severity of atherosclerotic lesions in aorta from both populations are less than the differences in death rates resulting from the lesions.

The sex factor in atherosclerosis and coronary heart disease

Among white populations, differences between males and females regarding both severity of atherosclerotic lesions and death rates from coronary artery disease have given rise to much speculation. The fact that data for males, even up to old age, indicate greater severity and higher incidence of death than for females, has led to the belief that in females some endocrine factor may exert a protecting effect which, however, operates until long after the menopause, although to a diminishing degree. Examination of the available evidence on the Bantu, among whom the severer complications of atherosclerosis are very rare, reveals that there is *no* sex bias, either in extent of atherosclerotic lesions, or of death rates from coronary heart disease. In consequence, it appears that in degenerative heart disease, the sex factor has a secondary, rather than a primary role.

Parasitism and Nutritional State

This extensive and important subject has been touched upon by the Unit only in so far as determining the blood loss in urinary and intestinal bilharzia (*Schistosoma haematobium* and *mansoni*), and in hookworm disease (*ancylostomiasis*).

Blood loss in children suffering from S. haematobium infestation

With the co-operation of the Hospital Superintendent and the District Surgeons of Rustenburg, six Bantu chil-

kinders met bilharziabesmetting en klaarblyklike hematurie in die hospitaal opgeneem, waar hul urine vir 'n tydperk van vyf dae opgevang en vir bloed ondersoek is. Dit is bevind dat, net soos by volwassenes, die bloedverlies klein is en beslis onvoldoende om anemie te veroorsaak.

Behandeling van kinders met Miracil D

'n Totaal van 150 kinders is oor 'n tydperk van 4 tot 6 dae met Miracil D behandel, teen 'n dosis van 130 mg. per Kg. liggaamsgewig, volgens ouderdom. Daar is voortgegaan met ondersoeke op die ontlasting en urine, en oor die hematologie en biochemie van bloedmonsters, eers voor behandeling en daarna met tussenposes van twee maande, om sodoende nie alleen die waarde van die behandeling te bepaal nie, maar ook die tydsverloop voordat volkome herbesmetting weer intree.

Vergelyking van gesondheidsbeeld van kinders met en sonder bilharziase

Twee nabygeleë skole in die Rustenburg-distrik verskaf uitmuntende materiaal vir 'n vergelykende studie oor die uitwerking van bilharzia op Bantoe-skoolkinders. Kinders van een skool kom uit 'n gebied waar die water-voorraad verkry word uit vlak putte wat nie met slakke besmet is nie en dus vry van bilharzia is, terwyl die kinders van die ander skool afkomstig is uit besmette gebiede. Noukeurige vergelyking word gemaak tussen die groepe Bantoe-seuns en -dogters van elke skool. Dit sluit in kliniese, antropometriese, biochemiese, hematologiese, parasitologiese sowel as spesiale ondersoeke van oë, tande en sekere fisiologiese en intelligensietoetse. Hierdie werk word onderneem in medewerking met spesialiste van die S.A. Instituut vir Mediese Navorsing, die Mediese en Tandheelkundige skole, Johannesburgse hospitale, die Kamer van Mynwese se Eenheid vir Toegepaste Fisiologie, en die Nasionale Instituut vir Personeelnavorsing. Dit sal die eerste noukeurige en omvattende poging wees om te oordeel in watter mate bilharziase 'n stremmende invloed het op die nie-blanke kinderbevolking.

Lewersiekte

In medewerking met patoloë van die Instituut vir Mediese Navorsing, is 'n reeks van 876 postmortem-lewers en 215 lewerbiopsiemonsters bestudeer om meer te wete te kom van die oorsake van lewersiekte. Die ouderdomsneiging van die letsels is ook vasgestel, en die belangrikste letsels is die strawwe vetlewer in kwashiorkor, 'n verspreide fibrose wat oorheersend van portale oorsprong is, en 'n strawwe sirrose.

Ondersoek van die beskikbare gegewens toon dat die voedingsfaktore wat so maklik lewerbeskadiging in diere aanrig, min verband het met lewerkwaal in die Bantoe.

Afwykings in die Spoed van Rooiselbesinkings in die Bantoe

In medewerking met mediese beamptes van die Witwatersrandse Naturellehospitaal van die Arbeids-

dren infested with bilharzia and showing obvious haematuria were hospitalized, their urine collected for a five-day period and examined for blood. As with adults, it was found that the blood loss was small and certainly insufficient to give rise to an anaemia.

Treatment of children with Miracil D

A total of 150 Bantu children was treated over a 4 to 6 day period, dependent on age, with a dosage of 130 mg. Miracil D per Kg. body weight. Investigations on stools and urines, and haematology and biochemistry on blood samples have been pursued, prior to treatment and at two monthly intervals, to determine not only the efficacy of the treatment, but the time elapsing before complete re-infestation supervenes.

Comparison of health picture of children with and without bilharzia

Two nearby schools in the Rustenburg District provide excellent material for a comparative study of the effect of bilharzia on Bantu school children. Children attending one school are drawn from a community whose source of water is shallow wells not infested with snails and therefore free from infection, while those at the other school are drawn from infested areas. Careful comparisons are being made between groups of Bantu boys and girls from each school—clinical, anthropometrical, biochemical, haematological, parasitological, also special examinations of eyes, teeth, certain physiological tests, and intelligence tests. This work is being undertaken in collaboration with specialists from the S.A. Institute for Medical Research, the Medical and Dental Schools, Johannesburg Hospitals, the applied Physiology Unit of the Chamber of Mines, and the National Institute for Personnel Research. This will be the first careful and comprehensive endeavour to assess the handicap imposed by bilharzia on a non-white child population.

Liver Disease

In collaboration with pathologists at the Institute for Medical Research, a series of 876 postmortem livers and 215 liver biopsy samples have been studied, with a view to learning more of the aetiology of hepatic disease. The age trend of the lesions has been determined, the main lesions being: the severe fatty liver of kwashiorkor; a diffuse fibrosis which is predominantly portal in origin, and a severe cirrhosis.

Examination of the available evidence indicates that the nutritional factors which so readily induce hepatic damage in animals have little relevance in liver disease in the Bantu.

Abnormalities of Erythrocyte Sedimentation Rate in the Bantu

In collaboration with medical officers at the Witwatersrand Native Labour Association Hospital, Rand

vereniging, die hospitaal van die Rand Leases-myn, en die Ernest Oppenheimer Eenheid vir Hart-bloedvat-siekte is bevind dat afwykings in die spoed van rooiselbesinkings dikwels voorkom in uiterlik gesonde Bantoemynwerkers by die aanvang van hul dienstermyn. Die waardes daal byna sonder uitsondering tot binne normale perke nadat die natuurlike vir 'n paar maande die volwaardige dieet gekry het wat in die mynkampongs verskaf word, maar word weer abnormaal nadat die natuurlike terugkeer na hul kraaltoestande, en maande later weer kom aanmeld vir werk in die myne. Hoewel nog geen juiste uitleg vir hierdie verskynsel gegee kan word nie, skyn dit asof die veranderinge, regstreeks of onregstreeks, die gevolg kan wees van 'n uitstekende dieet wat oor 'n tydperk van 'n paar maande aan hulle verskaf word.

VOEDINGNAVORSINGSEENHEID

Hoof van die Eenheid: PROF. J. GILLMAN
Universiteit van die Witwatersrand,
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Voeding

Vitamiën A-metabolisme

Ten spyte van 30 jaar se intensiewe navorsing oor vitamien A, het die resultate wat tot dusver verkry is, nog skaars geraak aan die algemene rol wat hierdie vitamien in selmetabolisme speel. 'n Studie oor die algemene klas van reaksies wat die metabolisme van vitamien A beheer, is nou aan die gang. Omrede die feit dat baie lae hoeveelhede vitamien A nodig is vir normale metabolisme, is gemerkte vitamien A gesintetiseer om navorsing oor die deelname van vitamien A in metabolisme onder fisiologiese toestande te vergemaklik. Hierdie sintese is in Desember 1955 voltooi.

Die rol van vitamien D in die metabolisme van kalsium en fosfor

Ondersoeke wat gedurende die verslagjaar uitgevoer is, het aan die lig gebring dat, afgesien van sy verkalkings-uitwerking, vitamien D verspreide, nie-verkalkende letsels in die hart-bloedvat-stelsel, spysverteringskanaal, nier, milt en long veroorsaak. Nekrotiese slagaarontsteking en verskeie ander vorms van bloedvatontsteking, miokarditis (hartspierontsteking), sweervorming in die grootderm en maag, ligte en soms ernstige nierontsteking, nekrose van die gestreepte spier en van die milt, is almal waargeneem in rotte wat met vitamien D behandel is.

Sulke reaksies kan toe te skryf wees aan 'n verandering in die reaktiwiteit van die weefsels wat geassosieer is met 'n verhoogde behoefte aan kalsium en fosfor en/of 'n ernstige wysiging in nierfunksie. Wat ookal die primêre plek van vitamien D-werking mag wees, was daar alle aanduidings dat die nier vroeg gedurende die proef-

Leases Mine Hospital, and Ernest Oppenheimer Unit for Cardio-vascular Disease, it has been found that abnormalities in erythrocyte sedimentation rate occur often in outwardly healthy Bantu mine-workers at the time of their starting work. Values almost invariably fall to within normal limits after workers have been consuming for some months the adequate diet provided in the mine compounds; but they again become abnormal once workers return to kraal conditions and several months later re-present themselves for work on the mines. While the precise explanation of the phenomenon observed is obscure, it would seem that the changes, directly or indirectly, are ascribable to the consumption of an excellent diet for several months.

NUTRITION RESEARCH UNIT

Head of the Unit: PROF. J. GILLMAN
University of the Witwatersrand, Johannesburg

Nutrition

Vitamin A metabolism

In spite of thirty years of intensive research into vitamin A, the results up to now scarcely touch the general role of this vitamin in cellular metabolism. A study of the general class of reactions governing the metabolism of vitamin A is now in progress. Because very low quantities of vitamin A are necessary for normal metabolism, labelled vitamin A was synthesized to facilitate research into the participation of vitamin A in metabolism under physiological conditions. This synthesis was completed in December, 1955.

The role of vitamin D on the metabolism of calcium and phosphorus

Investigations conducted during the period under review have disclosed that, apart from its calcifying effects, vitamin D produced widespread, non-calcifying lesions in the cardio-vascular system, gastro-intestinal tract, kidney, spleen and lung. Necrotising arteritis and various other forms of angeitis, myocarditis, ulceration of the large bowel and stomach, mild and sometimes severe nephritis, necrosis of the striated muscle and of the spleen have all been observed in vitamin D-treated rats.

Such reactions may be attributable to a change in the reactivity of the tissues associated with an increased avidity for calcium and phosphorus or a profound modification in kidney function. Whatever the primary site of action of vitamin D, there was every indication that the kidney was damaged early during the experiment. All the other reactions (such as, haemorrhagic necrosis

neming beskadig raak, en al die ander reaksies (soos hemorragiese nekrose van die milt, sweervorming in die maag en grootderm, ens.) was regstreeks afhanklik van die aard en graad van die nieraandoening.

Hierdie ondersoek is van besondere belang vir die begrip van die ontstaan en oorsake van verskillende siekte-prosesse in die mens. Hieronder kan genoem word: Feitis se siekte (d.w.s. milt-nekrose saam met nierkwaal), sweervorming van die spysverteringskanaal in uremiese toestande, verwantskap van long- en beensiekte met nierkwaal, hartkwaal, voorkoms van oormatige kalk in babas en kinders en knopperige ontsteking van die slagaarbutewand, hipersensitiewe en rumatiese slag-aarontsteking.

Proewe is ook uitgevoer oor die manier van werking van vitamien D, en dit is getoon dat verkalking van sagte weefsels, veral van die aorta en die groot en klein slagare voortduur lank nadat behandeling met vitamien D gestaak is.

Na 'n tydperk van behandeling met vitamien D, gee die serum van kalsium en fosfor geen aanduiding van die graad van verkalking van die hart-bloedvat-stelsel nie. Vitamien D veroorsaak 'n verandering in die weefsels en verhoog hul gretigheid vir kalsium en fosfor, maar 'n tiendubbele toename in die kalsium- en fosforinhoud van die weefsel, soos deur chemiese metodes bepaal, kan voorkom voordat sodanige verkalking histologies opgespoor kan word.

Voedselinname van die bobbejaan

Voordat 'n ondersoek onderneem kon word van die verwantskap van die dieet met daardie faktore van die buislose kliere wat die menstruasiesiklus beheer, moes eers gegewens ingewin word oor die daaglikse voedselinname van bobbejane wat vrye toegang tot 'n gemengde dieet het. Vir hierdie doel is die voedselverbruik gemeet van vyf normale volwasse wyfie-bobbejane wat vir 60 tot 80 dae lank in metabolismekaste gehou is. Uit hierdie studie het dit duidelik geword dat die endokrienfaktore wat die verskillende dele van die menstruasiesiklus reguleer, die voedselinname van die volwasse wyfie-bobbejaan aanmerklik beïnvloed.

Proefverwekking van Kanker

Metabolisme van porfirien en galsure in proefverwekte Karsinoom

Dit is beweer dat die ontwikkeling van karsinoom van die lewer in verband staan met faktore soos versteuring van gal-metabolisme, veranderde metabolisme van vitamien A, en met abnormale werking van die buislose kliere—veral die skildklier en estrogeenmetabolisme. Hierdie vraagstuk is verder ondersoek deur proefnemings op rotte om die uitskeiding van uro-porfirien en koproporfirien te bepaal, en om vas te stel of daar enige verandering in die galsure plaasvind in die verskillende stadiums gedurende die ontwikkeling van proefverwekte karsinoom van die lewer.

of the spleen, ulceration of the stomach and large bowel, etc.) were directly dependent upon the nature and extent of the kidney disorder.

These investigations have particular significance in the understanding of the pathogenesis and etiology of several disease processes in man. Among these may be mentioned Feitis' disease (i.e. splenic necrosis in association with kidney disease), the ulceration of the alimentary tract in uraemic states, the association of lung and bone disease with kidney disease, cardiac diseases, hypercalcaemic states in infants and children and periarteritis nodosa, hypersensitivity arteritis and rheumatic arteritis.

Experiments were also carried out on the mode of action of vitamin D, and it has been shown that calcification of soft tissues, particularly of the aorta and large and small arteries, continues long after the suspension of treatment with vitamin D.

Following a period of treatment with vitamin D, the serum calcium and phosphorus affords no indication of the extent of mineralization of the cardiovascular system. Vitamin D induces a change in the tissues, increasing their avidity for calcium and phosphorus, but a ten-fold increase in the calcium and phosphorus content of the tissues, as determined by chemical methods, occurs before such calcification can be detected histologically.

Dietary intake of the baboon

Before it was possible to investigate the relationship of diet to those endocrine factors regulating the menstrual cycle, it was necessary to obtain data concerning the daily food consumption of baboons having free access to a mixed diet. For this purpose the food consumption has been measured of five normal adult female baboons kept in metabolism cages for periods of 60 to 80 days. From this study it became evident that the endocrine factors regulating the different parts of the menstrual cycle substantially influence the food intake of the adult female baboon.

Experimental Carcinogenesis

Metabolism of porphyrins and bile acids in experimentally-induced carcinoma

It has been suggested that the development of carcinoma of the liver hinged on factors such as disturbance in bile metabolism, altered metabolism of vitamin A, and on endocrine dysfunction, implicating in particular the thyroid gland and oestrogen metabolism. In pursuance of this problem, experiments have been designed to determine the excretion of uroporphyrin and coproporphyrin and to ascertain whether or not any change occurs in the bile acids at various stages during the development of experimentally induced carcinoma of the liver in rats.

Metabolismestudies in die Bobbejaan

Regulering van serumlipiede en proteïengebonde jodium

Ondersoeke na die faktore wat die peil van die serumlipiede en die proteïengebonde jodium (PGJ) in normale en proefnemingsstoestande reguleer, het aangetoon dat daar geen betekenisvolle seisoens- of geslagsverskille in die gemiddelde serumlipiede van die bobbejaan is nie. Die kalsium-fosfor-verhouding bly konstant dwarsdeur die lewe en is onafhanklik van geslag of ouderdom. Die hoë serumlipiede en PGJ wat waargeneem is in die bobbejaantjies wat aan die bors gevoed word, is 'n fisiologiese eienaardigheid van die baba-bobbejaan. Individuele verskille kan in die serumlipiede en PGJ in die babastadium waargeneem word.

Samestelling van die geslagsvel gedurende die menstruasiesiklus

In proewe op die chemiese samestelling van die geslagsvel in verskillende stadiums gedurende die menstruasiesiklus van die bobbejaan, is bevind dat sowat 50 gram plasmaproteïen in die geslagsvel ophoop gedurende die follikulêre fase van die siklus en dan na ovulasie weer uitgeskei word. Die groot ophoping van stikstof in die opgeswelde vel kom hoofsaaklik van plasmaproteïene; die groot toename in proteïeninhoud van die geslagsvel in die follikulêre fase kan toegeskryf word aan verhoogde plasmaproteïensintese, verminderde afbreek en herverspreiding van plasmaproteïene van die ekstra- en introvaskulêre kamers na die tussensense ruimtes van die boudnaat. Daar was geen aanduiding dat enige plasmaproteïene in die boudnaat gesintetiseer is nie.

Endokrienregulering van watermetabolisme

Ondersoeke van die endokrien-regulering van watermetabolisme en sy verwantskap met liggaamsgewig in bobbejane wat 'n hipofisektomie ondergaan het, dui aan dat die liggaamsgewig van die normale bobbejaan deels afhang van die relatiewe funksionering van die skildklier en van die bynierskors. In normale bobbejane kan oormatige gevoeligheid vir die gewigsverminderende uitwerking van tiroksien beskou word as 'n teken van onderdrukte bynierfunksie. Verder is getoon dat, in adolessente bobbejane, weerstand teen die gewigsverminderende uitwerking van tiroksien te wyte was aan intense bynierskorswerking en/of aan onderdrukking van skildklierfunksie deur groeihormoon.

Dit skyn die eerste poging te wees om 'n verklaring te vind vir die verskillende endokrienfaktore wat liggaamsgewig van 'n Primaat reguleer. Deur omskrewe manipulering van die hormone kon aktiewe vetsintese en selfs swaarlywigheid bevorder word. Sulke inligting is van aansienlike belang vir die begrip van ooreenstemmende vraagstukke by die mens.

Wat die endokrienregulering van watermetabolisme betref, het die ondersoeke getoon dat, net soos in die geval van die plasmaproteïene, serumlipiede en PGJ, individualiteit ook 'n rol speel in die metabolisme van

Metabolic Studies in the Baboon

Regulation of serum lipids and protein-bound iodine

Investigations into factors regulating the levels of the serum lipids and of the protein-bound iodine (PBI) under normal and experimental conditions, have shown no significant seasonal or sexual differences in the mean serum lipids of the baboon. The calcium/phosphorus ratio remains constant throughout life and is independent of sex or age. The high serum lipids and PBI in the breast-fed infant baboons were shown to be a physiological peculiarity of the infant baboon. Individual differences in the serum lipids and PBI could be detected in early infancy.

Composition of the sex skin during the menstrual cycle

In experiments on the chemical composition of the sex skin at different stages during the menstrual cycle of the baboon, it was found that about 50 grams of plasma protein accumulates in the sex skin during the follicular phase of the cycle and is discharged after ovulation. The large accumulation of nitrogen in the turgescient skin is derived mainly from plasma proteins, the great increase in protein content of the sex skin in the follicular phase being explained by increased plasma protein synthesis, decreased breakdown and redistribution of plasma proteins from the extra- and intravascular compartments to the intercellular spaces of the perineum. There was no indication that any plasma proteins were synthesized in the perineum.

Endocrine regulation of water metabolism

Investigations of the endocrine regulation of water metabolism and its relationship to body weight in hypophysectomized baboons suggests that the body weight of the normal baboon depends in part on the relative functional activity of the thyroid gland and of the adrenal cortex. In normal baboons, undue sensitivity to the weight-reducing effects of thyroxin could be regarded as a manifestation of depressed adrenal function. It was also suggested that, in adolescent baboons, refractoriness to the weight-reducing effects of thyroxin was due either to intense adrenal cortical activity and/or to depression of thyroid function by growth hormone.

This seems to represent the first attempt to elucidate, in a primate, the various endocrine factors regulating body weight. By defined manipulation of the hormones, it has been possible to promote active fat synthesis and even obesity. Such information is of considerable importance for the understanding of corresponding problems in man.

In regard to endocrine regulation of water metabolism, the investigations have shown that, just as in the case of the plasma proteins, serum lipids and protein-bound iodine, individuality also asserts itself in the metabolism

water. Gedurende hierdie ondersoek is die groot waterbewegings in die bobbejaan tydens die menstruasiesiklus bestudeer sowel in normale as in dié waarvan die hipofise, die bynier en die skildklier verwyder is.

Vervette lewer veroorsaak deur die buislose kliere

Die snelheid waarmee vervette lewers in ondervoede kinders kan ontwikkel, het aangedui dat die buislose kliere moontlik onmiddellik daarmee in verband staan. Proewe is dus begin om vas te stel of dit moontlik is om 'n vet lewer by die bobbejaan te veroorsaak deur die endokrienstatus te verander. Hierdie ondersoek het getoon dat dit moontlik is om uiters vet lewers te veroorsaak in bobbejane waarvan die pankreas verwyder is en wat nie insulien ontvang nie, en in bobbejane waarvan die hipofise verwyder is ná 'n reeks behandelings met kortison en tiroksien. In teenstelling met 'n hond, ontwikkel 'n vet lewer egter nie in 'n bobbejaan nadat die skildklier of die hipofise, of albei, verwyder is nie.

In bobbejane waarvan die pankreas verwyder is en wat nie insulien ontvang nie, het die ophoping van vet in die lewer gepaard gegaan met 'n merkbare styging van die cholesterol, fosfolipiede en van die trigliseriede van die plasma. So 'n korrelasie kon egter nie vasgestel word nie tussen die serumlipiede en vet in die lewer in bobbejane waarvan die hipofise verwyder is ná 'n behandeling met kortison en tiroksien.

Die meganisme verantwoordelik vir hierdie verskillende soorte vet lewers word nou noukeurig ondersoek.

Metaboliese veranderinge in suikersiekte

Aangesien die verwydering van die pankreas ernstige suikersiekte in die bobbejaan tot gevolg het, is 'n gunstige geleentheid gebied om die plek van werking van insulien in Primate te ondersoek. Aan die begin kan gesê word dat die eienaardige vorming van klein holtes in die lewerkerne as gevolg van suikersiekte in die mens, ook veroorsaak kan word in die bobbejaan waarvan die pankreas verwyder is.

In die literatuur is herhaaldelik verklaar dat vetsintese gestrem word in diere met suikersiekte na die onttrekking van insulien. Die Eenheid het getoon watter veranderinge in die glukose en verskeie lipiedfraksies van die bloed van die bobbejaan plaasvind as gevolg van pankreas-verwydering en het hierdie veranderinge met die ontwikkeling van vet in die lewer gekorreleer deur reekse van lewerbiopsies.

Die groot toename in die lipiede van die serum en van die lewer sonder enige verlies van liggaamsgewig of aptyt, het getoon dat vetsintese skynbaar nie volkome onderbreek is nie. Om hierdie moontlikheid te ondersoek, is vetsintese in die bobbejaan waarvan die pankreas verwyder is, met behulp van radioisotope ondersoek (C^{14} in die tweede koolstofatoom van pirodruiwesuur).

Uit hierdie voorlopige ondersoek blyk dit dat vetsintese wel voorkom in die lewer van bobbejane waarvan die pankreas verwyder is, en dat C^{14} ingesluit is in die serumfosfolipiede en serumcholesterol-ester.

of water. In the course of this work, the great movements of water which occur during the menstrual cycle of the baboon were studied in normal as well as in hypophysectomized, thyroidectomized and adrenalectomized animals.

The fatty liver of endocrine origin

The rapidity with which fatty liver can develop in malnourished human infants suggested that the endocrine glands were immediately implicated. Experiments were, therefore, started to investigate the possibility of producing a fatty liver by changing the endocrine status of the baboon. These investigations have shown that an intensely fatty liver can be produced in depancreatized baboons not receiving insulin, and in hypophysectomized baboons following a course of treatment with cortisone and thyroxin. Unlike the dog, the baboon does not develop a fatty liver after removal of the thyroid or the pituitary or of both glands.

In depancreatized baboons, not receiving insulin, the accumulation of fat in the liver was accompanied by marked elevation of the cholesterol, phospholipids and of the triglycerides of the plasma. No such correlation could be established between the serum lipids and fat in the liver in hypophysectomized baboons after a course of treatment with cortisone and thyroxin.

The mechanism responsible for these different kinds of fatty liver is now being more closely examined.

Metabolic changes in diabetes

Since removal of the pancreas results in severe diabetes in the baboon, a favourable opportunity was provided for investigating in primates, the site of action of insulin. At the outset, it can be stated that the peculiar vacuolation of the liver nuclei in human diabetics can be produced in the depancreatized baboon.

It has been repeatedly stated in the literature that fat synthesis is inhibited in diabetic animals after withdrawal of insulin. In depancreatized baboons, the Unit has demonstrated sequential changes in the glucose and various lipid fractions of the blood and has correlated these with the development of fat in the liver by serial biopsy punctures.

The great increase in the lipids of the serum and of the liver without any loss of body weight or of appetite, would appear to indicate that fat synthesis was not entirely interrupted. In order to test this possibility, fat synthesis in the depancreatized baboon was investigated with the aid of radioisotopes (C^{14} incorporated into the second carbon atom of pyruvic acid).

From this preliminary investigation, it is apparent that fat synthesis does occur in the liver of depancreatized baboons and that C^{14} is incorporated into the serum phospholipids and serum cholesterol ester.

NAVORSINGSEENHEID VIR PNEUMOKONIOSE

Hoof van die Eenheid: DR. A. J. ORENSTEIN
London House, Johannesburg

Op versoek van die Minister van Mynwese het die Raad die Navorsingseenheid vir Pneumokoniose gedurende die jaar in die lewe geroep vir die koördinasie van navorsingswerk oor die voorkoming van beroepsiektes wat deur stof in die lug veroorsaak word. Dr. A. J. Orenstein, 'n voormalige Direkteur-generaal van Mediese Dienste in die Unieverdedigingsmag en tot onlangs hoofmediese beampte van die Rand Mines Central Mining Group, is as hoof van die eenheid aangestel en het op 1 Maart 1956 diens aanvaar.

Vir baie jare is deur verskillende organisasies in Suid-Afrika heelwat navorsingswerk onderneem oor die tegniese en mediese aspekte van die silikose-vraagstuk. Die nuwe Eenheid het dus 'n sterk fondament om op voort te bou, en sy belangrikste taak sal wees om bestaande navorsingswerk te koördineer en, waar nodig, nuwe projekte aan te voer sodat daar 'n gebalanseerde program sal wees oor alle aspekte van die bestryding van stof en vir die voorkoming en behandeling van die siektes wat daardeur veroorsaak word.

Die doel is nie om groot nuwe laboratoriums spesiaal vir pneumokoniose-navorsing op te rig nie. In plaas hiervan sal die Eenheid reëlings tref vir afsonderlike navorsingsprojekte om deur 'n aantal medewerkende liggame onderneem te word, onder meer deur die Suid-Afrikaanse Instituut vir Mediese Navorsing, die Navorsingslaboratoriums van die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese, die Mediese Silikoseburo, die Johannesburgse Volkshospitaal en sekere nasionale laboratoriums van die W.N.N.R. Daar sal egter een bykomende gebou vir die Eenheid opgerig word by die S.A. Instituut vir Mediese Navorsing in Johannesburg.

Gedurende die grootste gedeelte van die tydperk waaroor hierdie verslag handel, was die hoof van die Eenheid besig met administratiewe reëlings en same-sprekings oor die navorsingsprogramme. 'n Verteenwoordigende adviserende komitee is saamgestel en 'n aantal vooraanstaande wetenskaplikes en ingenieurs het hulle bereidwillig verklaar om as ere-raadgewers van die Eenheid te dien. Hierdie groep raadgewers bestaan uit professor A. J. Vorwald, 'n voormalige direkteur van die beroemde toringinrigting van die Trudeau-stigting by Saranac Lake in die Verenigde State, dr. E. J. King, professor in Biochemie aan die nagraadse mediese skool van die Universiteit van Londen, dr. Eric Samuel, voormalige adviseur oor radiologie van die Britse Leër, professor R. A. L. Black van die Afdeling Mynwese van die Universiteit van die Witwatersrand en mnr. F. G. Hill, Raadgewende Ingenieur van die Central Mining and Investment Corporation.

PNEUMOCONIOSIS RESEARCH UNIT

Head of the Unit: DR. A. J. ORENSTEIN
London House, Johannesburg

In response to a request from the Minister of Mines, the Council established the Pneumoconiosis Research Unit during the year, in order to co-ordinate research into the prevention of occupational diseases caused by airborne dust. Dr. A. J. Orenstein, a former Director-General of Medical Services in the Union Defence Force and until recently Chief Medical Officer to the Rand Mines Central Mining Group, was appointed Head of the Unit and assumed duty on 1st March, 1956.

For many years a considerable amount of research work on both the technical and medical aspects of the silicosis problem has been undertaken by various organizations in South Africa. The new unit has thus a firm foundation on which to build. Its main task will be to co-ordinate existing research and, where necessary, to initiate new projects to ensure a balanced programme covering all aspects of the suppression of dust and the prevention and treatment of the diseases it causes.

It is not proposed to build large new laboratories specifically for pneumoconiosis research. Instead, the unit will arrange for individual research projects to be undertaken by a number of co-operating bodies. Among these will be the South African Institute for Medical Research, the Research Laboratories of the Transvaal and Orange Free State Chamber of Mines, the Silicosis Medical Bureau, the Johannesburg General Hospital and certain National laboratories of the C.S.I.R. However, one additional building is to be erected for the Unit at the S.A. Institute for Medical Research in Johannesburg.

For most of the period under review, the Head of the Unit has been engaged in making administrative arrangements and holding discussions on the research programme. A representative advisory committee has been appointed and a number of eminent scientists and engineers have agreed to act as honorary consultants to the Unit. This panel of consultants consists of Professor A. J. Vorwald, a former director of the Trudeau Foundation's famous tuberculosis institution at Saranac Lake in the United States, Dr. E. J. King, Professor of Biochemistry at the Post-graduate Medical School of the University of London, Dr. Eric Samuel, former adviser of radiology to the British Army, Professor R. A. L. Black of the Mining Department of the University of the Witwatersrand and Mr. F. G. Hill, Consulting Engineer to the Central Mining and Investment Corporation.

Die onderhoudskoste van die Eenheid word gedek uit bydraes van die Departement van Mynwese, die Transvaalse en Oranje-Vrystaatse Kamer van Mynwese en die Mynwerkersunie. Behalwe die beskikbaarstelling van sy laboratoriumfasiliteite aan die Eenheid, verskaf die W.N.N.R. ook sekretariële en administratiewe dienste.

TERINGNAVORSINGSEENHEID

Hoof van die Eenheid: DR. B. A. DORMER
King George V-Hospitaal, Durban

Die navorsingseenheid het hom hoofsaaklik toegelê op die ondersoek van die ontwikkeling van weerstand van *Mycobacterium tuberculosis* teen isonikatiensuurhidrasied (INSH) en ander antimikrobiële middels en die uitwerking van weerstand op die kultuur- en morfologiese eienskappe en die kwaadaardigheid van die organismes.

Voordat enige betroubare gevolgtrekkings gemaak kon word, moes 'n betroubare metode ontwikkel word vir die uitvoering van die toetse. Baie metodes is beskryf en die verskillende metodes het teenstrydige resultate gelewer. Die afgelope jaar is baie tyd bestee aan die beoordeling van die waarde van die verskillende metodes. Dit was veral belangrik met die oog op die feit dat getoon is dat organismes wat deur sommige ondersoekers as „volkome ongevoelig” beskou is, slegs gedeeltelik ongevoelig is. Omdat saprofiete baie bestand is teen INSH en verskeie navorsers verklaar het dat *M. tuberculosis* wat bestand is teen INSH, biologies soos saprofiete optree, het dit belangrik geword om die hoogste konsentrasie INSH vas te stel waarin die organismes sou groei en dan die kwaadaardigheid van die hoogs bestande organismes te vergelyk met die van organismes wat meer gevoelig is vir INSH.

Gedurende die jaar is 3,957 stamme van *M. tuberculosis* vir gevoeligheidstoetse teen INH ondersoek, 1,305 teen Streptomisien, 97 teen PAS, 59 teen Dipasic, 4 teen Terramisien, 11 teen Streptohidrasied, 15 teen Viomisien en 65 teen Neotizied. Dit sluit nie kontrole van bekende sensitiewe, „byna ongevoelige” en kontrole sonder antibiotikum in nie. Indien hulle wel ingesluit sou word, sou die getalle van werklike toetse vier keer groter wees.

In die ondersoek van bestande organismes is dit essensieel om die weerstand van die organismes teen alle antibiotika, wat gebruik word met die kliniese toestand van die pasiënt, te korreleer.

Die volgende resultate toon die teenstrydighede wat gevind is in gepubliseerde resultate en die tydrowende toetse wat uitgevoer moes word om die foute in hierdie gepubliseerde resultate te bewys.

Tot Oktober 1955, is die gevoelighede volgens die plaatweekmetode getoets deur gebruik te maak van 'n suspensie van INSH wat 'n konsentrasie van sowat 50 mikrogram in 'n straal van 0.5 cm. van die strokie gegee

The cost of running the Unit is being met by contributions from the Department of Mines, the Transvaal and Orange Free State Chamber of Mines and the Mine-workers' Union. The Council, in addition to making its laboratory facilities available to the Unit, is providing secretarial and administrative services.

TUBERCULOSIS RESEARCH UNIT

Head of the Unit: DR. B. A. DORMER
King George V Hospital, Durban

The main efforts of this Research Unit have been devoted to an investigation of development of resistance of *Mycobacterium tuberculosis* to isonicatinic acid hydrazide (INAH) and other antimicrobial agents, and the effect of resistance on the cultural and morphological characteristics, and on the virulence of the organisms.

Before any reliable conclusions could be drawn it was necessary to evolve a reliable method of doing the tests. Many methods have been described and the different methods gave equivocal results. Much of the past year was spent in assessing the value of the different methods. This was particularly important in view of the fact that organisms, which were considered “completely insensitive” by some investigators, were subsequently shown to be only partially insensitive. Because saprophytes are very resistant to INAH, and *M. tuberculosis* resistant to INAH have been stated by various investigators to behave like saprophytes biologically, it became very important to find the highest concentration of INAH in which the organisms would grow, and then to compare the virulence of the highly resistant organisms with that of organisms more sensitive to INAH.

During the year, 3,957 strains of *M. tuberculosis* for sensitivity tests to INH, 1,305 to Streptomycin, 97 to PAS, 59 to Dipasic, 4 to Terramycin, 11 to Streptohydrazid, 15 to Viomycin, and 65 to Neotizide have been examined. This excludes the controls of known sensitive, “almost insensitive” and control without antibiotic. The inclusion of these brings the actual tests to four times those numbers.

In the investigation of resistant organisms, it is essential to correlate the resistance of the organisms with the clinical condition of the patient.

The following results indicate the discrepancies found in published results, and the very laborious tests that had to be done to prove the errors in these published results.

Until October, 1955, the sensitivities were put up on the plate method, using a suspension of INAH which gave a concentration of approximately 50 micrograms in

het. Die resultate is na 10 dae gelees. Die toetse wat uitgevoer is volgens die plaatweekmetode, met die konsentrasie van slegs 1 in 80 en na 10 dae gelees is, het resultate gelewer wat verskil het van gepubliseerde verslae van ander navorsers, en geen enkele stam van *M. tuberculosis* is gevind wat heeltemal teen INSH bestand was nie. Versoeke is toe na Engeland en Amerika gestuur vir kulture van *M. tuberculosis* wat as heeltemal ongevoelig vir INSH beskou word. Engeland het 6 gestuur en Amerika 8. Twaalf van hierdie 14 kulture, wat voorgegee word as ongevoelig vir INSH te wees, het 6 weke geneem om tot by die strokie te groei, terwyl slegs vier van hulle 10 dae geneem het om tot by die strokie te groei. Daar is toe gemeen dat baie van die Eenheid se resultate tot dusver onbetroubaar was omrede die kulture te gou gelees is. Gevolglik is gevoeligheidstoetse gelees na 10 dae, 20 dae, 30 dae en 6 weke, en geen verskil is gevind tussen die resultate wat na 20 dae en na 6 weke gelees is nie. Verdere gevoeligheidstoetse is uitgevoer met INSH in konsentrasies van 1/80, 1/20, 1/5, 1/1 op die strokies. Die eerste 35 toetse het getoon dat die strook filtreerpapier wat geïmpregneer was met 'n konsentrasie van INSH 1/1, elke stam van *M. tuberculosis* wat getoets is, teengehou het, en gevolglik is afgesien van hierdie konsentrasie. Die meeste van die stamme is ook volkome teengehou deur konsentrasies van INSH 1/5 op die filtreerpapierstrokie.

'n Vergelykende reeks gevoeligheidstoetse is uitgevoer met die plaatmetode en buise van L.J. waar bekende hoeveelhede INSH bygevoeg is. Dit het getoon dat $1/80 = 50\mu\text{gm}$ en $1/5 = 300\mu\text{gm}$.

Hierdie toetse het ook getoon dat baie kulture growwe en gladde variante van *M. tuberculosis* bevat, en dat die growwe variante meer teengehou is deur 'n laer konsentrasie van INSH, as die gladdes.

Biologiese toetse is uitgevoer op 46 stamme van *M. tuberculosis* wat oorspronklik as ongevoelig vir INSH beskou is, en kleurstofabsorpsietoetse is op 112 van hierdie stamme uitgevoer, en besondere aandag is geskenk aan die kulture wat uit Engeland en Amerika ontvang is as ongevoelig vir INSH.

Twee toetse vir kwaadaardigheid, naamlik die „Katalasetoets” en die „Kleurstofabsorpsietoets” waarin geen diere benodig word nie, is deur ander navorsers beskryf.

Die A.T.S.-media wat vir die Katalasetoetse aanbeveel is, is baie soortgelyk aan L.J., en 'n reeks vergelykende toetse met L.J. en A.T.S.-media is uitgevoer, dog baie meer van hierdie toetse is nodig voordat hul waarde beoordeel kan word. Biologiese kleurstof- en absorpsietoetse is uitgevoer op growwe en gladde kolonies van *M. tuberculosis* en die ondersoek duur nog voort.

Die gevolgtrekkings waartoe gekom is as gevolg van hierdie ondersoekwerk is dat geen stam van *M. tuberculosis* wat volkome bestand is teen INSH, nog gepro-

a radius of 0.5 c.m. from the strip; the results were read after 10 days. The tests done on the plate method, with the concentration 1/80 only and read after 10 days, produced results that differed from published reports of other workers and no single strain of *M. tuberculosis* was found that was completely resistant to INAH. Requests were then sent to England and America for cultures of *M. tuberculosis* considered completely insensitive to INAH; England sent 6 and America 8. Twelve out of the 14 cultures, sent as insensitive to INAH, grew up to the strip in 6 weeks, but only four grew up to the strip in 10 days. It was considered that many of the Unit's results to date may have been unreliable because the cultures had been read too soon. Sensitivity tests were then read at 10 days, 20 days, 30 days and 6 weeks, and it was found that there was no difference in results in reading after 20 days or after 6 weeks. Further sensitivity tests were done, using INAH in concentrations of 1/80, 1/20, 1/5, 1/1 on the strips. The first 35 tests showed that the strip of filter paper impregnated with a suspension of INAH 1/1 inhibited every strain of *M. tuberculosis* tested, and this concentration was then discontinued. Most of the strains were also inhibited completely by suspension of INAH 1/5 on the filter paper strip.

A comparable series of sensitivity tests, using the plate method and tubes of L.J. with known amounts of incorporated INAH was done. It was shown that $1/80 = 50\mu\text{gm}$. and $1/5 = 200\mu\text{gm}$. INAH.

These tests also showed that many cultures contained rough and smooth variants of *M. tuberculosis*, and the rough variants were inhibited by a lower concentration of INAH than the smooth.

Biological tests have been done on 46 strains of *M. tuberculosis* which were originally considered insensitive to INAH, and dye-absorption tests were done on 112 of these strains. Particular attention was paid to the organisms sent from the U.K. and U.S.A. as insensitive to INAH.

Two tests for virulence, the “Catalase” and “Dye Absorption” which do not require animals, have been described by other workers.

The A.T.S. media recommended for the Catalase test is very similar to L.J., and a series of comparative tests using L.J. and A.T.S. media were done also. Many more of these tests are, however, necessary before their value can be assessed. Biological dye and absorption tests were done on “rough” and “smooth” growths of *M. tuberculosis* and these investigations are still in progress.

The conclusions reached as a result of this work are that no strain of *M. tuberculosis* that is completely resistant to INAH has yet been produced. Complete resistance

duseer is nie. Volkome weerstand moet dus baie stadig ontwikkel. Die meeste kulture van *M. tuberculosis* toon gemengde growwe en gladde stamme. Dit kan die beste getoon word op die INSH-sensitiewe plate. Die growwe en gladde stamme toon baie verskillende grade van weerstand teen INSH.

Sitochemiese Eienskap van die Bakterie-sel

Ondersoeke is op 112 kulture uitgevoer om die weerstand van *M. tuberculosis* vir INSH te probeer korreleer met „kleurstofabsorpsie”.

Geen korrelasie is gevind tussen organismes wat bestand is teen 50 mikrogram INSH en hul kleurstofabsorpsie nie totdat die belangrikheid van growwe en gladde stamme besef is. Die teenwoordigheid van gladde en growwe kolonies skyn wel van fundamentele belang te wees.

Groei op Media wat P.A.S. Bevat

Ondersoeke het getoon dat media wat P.A.S. bevat, gebruik kan word as bykomende hulp om die onderskeid aan te toon tussen tipes van *M. tuberculosis* en ander suurvaste organismes.

Biologiese Toetse met Marmoties en Muise

Biologiese toetse is uitgevoer op 46 kulture van *M. tuberculosis* wat oorspronklik as ongevoelig vir INSH beskou is. Daar was geen korrelasie tussen gevoeligheidsresultate en biologiese kwaadaardigheid in 34 van hierdie kulture nie; en in 12 was daar wel 'n korrelasie. Dit is moontlik as gevolg van die feit dat 'n betreklik oormaat growwe of gladde variante teenwoordig kon gewees het, en hierdie aspek verg nadere ondersoek.

Katalasetoets

Korrelasie tussen die Katalasetoets, kleurstofabsorpsietoets, ontwikkeling van weerstand, en biologiese ondersoeke is in ses gevalle nagegaan. Slegs een is egter voltooi. In hierdie geval het 'n kultuur, wat destyds as ongevoelig vir INSH beskou is, 'n 3+ biologiese, 'n gemengde kleurstoftoetsresultaat en 'n negatiewe katalase gelever.

Hierdie toetse moet op verskillende tye gedoen word, byvoorbeeld die oorspronklike kultuur moet voortgevoel word in die Dubos-medium vir die kleurstoftoets en vir die biologiese toets, en op A.T.S.-media vir die katalasetoets. Die biologiese toets duur ses weke langer.

Op die oomblik kan daar nog geen gevolgtrekkings gemaak word oor die verdienste van die katalase- en kleurstofabsorpsietoetse as aanduidings van die graad van kwaadaardigheid nie.

Verdere toetse wat waardevolle inligting behoort te verskaf, word onderneem.

must therefore develop very slowly. Most cultures of *M. tuberculosis* contain mixed, rough and smooth strains. This can be demonstrated best on the INAH-sensitivity plates. The rough and smooth strains show very different degrees of resistance to INAH.

Cytochemical Property of the Bacterial Cell

Investigations on 112 cultures were done to try to correlate resistance of *M. tuberculosis* to INAH with “dye absorption”.

No correlation was found between organisms resistant to 50 micrograms INAH and their dye absorption until the importance of rough and smooth strains was appreciated. The presence of smooth and rough colonies does seem to be of fundamental importance.

Growth on Media Containing P.A.S.

Investigations have shown that media containing P.A.S. may be used as an additional means of assisting in differentiating acid-fast organisms.

Biological Tests using Guinea Pigs and Mice

Biological tests were done on 46 strains of *M. tuberculosis* that were originally considered insensitive to INAH. There was no correlation between sensitivity results and biological virulence in 34 of the cultures; correlation was present in 12. This is possibly due to the fact that a preponderance of rough or smooth colonies may have been present, and is a matter which requires further investigation.

Catalase Test

Correlation between the catalase test, dye-absorption test, developing resistance, and biological examinations were examined in six cases. Only one, however, is complete. In this case a culture which at that time was considered insensitive to INAH, produced a 3+ biological, a mixed dye-absorption test result, and a negative catalase.

These tests have to be done at different times, e.g. the original culture must be sub-cultured into Dubos medium for the dye and for the biological tests, and on to A.T.S. media for the catalase test. The biological test then takes six weeks longer.

No conclusion can be drawn yet about the merits of the catalase and dye absorption tests as indications of degree of virulence.

Further tests are in progress which should produce valuable information.

VIRUSNAVORSINGSEENHEID

Hoof van die Eenheid: PROF. M. VAN DEN ENDE
Universiteit van Kaapstad

Studies oor Oplosbare Antigene

Bloutong

'n Bepaling is verkry vir die nie-spesifisiteit van die komplementbindingsreaksie—hoofsaaklik 'n funksie van die oplosbare antigeen—in vergelyking met virusneutralisasie. Pogings om die oplosbare antigeen deur middel van elektroforese, sentrifugering en diffusie te karakteriseer, duur voort.

Hondsdolheid

Proefnemings is onderneem ter bevestiging van die immunologiese resultate waarvan in die vorige jaarverslag melding gemaak is. Sistematiese pogings word aangewend om die oplosbare antigeen te suiwer deur middel van elektroforetiese, kromatografiese en ander metodes.

Poliomiëlitis

'n Ondersoek van weefselkultuur-poliovirus, wat gekonsentreer is deur pervaporasie, het aan die lig gebring dat oplosbare antigeen klaarblyklik nie in enige van die drie soorte weefselkultuur van aapniere gevind word nie.

Ander Studies van Poliovirusse

Konsentrate is berei van weefselkultuur-virusse, soos gebruik in entstof-vervaardiging. Die gekonsentreerde virus-preparate is gebruik vir immuniseringstoets in marmotjies. Een van die hoof-oogmerke was om vas te stel hoeveel antigeen nodig is om, nadat dit met hoë konsentrasies van formalien behandel is, 'n immuniteit te veroorsaak. Die resultate was egter teleurstellend, aangesien immuunreaksies van die marmotjies swak was, selfs ook toe groot dosisse lewende virusse toegedien is.

Pogings word aangewend om Tipe 1 virus aanpasbaar te maak vir die brein van soogmuisies, op dieselfde wyse soos met Lansing-virus bereik is. Gebruik word gemaak van die stam wat deur Stanley aanpasbaar gemaak is vir die rugmurg van volwasse muis. Aanpasbaarheid kan waarskynlik bereik word deur gebruik te maak van 'n metode van alternatiewe deurlating deur weefselkulture en muisbrein.

Grootte van Diervirusse

Navorsingswerk op hierdie gebied is uitgebrei. Virusse, waarvan verskillende groottegroepe in dieselfde suspensie aangetoon is, sluit nou in: Polio (Tipe 2), Slenkdalkoors, perdesiekte, ens. Die verskynsel hang deels af van die aanpassing van die voedsterdier. Die belangrikheid van hierdie waarneming word nou ondersoek.

VIRUS RESEARCH UNIT

Head of the Unit: PROF. M. VAN DEN ENDE
University of Cape Town

Studies on Soluble Antigens

Blue Tongue

The non-specificity of the complement fixation reaction—a function mainly of the soluble antigen—in comparison with virus neutralization has been established. Attempts to characterize the soluble antigen by electrophoretic, centrifugation and diffusion methods are continuing.

Rabies

Experiments designed to confirm the immunological results recorded in the previous annual report have been undertaken. Systematic attempts are being made to purify the soluble antigen, using electrophoretic, chromatographic and other methods.

Poliomyelitis

An investigation of tissue culture polio virus, concentrated by pervaporation, revealed that soluble antigen was apparently not found in monkey kidney tissue culture of any of the three types.

Other Studies on Poliomyelitis Viruses

Concentrates have been prepared of tissue culture virus as used in vaccine manufacture. The concentrated virus preparations were used for immunization experiments in guinea pigs. One of the main aims was to determine the amount of antigen required, which, after treatment with high concentrations of formalin, would give an immunological response. The results were disappointing in that immune responses in the guinea pigs were poor, even when large doses of live virus were administered.

Attempts are being made to adapt Type 1 virus to the brains of infant mice, as has been achieved with Lansing virus. The strain adapted by Stanley to spinal cords of adult mice is being used. Adaptation can apparently be achieved using a method of alternate tissue culture mouse-brain passage.

Size of Animal Viruses

Work in this field has been extended. Viruses for which different size groups in the same suspension have been demonstrated now include: Polio (Type 2), Rift Valley fever, horse sickness, etc. The phenomenon depends, in part, on host adaptation. The significance of this observation is now being explored.

Die Slenkdalkoors-virus

Proewe is voortgesit oor die inmenging deur die ultravioletbestraalde virusse op die oorblywende lewende virusse in sodanig bestraalde materiaal, en op die uitwerking van ultraviolet op antigenisiteit. Langdurige bestraling onaktiveer nie alleen die virus nie, maar vernietig ook sy immuniseringsvermoë. Die mening is dat antigenisiteit van virusse wat met geskikte dosisse ultraviolet bestraal is, kan afhang van die teenwoordigheid van lewende maar „nie-patogeniese” virusse. Hierdie verskynsel kan van groot praktiese belang wees, en hierdie aspek word dus breedvoeriger ondersoek.

Virus van Rous se Sarkoom

Proefnemings is nog in die beginstadium, omrede praktiese moeilikhede wat ondervind word met die voortplanting van gewasselle as sulks in die weefselkultuur, of met die verkryging van betroubare bewyse van besmetting van kuikenfibroblast in weefselkultuur.

Bakteriofage

Werk in verband met die stremmende of stimulerende uitwerking van antigene van die *Ps-aeruginosa*-stamme op 'n groep fage, is afgerond vir publikasiedoeleindes. Verdere werk op hierdie gebied word voorlopig beperk sodat meer aandag geskenk kan word aan die studie van oplosbare antigene van diervirusse.

Neutralisering van Knoppiesvelsiektevirus deur middel van Normale en Immune-serums

Die plaattegniek, volgens Dulbecco of Cooper, verskaf 'n gevoelige metode vir neutralisering van hierdie virus. Dit is bekend dat die virus deur baie normale sera geneutraliseer kan word, maar geskikte titrasiemetodes was nie beskikbaar nie. Dit word vertrou dat die nuwe metode besonder behulpsaam sal wees vir die identifikasie van hierdie virus. (Die etiologiese verwantskap van die Kaapstadse virus tot beesknoppiesvelsiekte word betwyfel, in die lig van die navorsingswerk wat onlangs op Onderstepoort uitgevoer is). Navorsingswerk is nou aan die gang om te bepaal of die virus-dodende middel wat in normale serum teenwoordig is, enige verband het met Pillemer se properdien.

Rift Valley Fever Virus

Experiments have continued on the interference by ultra-violet irradiated virus of residual live virus in such irradiated material, and on the effect of ultra-violet on antigenicity. Prolonged irradiation not only inactivates the virus but destroys also its immunizing power. It is felt that antigenicity of virus irradiated with appropriate doses of ultra-violet may depend on the presence of living but "nonpathogenic" virus. This phenomenon may be of great practical significance and is therefore being investigated more extensively.

Rous Sarcoma Virus

Experiments are still in the preliminary stages, in view of practical difficulties encountered in propagating tumour cells themselves in tissue culture, or of obtaining reliable evidence of infection of chick fibroblasts in tissue culture.

Bacteriophages

Work on the inhibitory and exhibitory effect of antigens from *Ps. aeruginosa* strains on a group of phages has been rounded off for publication. Further work in this field is being reduced for the time being in order to devote more attention to study of soluble antigens of animal viruses.

Neutralization of "Lumpy Skin Disease" Virus by Normal and Immune Sera

The Dulbecco or Cooper plaque techniques provide a sensitive method for the neutralization of this virus. It was known that the virus was neutralized by many normal sera, but suitable titration methods were not available. It is hoped that the new method will be particularly helpful in the identification of this virus. (The etiological relationship to bovine lumpy skin disease of the Cape Town virus is in doubt in the light of recent work done at Onderstepoort). Work is in progress to determine whether the viricidal agent present in normal sera is related to Pillemer's properdien.

Nywerheidsnavorsings- institute

In die volgende paragrawe word 'n kort oorsig gegee van die werk wat gedurende die jaar deur nywerheidsnavorsingsinstitute gedoen is. Die institute is as maatskappye sonder winsbejag geïnkorporeer en word deur Beheerrade bestuur. Hulle is dus nie institute van die W.N.N.R. nie en reik afsonderlike jaarverslae uit.

Aangesien die Raad hulle egter finansiële steun, in die verskillende rade verteenwoordig is en in noue verband met hulle saamwerk, is dit wenslik dat opsommings van hul jaarverslae in die van die Raad ingesluit word.

LEERNYWERHEID-NAVORSINGSINSTITUUT

Direkteur: DR. S. G. SHUTTLEWORTH

In ooreenstemming met die aanbevelings van 'n hersieningskomitee van die W.N.N.R. gedurende die afgelope jaar met betrekking tot die werksaamhede van en geldelike steun vir die Instituut, is 'n beroep gedoen waarop die vernaamste bydraers mildelik gereageer het met 'n verdubbeling van hul bydraes vir die volgende vyfjaarperiode, met ingang van 1 April 1956. Hierdeur is die Instituut in 'n gesonde posisie geplaas vir uitbreiding van sy toekomstige navorsingswerksaamhede op die gebied van leer- en sy verwante nywerhede.

Behalwe sy gewone navorsingswerk, het die Instituut ook direkte dienste vir lede-firmas verrig, en hoewel die inkomste uit hierdie werk nie in aanmerking geneem word by die berekening van die W.N.N.R. se toekenning nie, het dit nogtans die totale inkomste vir die jaar geëindig op 31 Maart 1956, op £55,000 te staan gebring.

Fundamentele Navorsing

Die Instituut het voortgegaan met sy program van fundamentele navorsing wat beskou word as 'n noodsaaklike voorvereiste vir groter tegniese vooruitgang. Die publikasie *Wattle Tannin and Mimosa Extract* (230 bladsye), waarvan melding in verlede jaar se verslag gemaak is, het 'n goeie afset in die buiteland geniet en gunstige kommentaar in oorsese tydskrifte uitgelok. 'n Groot deel van die boek bevat nuwe gegewens oor die struktuur, molekulêrgewig en fisiese eienskappe van die watteltanniensoorte. Die werk op hierdie gebied duur voort.

Studies oor die komplekse basiese soute van chroom is voortgesit, terwyl goeie vordering gemaak is met die studie van die ekstraheerbare proteïene en polisakkariede van huide en velle.

Industrial Research Institutes

In the following paragraphs a brief description is given of the work undertaken by Industrial Research Institutes during the year under review. These institutions are incorporated as non-profit companies and are managed by Boards of Control. They are thus not institutes of the C.S.I.R. and issue separate annual reports.

However, since the Council contributes to their financial support, is represented on the various boards and works in close collaboration with them, it is considered desirable to include summaries of their annual reports in the annual report of the Council.

LEATHER INDUSTRIES RESEARCH INSTITUTE

Director: DR. S. G. SHUTTLEWORTH

In accordance with the recommendations of a C.S.I.R. Reviewing Committee during the previous year, concerning the activities of and financial support for the Institute, an appeal was made to which the main subscribers responded generously and agreed to doubling their grants for the ensuing five-year period commencing 1st April, 1956. The Institute has thereby been placed in a sound position to expand its future research activities in the leather and related industries.

In addition to its ordinary research work, the Institute provided a number of direct services for its member firms. Although the income from this work is not taken into consideration for estimating the C.S.I.R. grant, it nevertheless brought the total income to £55,000 for the year ending 31st March, 1956.

Fundamental Research

The Institute has continued its fundamental research programme which is regarded as an essential prelude to major technical advances. The publication entitled *Wattle Tannin and Mimosa Extract* (230 pages), and referred to in the previous annual report, has met with a good overseas sale and has been favourably reviewed in overseas journals. A considerable proportion of this book involves new knowledge on the structures, molecular weights and physical properties of the wattle tannins. Work in this field is being continued.

Studies of the complex basic salts of chromium have been continued, while good progress has been made in the study of the extractable proteins and polysaccharides of hides and skins.

Algemene Tegniese Vordering

Toegepaste navorsing op die gebied van huide en velle het afgeneem as gevolg van 'n tekort aan personeel en was hoofsaaklik beperk tot die ontwikkeling van 'n verbeterde bereidings tegniek vir Karakoelvelle en tot 'n studie van die oormatige vet-konsentrasie by die Swartkop Persieskaap. Studies wat voortspruit uit die fundamentele aspekte van die ekstraheerbare proteïene en polisakkariede het egter waardevolle gegewens verskaf oor die uitwerking van ontwatering op die aanklammingsgehalte van huide en velle wat van groot betekenis is vir die metodes van bereiding en bewaring daarvan.

Op die gebied van looiery, het die uitwerking van plaasvervangers vir sool leer as aansporing gedien vir toenemende aandag aan nuwe en beter looi prosesse en aan spesifikasies vir hoë gehalte eerder as standaard vir minimum gehalte. Die ontdekking dat sogenaamde waterdigte chroomsool leer, wat 33% was bevat, tot 35% water kan absorbeer, het gelei tot intensiewe navorsingswerk in medewerking met die Suid-Afrikaanse Leerlooiersvereniging. As gevolg hiervan is 'n spesifikasie vir mynwerkers leer vrywillig aanvaar en na berig word het dit tot aansienlike verbetering gelei. Hierdie werk word uitgebrei tot baskstrakgelooid leer. Navorsingswerk is ook aan die gang oor leerimpregnering met sintetiese rubber en met hidrofoobverbindings en oor die gebruik van epoksihars vir beter leerafwerking wat bestand is teen oplosmiddels en chemikalieë. Uitgebreide gebruik is gemaak van die Instituut se looi metodes vir binnesool wat dit bestand maak teen verrotting. Verdere vordering is gemaak met baskstrak-looi tegniek, en die praktiese toepassing van metodes wat deur die Instituut ontwikkel is het gedurende die afgelope jaar ook verdere uitbreiding getoon.

In die skoeiselnywerheid het die ontwikkeling van „Liripuff” en „Liristiff”-stowwe en kunshars vir toonkappe en agterkappe van skoeisel nog steeds wêreldwye aandag geniet, en hierdie tegniek word nou ook oorsee aanvaar waar aansoek gedoen is vir patente in die twintig belangrike skoeiselvervaardigende lande. Ooreenkomste vir vrystelling daarvan is met Brittanje gesluit en onderhandelings hieroor word nog met 'n paar ander lande gevoer waar geslaagde demonstrasies van die nuwe tegniek uitgevoer is. Gedurende die jaar het ontwikkelingswerk oor kunsharsaanwendings in die skoeiselnywerheid voortgeduur, en dit het gelei tot die ontwikkeling van 'n reeks van ses harsformulerings, waaronder harde sowel as buigsame hars voorkom. Die gebruik van die poliester-veselglas tegniek vir die neuse van voetbal- en veiligheidstewels is ook belowend.

Ander navorsingswerk in die skoeiselnywerheid het ingesluit opnames van die voetvorms van verskeie groepe volwassenes, van sowel blanke as nie-blanke manlike en vroulike beroepswerkers. Die uitwerking van omgewing en veral skoendragewoontes gedurende die vormingsjare, geniet spesiale aandag.

General Technical Advances

Applied research in the hides and skins' field has slowed down due to shortage of staff, and has been confined mainly to the development of an improved curing technique for Karakul skins and a study of the excess fatty deposits of Blackhead Persian sheep. Studies arising from the fundamental aspects of the extractable proteins and polysaccharides have, however, given valuable data on the effects of dehydration on the extent of rehydration of hides and skins, with great significance to curing and preservation methods.

In the tanning field, the impact of substitutes for sole leather has stimulated increasing attention to new and improved tanning processes and to high quality specifications rather than minimum quality standards. The discovery that so-called water-proof chrome sole leather, containing 33 per cent. of wax, could absorb as much as 35 per cent. of water led to intensive work in collaboration with the South African Tanners' Association, and gave rise to the voluntary adoption of a specification for miners' leather which has been stated to have led to considerable improvement. This work is being extended to vegetable tanned leather. Work is also in progress on impregnating leather with synthetic rubbers and with hydrophobic compounds, and on the use of epoxy resins for improved leather finishes resistant to solvents and chemicals. Wide use has been made of the Institute's perspiration rot-proof insole tanning methods. Further progress has been made in vegetable leather tanning techniques, and practical application of methods developed by this Institute has shown further extension during the past year.

In the footwear industry the development of “Liripuff” and “Liristiff” fabrics and synthetic resins for toepuffs and stiffeners for footwear has continued to attract worldwide attention, and these techniques are now being adopted overseas, where patents have been applied for in the twenty major footwear producing countries. Franchise agreements have been completed with Britain and are in course of negotiation with a number of other countries where successful demonstrations of the new techniques have been carried out. Development work on synthetic resin applications to the footwear industry has continued throughout the past year and has led to a range of six resin formulations, including both hard and flexible resins. The use of polyester fibre-glass techniques for football boot and safety boot toes is also showing promise.

Other work in the footwear industry has included footshape surveys of several adult groups, including European and non-European male and female occupational groups. The influence of environment, and particularly shoe-wearing habits during formative years, is receiving special attention.

Bedryfsnavorsing

Nadat die Instituut vir drie jaar ondersoek ingestel het na die verhoging van produktiwiteit, word die invoering van aansporingslone eers toegelaat om in te sink voordat verdere ondersoekwerk in die fabriek gedoen word. Intussen word beskikbare gegewens gebruik om navorsingsverslae op te stel. Die statistiese gegewens oor produksie het neigings in die vervaardigingsproses aan die lig gebring wat nou bestudeer en opgeteken word om te dien as leidraad vir toekomstige beleid.

Goeie vordering is gemaak met die studie van skoeisel-aankope in die gesinsbegroting van verskillende nie-blanke groepe.

In die afgelope jaar het lede van die navorsingspersoneel van die Instituut meer besoeke as ooit tevore aan fabriek gebring, en die bedekte voordele van hierdie nouer voeling tussen die wetenskaplike en fabriekspersoneel behoort 'n baie belangrike aansporing te wees vir gesonde nywerheidsvooruitgang.

Publikasies

In die afgelope jaar het die Instituut een boek (230 bladsye) gepubliseer en 10 artikels vir oorsese wetenskaplike tydskrifte en 21 vir Suid-Afrikaanse wetenskaplike tydskrifte bygedra, en ook 16 gedrukte en 15 mimeograafverslae uitgereik.

VISNYWERHEIDNAVORSINGSINSTITUUT

Direkteur: DR. G. M. DREOSTI

Goeie vordering word gemaak met die bou van die Instituut se nuwe laboratorium by die Universiteit van Kaapstad wat gedurende die jaar begin is. Hopelik sal die gebou vroeg in 1957 gereed wees om betrek te word.

In dieselfde periode is 'n nuwe laboratorium asook woonhuise wat deur die Administrasie van Suidwes-Afrika vir die Instituut by Walvisbaai opgerig is, voltooi en betrek. Die groter ruimte en fasiliteite en oor die algemeen beter werksgeriewe wat in die laboratorium verskaf word, het gelei tot 'n aansienlike verhoging van doeltreffendheid.

Ondersoekwerk

Navorsingswerk oor vars vis het ingesluit 'n studie oor die belangrike nywerheidsaspekte van die voorkoms van 'n protosoëparasiet, *Chloromyxum thyrsites*, in die liggaamspiere van verskeie vissoorte. Hierdie organisme is geassosieer met 'n spesiale soort nadoodse verval en ontbinding van die vlees en staan bekend as „melkerigheid” in stokvis, snoek en John Dory, en as „papheid” of „moes” in ingemaakte sardyne. 'n Eenvoudige tegniek vir die berekening van die aantal protosoë-spore per gram vlees het gelei tot verskeie belangrike bevindings en 'n duideliker begrip van die nywerheidsvraagstukke. Dit is vasgestel dat die ondersoek van vismootjies onder ultravioletlig geen onfeilbare toets is vir die aanwesigheid of

Operations Research

After the three year period of productivity service supplied by the Institute, the introduction of wage incentive systems is being permitted to undergo a period of digestion before carrying out further field work. In the meantime use is being made of available data to prepare research reports. The statistical data on production are revealing manufacturing trends which are being studied and written up as a guide to future policy.

Good progress has been made in the study of footwear purchases in the family budgets of various non-European groups.

During the past year, members of the research staff of the Institute have been seen on the factory floor more than ever before, and the hidden benefits of this closer contact between scientist and factory personnel must constitute a very important stimulus to sound industrial progress.

Publications

During the past year the Institute published one book (230 pages), and has contributed 10 papers to overseas scientific journals, 21 papers to South African scientific journals, and has issued 16 printed and 15 mimeographed reports.

FISHING INDUSTRY RESEARCH INSTITUTE

Director: DR. G. M. DREOSTI

The building of the Institute's new laboratory at the University of Cape Town was begun during the year and is now well advanced. It is hoped that the building will be ready for occupation early in 1957.

In the same period a new laboratory and living quarters erected for the Institute at Walvis Bay by the South West African Administration, were completed and occupied. The additional space and facilities, and generally improved working conditions provided in this laboratory, have led to considerably increased efficiency.

Investigations

Work on fresh fish included a study of the industrially important aspects of the occurrence of a protozoal parasite, *Chloromyxum thyrsites*, in the somatic muscles of several fish species. This organism is associated with a special type of post mortem breakdown and disintegration of the flesh, known as “milkiness” in hake, snoek and John Dory, and as “papness” or “mush” in canned pilchards. A simple technique, devised for the estimation of the number of protozoal spores per gram of flesh, led to several important findings and a clearer understanding of the industrial problems. It was established that the

afwesigheid van die protosoë, soos voorheen deur navorsers elders aangeneem is nie.

Navorsingswerk is voortgesit in verband met die koel-opberging van stokvis met betrekking tot visgrootte, lugvog en die aanwending van chemiese bederfweringsmiddels. Nuwe metodes is oorweeg vir die verspreiding van vis na binnelandse marke. Voorlopige studies dui daarop dat die spoorvervoer van bevrore vis in geïsoleerde houers aansienlike ekonomiese voordele mag hê as sekere tegniese moeikhede wat nou ondersoek word, uit die weg geruim kan word. 'n Nuwe metode is ontwikkel om 'n geroekte geur te verleen aan stokvis-mootjies wat bevries moet word, deur dit in voorgerookte plantolie te doop.

Navorsingswerk vir die vis- en droëvis-nywerheid het 'n ondersoek ingesluit van die gebruik van natriumbikarbonaat as 'n byvoeging in die pekeling van stokvis. Verskillende metodes vir die bereiding van gesoute en gedroogde maasbankers is bestudeer met betrekking tot finale opbrengs en die hoeveelheid arbeid wat vereis word. Die studie van chromogene soutliewende bakterieë is voortgesit.

Toetse van fabrieksomvang oor die verkilling van sardyne, het getoon dat die byvoeging van ys by tenks wat die vis bevat, 'n doeltreffende en ekonomiese manier bied vir laetemperatuuropberging van vis wat nog ingemaak moet word. Sodanige verkilling van vis verdraag bederf as gevolg van protosoön- en bakteriewerking, sodat die vis vir baie langer tye as tans gehou kan word en tog nog 'n ingemaakte produk van uitmuntende gehalte kan lewer.

Die grootskaalse proefneming in agt visinmaakfabrieke waarvolgens inspeksie gedurende prosesbeheer vergelyk is met inspeksie deur middel van inkubasie en mikrobiologiese ondersoek, is tot finaliteit gebring en die waarde van die resultate bepaal. Dit is duidelik dat inspeksie gedurende prosesbeheer baie voordele bied. Vir die inspekteurs is dit 'n vinniger en goedkoper metode as die inkubasie- en mikrobiologiese ondersoek, en bowendien is dit meer elasties vir sover 'n gegewe personeelsterkte minder onderhewig is aan 'n oormaat van werk gedurende tye van hoë produksie. Inspeksie gedurende prosesbeheer is meer sensitief en bring baie meer gebreke aan die lig as wat deur die ander stelsel ontdek word of ontdek kan word. Vir die fabrikant lewer dit 'n volledige rekord van al die prosesgegewens, verskaf beter toesig oor die personeel, en verbeterde beheer van die fabriekswerking sodat werklike of ontwikkelende foute onmiddellik gevind en herstel kan word, en laastens het dit die voordeel dat alle produksielotte wat aan spesifikasies voldoen onmiddellik vrygestel kan word in plaas van 'n vertraging daarvan vir twee tot vier weke wat genoodsaak word deur die inkubasie- en mikrobiologiese ondersoek.

Daar is voortgegaan met navorsingswerk oor metodes en verbindings vir die skoonmaak van blikke. Vir die nywerheid is aangetoon hoe beter afspoeling verkry kan word deur gebruik te maak van dieselfde hoeveelheid water, maar verdeel oor 'n reeks afspoeltenks.

examination of fillets under ultraviolet light is not, as was formerly thought by other workers elsewhere, an infallible test for the presence or absence of the protozoa.

Further work was done on the chilled storage of hake in relation to the size of the fish, the humidity of the atmosphere and the use of chemical preservatives. New methods of distributing fish to inland markets were considered. Preliminary studies indicate that railage of frozen fish in insulated containers may have considerable economic advantages if certain technical difficulties, now under investigation, can be overcome. A new method which involves dipping in pre-smoked vegetable oil was developed for imparting a smoked flavour to hake fillets intended for freezing.

Work on behalf of the salted and dried fish industry included investigation of the use of sodium bicarbonate as an additive in the brining of hake. Various methods for the preparation of salted and dried maasbankers were studied in relation to final yield and the amount of labour required. Studies of chromogenic halophilic bacteria were continued.

Factory-scale tests on the chilling of pilchards showed that the addition of ice to fish-holding tanks provides an efficient and economical means for low-temperature storage of fish awaiting canning. Such chilling retards protozoal and bacterial breakdown of the fish so that they can be held for considerably longer periods than at present and will yield a canned produce of superior quality.

The large-scale experiment in eight fish canneries, comparing process control inspection and inspection by incubation and microbiological examination, was brought to a conclusion and the results evaluated. It is plain that process control inspection has many advantages. For the inspecting authority, it is both quicker and cheaper than incubation and microbiological examination, and it is more elastic, in that a given staff is less subject to overloading during peak production periods. Process control inspection is more sensitive, revealing far more defects than are, or can be, discovered by the other system. For the manufacturer, it provides a full record of all processing data, permits closer supervision of staff and improved control of operations, with immediate location and correction of actual or incipient faults. Finally, it permits prompt release of all batches complying with specifications, instead of the two to four weeks delay occasioned by incubation and microbiological examination.

Work on can-cleaning methods and compounds was continued. The industry was shown how improved rinsing can be obtained, using the same amount of water but distributing it in a series of rinsing tanks.

Further studies of the composition of fresh pilchards were made, and much fundamental data accumulated

Verdere studies is gemaak van die samestelling van vars sardyne, en baie fundamentele gegewens word ingewin oor seisoens- en individuele wisselinge in faktore soos proteïeninhoud, wateroplosbare proteïeninhoud en vetinhoud met betrekking tot grootte, geslag en toestand. Maandelikse wisselinge in die vetinhoud van toevallige monsters rou sardyne word gekorreleer met maandelikse wisselinge in olieopbrengste in die fabriek. 'n Studie van olie-opbrengste in fabriek oor 'n aantal jare het egter aangetoon dat daar jaarlikse wisselinge en afwykings is wat dit onmoontlik maak om hierdie syfers of ontledings van toevallige monsters van rou sardyne te gebruik om te voorspel wanneer die olie-opbrengs waarskynlik enige gegewe syfer sal bereik.

As deel van 'n program wat daarop gemik is om vismeel en olie-opbrengs te verbeter, is 'n studie gemaak van die gehalte van perskoeke wat verkry is deur gebruik te maak van verskillende kombinasies van verskeie soorte gewone kooktoestelle en perse. Interessante en ietwat onverwagte resultate is verkry, maar verdere studies sal nog eers onderneem moet word voordat gepoog sal word om hulle te vertolk.

Gedurende die jaar is spesiale aandag gegee aan die vraagstuk van self-ontbranding in vismeel. Ondersoeke het ingesluit proewe op die fabrieksvloer, die verskeping van 'n besending vismeel vanaf Walvisbaai na die Verenigde Koninkryk onder toetsbestande omstandighede, en fundamentele navorsingswerk in die Kaapstadse laboratoriums.

Hoewel die navorsingswerk nog maar in die beginstadium is, is dit reeds duidelik dat daar twee verskillende aspekte van die vraagstuk is. Die eerste staan in verband met die praktiese gevaar van verhitting tot so 'n punt dat ontbranding kan ontstaan met die bykomende gevaar van brand in die skeepsruim. Die tweede staan in verband met die voedingseienskappe van die meel, aangesien dit aangetoon is dat opberging by slegs effens verhoogde temperature die biologiese waarde van die visproteïene ernstig kan benadeel. Trouens, daar is aanduidings dat langdurige opberging by effens verhoogde temperature, soos dié wat mag voorkom waar sakke gedurende veroudering nie behoorlik gepak is nie, skadeliker kan wees as waar die meel vir 'n kort rukkie aan hoër temperature blootgestel word.

Die snelheid van verhitting en die onderliggende oorsake wat daarvoor verantwoordelik is, is bestudeer deur gebruik te maak van adiabetiese kalorimeters met spesiaal ontwerpte elektroniese temperatuurverskil-reguleerders. Die snelheid van verhitting neem toe namate die temperatuur styg, maar geen eenvoudige verband kon vasgestel word tussen faktore soos die snelheid van verhitting en die aanvanklike temperatuur van die meel nie. Verhitting gaan egter gepaard met 'n afname in vetinhoud en daar is aanduidings dat 'n lineêre verwantskap mag bestaan tussen die totale temperatuurstyging en die afname in vet soos gemeet deur heksaaneekstraksie.

on seasonal and individual variations in such factors as protein content, water-soluble protein content, and fat content in relation to size, sex and condition factor. Monthly fluctuations in the fat content of random samples of raw pilchards are correlated with monthly fluctuations in factory oil yields. However, a study of factory oil yields over a number of years has shown that there are annual variations and irregularities which make it impossible to use these figures or analyses of random samples of raw fish to predict when the oil yield is likely to reach any given figure.

As part of a programme aimed at improving fish meal and oil yields, a study was made of the quality of press-cakes produced by different combinations of various conventional cookers and presses. Interesting and somewhat unexpected results were obtained, and further studies are to be made before attempting interpretation.

The problem of spontaneous heating in fish meal received special attention during the year. Investigations included factory-floor experiments and the shipment of a consignment of fish meal from Walvis Bay to the United Kingdom under test conditions. In addition fundamental research was carried out at the Cape Town laboratories.

Although the work is still at an early stage, it is already apparent that there are two different aspects to the problem. The first concerns the practical risks of heating to the point of combustion, with concomitant shipping hazards. The second relates to the nutritional properties of the meal, as it has been shown that storage at even slightly elevated temperatures may seriously impair the biological value of the fish proteins. In fact, there are indications that prolonged storage at only slightly elevated temperatures, such as may occur in improperly stacked bags during curing, may be more harmful than brief exposure to higher temperatures.

The rate of heating and the underlying mechanisms have been studied, using adiabatic calorimeters with specially devised electronic temperature differential controllers. The rate of heating increases as the temperature rises, but no simple relationship could be established between such factors as the rate of heating and initial temperature of the meal. However, heating is accompanied by a decrease in fat content and there are indications that a linear relationship may exist between the total temperature rise and the decrease in fat as measured by hexane extraction.

Die veroudering van die meel veroorsaak 'n geleidelike vermindering in die snelheid van verhitting, en die eenvoudige fabrieks- en verskepingsvoorsorgmaatreëls wat reeds deur die Instituut aanbeveel is op grond van voorlopige toetse, het geregverdig en doeltreffend geblyk te wees vir die voorkoming van alle gevaar van selfontbranding.

'n Studie van die uitwerking van verskillende werkingsmetodes op die biologiese waardes van Suid-Afrikaanse vismeel is gedurende die jaar afgesluit. Verskeie interessante feite het aan die lig gekom. Dit is byvoorbeeld bevind dat die biologiese waarde van die vismeel sonder uitsondering hoër is as dié van die perskoek en dit is weer hoër as die biologiese waarde van die ooreenstemmende rou vis. Aansienlike wisselinge is waargeneem in die biologiese waardes van verskillende groepe rou vis (naamlik van 57.5 tot 72.6) wat gewoonlik weer waargeneem kon word in die vismeel wat daaruit verkry is (waardes van 74.2 tot 85.8).

Roetinedienste

Net soos in vorige jare, is roetinedienste gelewer aan lede-firmas. Dit het ingesluit

- (a) inspeksie van bevrore, gesoute en gedroogde, en ingemaakte vis en bevrore kreefsterte wat vir kieskeurige uitvoermarkte bedoel was;
- (b) monsterneming van vismeel vir verskeping na oorsese markte;
- (c) ondersoek van tamatiepasta vir visinmaak;
- (d) chemiese ontledings van vismeel, en van ander grondstowwe en verwerkte produkte van die nywerheid;
- (e) bakteriologiese ondersoek van water, sout en ander items;
- (f) vitamienbepalings.

SUIKERFABRIKASIE-NAVORSINGSINSTITUUT

Direkteur: DR. K. DOUWES DEKKER

Die afgelope jaar is gekenmerk deur groot bedrywigheid in die Instituut.

'n Belangrike ondersoek wat by twee meulens uitgevoer word maar nog nie voltooi is nie, beoog die direkte analise van suikerrietmonsters in 'n poging om 'n beter metode van waardebeoordeling van suikerriet te vind as die huidige Java-verhoudingsmetode. Hoewel die resultate nog nie behoorlik ontleed is nie, kan nou al gesê word dat die voorlopige gevolgtrekking belowend is. 'n Spesiale metode is ontwerp vir die opbreking van die suikerriet en vir die ekstraksie van die submonster waarby gebruik gemaak word van die sogenaamde Waddell-ropiesnyer en 'n hoogspoed-meganiese ekstraheerder wat oorspronklik ontwikkel is deur die proefstasie van die Hawaïese Suikerplantersgenootskap (Hawaii). Vir die bepaling van sukrose in die ekstrakt is die sogenaamde chemiese metode gebruik waarin die inhoud aan reducerende suikers van die ekstrakt bepaal word voor en na die inversie daarvan, volgens Luff-Schoorl. Dit het

Curing of the meal steadily reduces the rate of heating, and the simple factory and shipping precautions already advocated by the Institute on the ground of preliminary tests have proved well-founded and effective in avoiding all risk of spontaneous combustion.

A study of the effects of various processing methods on the biological values of South African fish meals was brought to a conclusion during the year. Several interesting facts emerged. For instance, it was found that the biological value of the fish meal is invariably higher than that of the corresponding presscake, which, in turn, is higher than that of the corresponding raw fish. Considerable variations were noted in the biological values of different batches of raw fish (from 57.5 to 72.6), which were usually reflected again in the resultant fish meal (values from 74.2 to 85.8).

Routine Services

As in previous years, routine services were provided for member firms. These included:

- (a) inspection of frozen, salted and dried, and canned fish, and frozen rock lobster tails intended for critical export markets;
- (b) sampling of fish meal for shipment to overseas markets;
- (c) examinations of tomato paste for fish canning;
- (d) chemical analyses of fish meal and of other raw materials and finished products of the industry;
- (e) bacteriological examination of water, salt and other items;
- (f) vitamin assays.

SUGAR MILLING RESEARCH INSTITUTE

Director: DR. K. DOUWES DEKKER

The year under review proved to be one of considerable activity.

A major investigation carried out at two mills, but not yet completed, dealt with the analysis of samples of cane in an attempt to find a method of cane evaluation superior to the present Java Ratio method. Although the results have not yet been properly analysed, it can be said that the preliminary conclusion is promising. A special method in which use is made of the so-called Waddell shredder and a high-speed mechanical extractor originally developed by the Hawaiian Sugar Planters Association's Experiment Station (Hawaii), was designed for the disintegration of the cane and the extraction of the subsample. For the determination of sucrose in the extract, the so-called chemical method was used in which the reducing sugar content of the extract is determined before and after inversiaccoon rding to Luff-Schoorl. It ap-

egter geblyk dat hierdie metode in sekere omstandighede tot verkeerde resultate kan lei en dat dit liever vervang moet word deur die polarimetriese metode vir sukrosebepaling of anders deur die Lane-Eynon-metode vir die bepaling van die inhoud aan reduserende suikers.

Die Instituut het voortgegaan met ondersoek na die bruikbaarheid en noukeurigheid van die bepaling van die witheid van witsuikers deur middel van reflektometriese metings met 'n Zeiss-spektrofotometer. Monsters van witsuiker is uitgeruil met die Java-Suikerproefstasie (Pasuruan), en op versoek van die Instituut het die Nasionale Fisiese Navorsingslaboratorium goedgunstiglik meegewerk deur verskillende monsters op 'n Beckman DU-instrument te meet. Die resultate het oor die algemeen bevredigende ooreenstemming getoon.

As uitbreiding van die kennis oor die grondbeginsels van die proses van afvalverwydering by sapsuiwering, wat nou die sulfatasiemetode in sewe ru-suikerfabrieke vervang het, is 'n ondersoek begin oor die vorming en neerslag van kalsiumfosfate. Hierdie afvalverwyderingsproses wat nog iets nuut vir Natal is, is deur die personeel van die Instituut noukeurig dopgehou by 'n aantal meulens, en voorstelle vir wysigings of verbeterings is met die fabriekspersoneel bespreek.

By een van die meulens is ondersoek ingestel na die voorkoms van onbepaalde verliese van sukrose. By 'n ander is die werking van 'n nuwe vyfvoudige verdamp-toestel bestudeer en die oorsaak van die moeilikheid vasgestel.

Toetse oor die moontlikheid om meulekstraksie te verhoog deur gebruik te maak van 'n reinigingsmiddel, is by 'n ander meul uitgevoer, maar het geen geldelike voordeel aangedui nie.

Die ondersoek na die voordele van brygranulering is voortgesit. Spesiale aandag is geskenk aan die faktore wat sal lei tot 'n toename of afname in die getal kristalle gedurende die korrelingstydperk.

'n Deurlopende sentrifuge, geïnstalleer by een van die meulens, is bestudeer en 'n verslag opgestel.

Die roetine-toetsing van monsters van suikers wat verskaf word deur al die meulens, het voortgeduur. Hierbenewens is 'n paar spesiale monsters ontleed. Die filtreerbaarheid van Natalse ru-suiker wat nog steeds klagtes van raffinaderye uitlok, is deeglik ondersoek en ondervinding en menings is gewissel met die Colonial Sugar Refining Co. Ltd. in Australië.

Op versoek van die Natalse Suikervervaardigersvereniging word die polarisasie nou bepaal op monsters van uitgevoerde ru-suiker.

Die publikasie van weeklikse en maandelikse *Verslae van Vervaardigingsgegewens* is voortgesit, en die maandelikse *Verslae* word weer in die *Suid-Afrikaanse Suikerjoernaal* gepubliseer.

Die jaarlikse opsomming van chemiese laboratoriumverslae is opgestel vir publikasie in die *Proceedings of the S.A. Sugar Technologists' Association Congress*.

Die nywerheid het vanjaar heelwat meer eise aan die

gepeerd, however, that this method, under certain conditions, could lead to erroneous results, and either the polarimetric method for determining sucrose, or the Lane-Eynon method for determining reducing sugars, had to be substituted for it.

The Institute's investigations on the usefulness and accuracy of the determination of the whiteness of white sugars by reflectometric measurements, using a Zeiss spectrophotometer, were continued. Samples of white sugars were exchanged with the Java Sugar Experiment Station (Pasuruan), and at this Institute's request the S.A. National Physical Laboratory co-operated by measuring various samples on a Beckman DU instrument. Agreement of results was usually satisfactory.

An investigation was started into the formation and settling of calcium phosphates, as a contribution to the knowledge of the fundamentals of the defecation process of juice clarification, which has now been substituted for the sulphitation method in seven raw-sugar factories. The defecation process, which is new in Natal, was followed by the Staff of the Institute at a number of mills, and suggestions for modifications and improvements were discussed with factory officials.

At one mill an investigation was instituted into the occurrence of undetermined losses of sucrose. At another mill the functioning of a new quintuple evaporator was studied and the cause of the trouble located.

Tests on the possibility of increasing mill extraction using a detergent were carried out at another mill, but did not prove to be of any financial advantage.

The investigations into the merits of slurry graining were continued. Special attention was paid to the factors which would result in an increase or drop in the number of crystals during the graining period.

A continuous centrifuge, installed at one of the mills, was studied and a report drawn up.

The routine testing of samples of sugars provided by all mills was continued. In addition, a number of special samples were analysed. The filtrability of Natal raw sugar, which is still leading to complaints from refineries, was taken as the subject of a thorough investigation, in which experience and opinion were exchanged with the Colonial Sugar Refining Co. Ltd. in Australia.

At the request of the Natal Sugar Millers' Association, the polarization is now being determined on samples of exported raw sugar.

The publication of weekly and monthly *Reports of Manufacturing Data* was continued, the monthly *Reports* again being published in the *South African Sugar Journal*.

The annual summary of chemical laboratory reports was prepared for publication in the *Proceedings of the S.A. Sugar Technologists' Association Congress*.

The demands made by the industry on the staff of

personeel van die Instituut gestel in verband met besprekings en verslae oor vraagstukke wat die meulens regstreeks raak. Dit het die vraag laat ontstaan of die huidige personeel genoeg tyd beskikbaar het om ondersoekte te onderneem oor basiese vraagstukke van suikervervaardiging. Nege-en-sestig besoeke is aan fabriek gebring om vervaardigingsvraagstukke te bespreek, en sewe-en-sestig tegniese verslae is opgestel. Drie verhandelinge is gepubliseer in die reeks oor *Mededelings van die Suikerfabrikasie-navorsingsinstituut*, drie verhandelinge is op die kongres van die Suid-Afrikaanse Vereniging van Suikertegnoloë gelewer en tien verhandelinge is opgestel vir publikasie in verskillende tegniese tydskrifte.

Kontak is behou met tegniese en wetenskaplike inrigtings in die Unie en oorsee. Die suikerfabriek Wonji in Etopië is deur die Beheerraad aanvaar as 'n geaffilieerde lid van die Navorsingsinstituut.

VERFNYWERHEID-NAVORSINGSINSTITUUT

Direkteur: MNR. G. M. HAMILTON

Soos verlede jaar berig, het die gulle bydrae van die nywerheid in die vorm van addisionele geldelike steun, die Instituut in staat gestel om voordeel te trek uit die aanbod van die W.N.N.R. om 'n aanvullende toelae beskikbaar te stel, sodat die jaar se inkomste die uitgawes oorskry het. Die grootste deel van die geld wat op die wyse beskikbaar gestel is, is gebruik vir die aankoop van toerusting vir die laboratoriums.

Die twee blootstellingsterreine by Congella en Reunion, as verteenwoordigend van nywerheids- en seetoestande, is nou in volle werking en verskaf interessante gegewens oor verskille in die werkverrigting van werke, veral grondverwe wat bestand is teen korrosie. Navorsingswerk oor hierdie grondverwe het bewys dat die voortrefflikheid wat sinkchromaat teenoor rooilood getoon het in die soutsprei-toetse nie gehandhaaf word by buiteblootstelling nie. Tot dusver het hierdie blootstellingstoetse getoon dat daar nie veel te kies is tussen hierdie pigmente nie. Ander navorsingswerk oor korrosiestremmende pigmente het bevestig dat kalsiumplumbaat nuttig is as 'n bestanddeel van alkieddakverwe vir nuwe gegalvaniseerde yster. Onder die pigmentstudies wat gedurende die jaar uitgevoer is en waarvoor verslag gedoen is, was resultate oor die eerste jaar se blootstelling van rooi-oksiede, chroomgeel en -groen en die tweede jaar se resultate met wit pigmente.

Werk oor mediums het ingesluit bevindinge wat verkry is met produkte van onversadigde sure en kasterolie en oor die resultate van die tweede jaar se blootstelling van olieerwe en sintetiese mediums. Voortspruitend uit al hierdie resultate word die program nou uitgebrei tot gemengde pigmente wat belowend lyk, asook sekere mediums wat uit die eerste reeks weggelaat moes word.

Die strafheid van die Durbanse klimaat is welbekend, maar is onlangs beklemtoon deur die resultate verkry van

the Institute for discussions and reports on problems of direct concern to the mills were considerably more than in former years and gave rise to the question whether with the present staff sufficient time is available to the Institute for investigations on basic problems of sugar manufacture. Sixty-nine visits were paid to mills for discussions on manufacturing problems, and sixty-seven technical reports were drawn up. Three papers were published in the series *Communications from the S.M.R.I.*, three papers were read before the South African Sugar Technologists Association Congress, and ten papers were prepared for publication in various technical journals.

Contact was maintained with technical and scientific institutions in the Union and overseas. The sugar factory Wonji in Ethiopia was accepted by the Board of Control as an affiliated member of the Research Institute.

PAINT INDUSTRIES' RESEARCH INSTITUTE

Director: MR. G. M. HAMILTON

As reported last year, the generous response by industry in the form of additional financial support enabled the Institute to take advantage of the offer made by Council to provide a supplementary grant, so that the income for the year exceeded expenditure. The major portion of the money thus made available has been spent in the purchase of specialized equipment for the laboratories.

The two exposure sites, maintained at Congella and Reunion and representing industrial and marine conditions, are now fully established and are yielding interesting points of difference in performance of paints, particularly anti-corrosive primers. Work on the latter has proved that the superiority displayed in the salt spray tests by zinc chromate over red lead is not maintained with exterior exposure. It would seem that there is little to choose between the pigments so far as the exposure tests have proceeded. Other work on corrosion inhibitive pigments has established the utility of calcium plumbate as a constituent of alkyd roof paints for new galvanized iron. Among the pigment studies carried out and reported upon during the year were results of the first year's exposure of red oxides, chrome yellows and greens, and the second year's results on white pigments.

Work on media has included reported findings on products obtained from unsaturated acids and castor oil and on the results of the second year's exposure of oil paints and synthetic media. Arising from all these results, the programme is now being extended to cover mixed pigments which appear promising, and also certain media which had to be omitted from the first series.

The severity of the Durban climate is well known, but has recently been underlined by the receipt of results

buiteblootstelling van olieverwe deur die Dominion-laboratorium van die Nieu-Seelandse Departement van Wetenskaplike en Industriële Navorsing. Dit is geskat dat die samestellings wat ondersoek is, 'n duursaamheid van drie tot vier jaar in Nieu-Seeland sal hê, terwyl die syfers vir Durban vir soortgelyke verwe nie meer as nege tot 12 maande sal wees nie. Om dié rede is dit twyfelagtig of die gebruik van olieverwe in die Unie werklik ekonomies is, en die vraag ontstaan of die verbruiker nie die duurder sintetiese afwerkverwe behoort te spesifiseer nie.

'n Belangrike funksie van die Instituut is om die verbruiker te onderrig en te lei in die keuse van tegniese geskikte materiale wat in die meeste gevalle op hul eie meriete beoordeel moet word. Dit is nietemin moontlik om sekere breë rigtinggewende beginsels neer te lê. As gevolg van die versoeke wat te berde gebring is tydens die algemene jaarvergadering van lede-firmas, word artikels opgestel vir die tegniese pers wat hopelik in dié verband van hulp sal wees.

'n Groot deel van die personeel se tyd word deur die ondersoek van verwe in beslag geneem wat strek van 'n paar fisiese toetse tot 'n volledige ontleding. As gevolg van sulke werk is nuwe en beter metodes ontwikkel, waarvan sommige gepubliseer is.

Vervaardigers- en verbruikerslede het baie gebruik gemaak van die Instituut vir die ondersoek en beoordeling van materiale, en gedurende die jaar is verslag gedoen oor byna 200 sulke gevalle. Sulke verslae is nie altyd die gevolg van korttermyn-toetswerk nie en minstens een was die resultaat van twee jaar se studie. Die aanvraag vir dienste van hierdie aard neem elke jaar toe en in die tydperk waaroor die verslag gaan is meer as 600 sulke monsters ontvang en ondersoek. Die mening is dat werk van dié aard, deur bewyse te lewer van die beter werkverrigting wat met die duurder materiale verkry kan word, die verbruiker sal aanmoedig om nie die goedkoopste materiale te koop nie. Aan die ander kant, en baie selde, kom gevalle egter voor waar die gehalte wat verskaf word hoër kan wees as die wat vereis word, en 'n reeks toetse op besoedelingwerende samestellings wat blootgestel is by die Durbanse hawe word tans uitgevoer om die minimum koperinhoud vas te stel wat vir 'n sekere periode beskerming sal verleen. Die huidige hoë prys van koper en sy derivate maak hierdie soort kennis van groot voordeel vir die verbruiker.

Die verskyning van nuwer soorte dekverwe, waarvan nie een behoorlik in Suid-Afrika beoordeel is nie, plaas 'n groot stremming op hierdie klein Instituut, aangesien die personeel te gering is om al die interessante ontwikkelinge wat nou plaasvind, te ondersoek. Gedurende die jaar het die Instituut die genoeë gehad om 'n Onderzoek-komitee van die W.N.N.R. onder voorsitterskap van dr. F. J. de Villiers hier te verwelkom. Hierdie komitee het simpatieke aandag gegee aan die moeilikhede wat ondervind word en aan die Instituut se menings oor die vooruitsigte vir uitbreiding van die fasiliteite.

obtained from exterior exposure of oil paints by the Dominion Laboratory of the New Zealand Department of Scientific and Industrial Research. The compositions examined were estimated to have a useful life of three to four years in New Zealand, whereas the figures for Durban for similar paints would not exceed nine to 12 months. For this reason it becomes doubtful if oil paints are really an economic proposition in the Union, and the question arises as to whether the consumer ought not to specify the admittedly more expensive synthetic finishes.

An important function of the Institute is to instruct and guide the consumer in the selection of technically suitable materials which in most cases must be considered on their individual merits. It is nevertheless possible to lay down certain broad guiding principles. As a result of requests put forward at the annual general meeting of member firms, articles are being prepared for the technical Press which it is hoped will be of assistance in this connection.

A very considerable proportion of the time of the staff is taken in examination of paints, ranging from a few physical tests to a complete analysis. As a result of such work, new and improved methods have been developed, some of which have been published.

Much use of the Institute has been made by both manufacturing and consumer members for the examination and evaluation of materials, and nearly 200 reports of this nature were made during the year. Such reports are not always the result of short-term testing, and one, at least, embraced the outcome of a two years' study. The demand for this type of service increases each year, and for the period under review more than 600 such samples were received and examined. It is maintained that work of this nature, by establishing the superior performance which may be obtained from the dearer product, helps to overcome the reluctance of the user to purchase other than the cheapest materials. On the other hand, and rarely, there occur cases when the quality supplied may be higher than that required, and a series of tests on anti-fouling compositions under exposure in Durban harbour are being conducted to determine the minimum copper content to give a certain period of protection. The present high price of copper and its derivatives makes this type of information of great benefit to the consumer.

The advent of newer types of surface coatings, none of which has been properly assessed in South Africa, is throwing a severe strain on this small Institute, since the staff is too small to examine all the interesting developments now coming forward. During the year the Institute had the pleasure of receiving a C.S.I.R. Investigating Committee, under the Chairmanship of Dr. F. J. de Villiers, who gave a sympathetic hearing to the difficulties experienced and the Institute's views on the prospects of expanding its facilities.

**SUID-AFRIKAANSE WOLTEKSTIEL-
NAVORSINGSINSTITUUT**

Direkteur: DR. C. C. KRITZINGER

Gedurende die afgelope jaar het intensiewe reorganisasie plaasgevind. Geslaagde onderhandelinge is gevoer met die Rhodes-Universiteit vir die verkryging van die laboratoriumgebou asook 'n gebou wat geskik is vir sekere proeftoerusting, plus genoeg grond vir uitbreiding. Alle nywerheidsondersteuners het ingestem om hul toekennings aanmerklik te verhoog en, tesame met die £-vir-£-bydraes van die W.N.N.R., sal die Instituut se inkomste vir die volgende vyf jaar nou £30,000 per jaar beloop. Sommige van die kamers in die laboratoriumgebou is toegerus met die nodige banke, water, elektrisiteit, gas en ander dienste, en heelwat van die laboratoriumsowel as proefskaaltoerusting is verkry sodat die personeel dringende fundamentele en tegnologiese navorsingsprojekte kan uitvoer. Planne vir die oprigting van 'n gebou vir die proefwasapparaat, kleur- en afwerktoerusting, 'n ketel en 'n werkplaas het reeds ver gevorder en, laastens, is die personeel vergroot deur die aanstelling van 'n paar navorsingsbeamptes en laboratorium-assistente.

Terwyl hierdie reorganisasie noodwendig heelwat energie en aandag geverg het en gevolglik die volume van navorsing en ander werksaamhede beïnvloed het, is daar nietemin rede vir 'n mate van tevredenheid oor die werk wat gedoen is, soos hieronder opgesom.

Fundamentele Studies

Voortdurende vordering is gehandhaaf met 'n studie oor die suurbasis-titrasiekurwes van sybokhaar. Hierdie werk begin reeds 'n mate van lig te werp op die verskille wat waargeneem is tussen sybokhaar en wol in hul reaksie op chemiese behandeling.

'n Uitgebreide studie is gemaak van die kleurstof-absorpsievermoë van verskillende tipes wol. Terwyl heelwat werk nog hieroor gedoen moet word, toon die resultate wat tot dusver verkry is dat daar wye verskille is in die kleurabsorpsie van wol tipes van dieselfde gehalte (spintelling) uit verskillende streke van die land. Na hierdie ontdekking word nou 'n studie gemaak met die oog op die verklaring van die redes vir hierdie verskille. Voorlopige navorsingswerk skyn daarop te dui dat minstens een van die redes die verskil is in die mate van verwerking van die punte van die wolstapel, en afhang van die tipe wol wat gekweek word in die verskillende streke wat bestudeer word. Dit lyk asof hierdie verskynsel in verband staan met die aantal sulfhidriël-groepe in die blootgestelde en onbeskadigde dele van die vesel. Hierdie werk is van groot praktiese belang aangesien moeilikheid dikwels in die fabriek ondervind word met die onegalige kleuring van wol van verskillende besendings.

In medewerking met die Grootfonteinse Landboukollege word voortgegaan met die studie van die groei

**SOUTH AFRICAN WOOL TEXTILE
RESEARCH INSTITUTE**

Director: DR. C. C. KRITZINGER

The past year has been one of intensive reorganization. Negotiations have been successfully concluded with Rhodes University for the Institute to acquire a laboratory building, plus a building which is suitable for certain pilot-scale equipment, plus sufficient land for expansion. All industrial supporters have agreed to marked increases in their grants and, together with £-for-£ subsidies from the C.S.I.R., the Institute's income will now be £30,000 per annum for the next five years. Some of the rooms in the laboratory building have been equipped with the necessary benches, water, electricity, gas and other services, and a considerable quantity of laboratory as well as pilot-scale equipment has been obtained to enable the staff to carry out urgent fundamental as well as technological research projects. Plans are well advanced for the erection of a building to house the pilot-scale washing set, dyeing and finishing equipment, a boiler and a workshop. Finally, the staff has been augmented by the appointment of a small number of research officers and laboratory assistants.

Whilst this reorganization has of necessity required considerable energy and attention, and has consequently affected the volume of research and other activities, there is nevertheless cause for some degree of satisfaction over the work done as summarized below.

Fundamental Studies

Steady progress has been maintained in a study on the acid/base titration curves of mohair. Already this work is beginning to throw some light on the differences between mohair and wool in their reaction towards chemical treatment.

An extensive study has been made of the dye-absorption capacity of different types of wool. Whilst considerable work still remains to be done, the results to date show that there is wide variation in the dye-absorption of wools of the same quality (spinning count) from different areas of the country. Following upon this discovery, a study is now being made with a view to elucidating the reasons for these differences. Preliminary work seems to indicate that at least one of the reasons is the difference in the extent of weathering which the wool tips undergo, depending upon the type of wool grown in the different areas being studied. It would seem that this phenomenon is connected with the number of sulfhydryl groups in the weathered and undamaged portions of the fibre. This work has an important practical bearing, in that difficulty is often experienced in the factories with uneven dyeing of wool from different batches.

In co-operation with Grootfontein Agricultural College, the study on the growth of wool on the sheep's

van wol op die skaap se rug. Die doel van die werk is om inligting te verskaf oor die lengte/deursnee-verhouding van die wol gedurende die groeiydperk, asook die samestelling van die vag in verhouding tot die voedingspeil.

'n Studie is gemaak van die periodieke wisselinge in kambolle. Die bevinding was dat daar in 'n kambol, volgens die Bradford-stelsel gekam, 'n periodisiteit van 14.5 mm. is, terwyl daar in 'n kambol volgens die Franse stelsel 'n periodisiteit van nagenoeg 40 mm. waargeneem is. Verdere werk word in dié verband gedoen, aangesien sulke periodisiteite 'n belangrike verband mag hê met onreëlmatighede in drade.

Tegnologiese Navorsingswerk

Navorsingswerk oor die was van ru-wol het voortgeduur en sluit die volgende in: die hoeveelheid reinigingsmiddel wat nodig is in die wasproses, die uitwerking van temperatuur op die wasproses, die uitwerking van meganiese werking op was en die afspoel van gewaste wol. Hopelik sal die proefskaalwastoestel vroeg in 1957 in werking wees sodat die bevindinge van hierdie laboratoriumproewe op semi-praktiese skaal getoets kan word.

Wolwasserye maak in toenemende mate gebruik van die vinnige beheermetodes wat deur die Instituut ontwikkel is.

In medewerking met 'n plaaslike firma word 'n uitgebreide studie gemaak van uitwasbare merkstowwe. Op grond van hierdie werk is 'n verbeterde formulering verkry en die Instituut kon tasbare hulp verleen aan die Suid-Afrikaanse Buro vir Standaard met die opstel van spesifikasies vir uitwasbare merkstowwe vir skape.

Die nywerheid maak in toenemende mate gebruik van die Instituut se fasiliteite vir tegniese dienste en baie navrae is gedurende die jaar afgehandel. Hierbenewens is daar 'n welkome toename in die aanvraag vir personelede om fabriek te besoek en te help met vraagstukke aldaar.

Algemeen

Om die nywerheid op die hoogte te hou van tegnologiese sowel as ander ontwikkelinge in die Instituut, is gedurende die jaar begin met *SAWTRI Digest* as 'n maandelikse publikasie. Hierdie publikasie bevat algemene nuus oor die Instituut, opsommings van navorsingswerk wat voltooi of aan die gang is, uittreksels uit tegniese tydskrifte en nou en dan spesiale artikels van aktuele belang. Die geesdriftige ontvangs van dié publikasie toon dat dit in 'n besliste behoefte in die nywerheid voorsien. Die resultate van voltooide navorsingsprojekte word in *Technical Reports* asook in oorsese tydskrifte gepubliseer.

Noue voeling is gehandhaaf deur persoonlike besoeke aan al die fabriek in die land. Meer as 150 besoeke is in die afgelope jaar afgelê.

back in being continued. This work aims at giving information on the length/diameter ratio of the wool during growth, as well as the composition of the fleece, in relation to the plane of feeding.

A study has been made of periodic variations in combed tops. It has been found that in a Bradford-combed wool top there is a periodicity of 14.5 mm., whilst in a French-combed wool top a periodicity of approximately 40 mm. has been observed. Further work is in progress in this connection, since such periodicities may have an important bearing upon irregularity in yarns.

Technological Research

Work has continued on the scouring of raw wool and includes the following: the quantity of detergent required in scouring, the effect of temperature upon scouring, the effect of mechanical action on scouring and the rinsing of scoured wool. It is hoped to have the pilot-scale washing set in operation early in 1957 in order to test, on semi-practical scale, the findings of these laboratory experiments.

Increasing use is being made by wool washeries of the rapid control methods which have been developed at the Institute.

In co-operation with a local firm, an extensive study is being made of scourable branding fluids. On the basis of this work an improved formulation has been devised and the Institute was able to give tangible assistance to the South African Bureau of Standards in preparing specifications for scourable sheep-branding fluids.

Increasing use is being made by industry of the Institute's facilities for technical service and a large number of enquiries have been dealt with during the past year. In addition there is a welcome increase in the demand for members of the staff to visit factories in order to assist with problems on the factory floor.

General

In order to keep industry acquainted with technological, as well as other developments at the Institute, *SAWTRI Digest* was started as a monthly publication during the year. This publication contains general news of the Institute, summaries of research work completed or in progress, abstracts from technical journals and occasionally special articles of topical interest. The enthusiastic manner in which this publication has been received, shows that it fulfils a definite need in the industry. The results of completed research projects are published in *Technical Reports* as well as in overseas journals.

Close contact has been maintained by personal visits to all the factories in the country, a total of over 150 visits having been paid during the past year.

Research Bursaries and Assistantships

awarded by the C.S.I.R. during 1956

Navorsingsbeurse en Assistenteskappe

wat deur die W.N.N.R. gedurende 1956 toegeken is

GENERAL RESEARCH — ALGEMENE NAVORSING

BURSARIES — BEURSE

Senior Bursaries/Senior Beurse

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
BOTTO, Dr. G. D. L. D.Ph. Research bursar £400	Transvaal Museum, Pretoria	Catalogue of Southern African Coleoptera. (Previous awards: 1954, 1955.)
BRENNER, Dr. (Mrs.) M. W. B.A., B.A.(Hons.), M.A., Ph.D. Research Bursar £500	National Institute of Per- sonnel Research, Johannesburg	"Satiationability" in its relation to temperament. (Pre- vious award: 1955.)
EWER, Dr. (Mrs.) R. F. B.Sc., Ph.D. Research Bursar £500	Rhodes University	1. Completion of work on fossil suidae from limeworks deposit at Makapan. 2. Re-examination of all available South African fossil suid material. (Previous awards: 1948, 1955.)
KRUPKO, Dr. S. Ph.D. Retired Lecturer in Botany £800	University of the Witwatersrand	1. Chromosome numbers and karyology of Genus <i>Hyparrhenia</i> . 2. Embryology and other development in restionaceae. 3. Embryology and chromosomes in <i>oxalis pescaprae</i> (= <i>O. Cernua</i>).
OMER-COOPER, Dr. (Mrs.) J. B.A., Ph.D. Honorary Lecturer in Zoology £500	Rhodes University	Dytiscidae of Southern Africa. A survey of Dytiscidae of the Eastern Cape Province. (Previous awards: 1954, 1955.)
OMER-COOPER, Prof. J. M.A., M.Sc. Professor of Botany £500	Rhodes University	Biological survey of standing waters. (Previous award: 1955.)
SCOTT, Dr. (Mrs.) K. M. F. B.Sc., M.Sc., Ph.D., F.R.E.S. Senior bursary £800	University of Cape Town	1. Taxonomic study and description of the trichoptera (caddis flies) of South Africa including both adult 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. (Previous awards: 1954, 1955.)
SMITH, Prof. J. L. B. M.A., M.Sc., Ph.D., F.R.S.S.A. Research Professor Senior bursary £1,300	Rhodes University	Fishes. (Previous awards: 1950, 1955.)

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
STEPHEN, Dr. T. M.Sc., Ph.D. Senior Research worker £400	University of Natal	1. The isolation and study of the structure of saponins and sapogenin from S.A. plants. 2. The conversion of sapogenins into hormones which may be of medicinal and industrial significance.
TAGER, Dr. J. M. B.Sc., Ph.D. Navorsingsbeurshouer Senior beurs £950	Universiteit van Pretoria	1. Die ensiematiese oksidasie van suffiet. 2. Die assimilasië van sulfaat by plante. 3. Isolasië en suiwering van mitokondriale ensieme. 4. Metaboliese aktiwiteit van hawer kiemplantjies gedurende verskillende tye van die jaar. (Vorige toekennings: 1954, 1955.)
WEINBRENN, Miss C. B.Sc., B.Sc.(Hons.), M.Sc. Research Bursar £80	University of the Witwatersrand	Problem concerning the functions of amphibian heart. (Previous award: 1955.)
WRIGHT, Dr. (Mrs.) W. G. B.Sc., D.I.C., Ph.D. Research Bursar £200	University of Natal	Alkaloids of Amaryllidaceae. (Previous awards: 1951, 1955.)

Senior Bursaries (Overseas)/Senior Beurse (Oorsee)

ARNOLD, Dr. R. B.Sc., B.Sc.(Hons.), M.Sc. Ph.D. Lecturer £600	National Chemical Laboratory, D.S.I.R. Teddington, Middlesex, England	Ion exchange.
BALINSKY, Prof. B. I. Doctor of Biological Sciences (Kiev), Fellow of the International Institute of Embryology Professor of Zoology £500	University of the Witwatersrand	An investigation of cellular activities involved in the formation of an organ rudiment.
DE WET, Dr. J. M. B.Sc., M.Sc., B.Sc.(Ing.), D.I.C., Ph.D. Senior Lektor £300	London University	Navorsings op die gebied van korrelasieteorie (Statistiek).
IMMELMAN, W. F. E. B.Sc. £800	Forest Products Laboratory U.S. Dept. of Agriculture Wisconsin	Studie van nuwerwetse toerusting in produksiemetodes aangewend in die vervaardiging van verpakkingsmateriaal met spesiale verwysing na moderne verpakkingsneigings ten opsigte van die gebruik van kartondose teenoor houtkissies.
MABBUTT, J. A. B.A.(Hons.), M.A.(Cantab.) £600	Dept. of Geography, Cambridge University	A study of the raised beaches and associated phenomena on the coasts of the Western Mediterranean and on the adjacent Atlantic Littorals of N. Africa and Portugal as a preliminary to correlation with similar features in S.A. and with an ultimate aim of establishing a comparative chronology for Quaternary events in the two areas.
MALAN, Dr. D. J. M.Sc., D.Sc. £600	University of the Witwatersrand	Microphysics of cloud formation and electrification.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
RALLIS, C. J. B.Sc., M.Sc., A.M.I.Mec.E. A.M.S.A.I.Mech.E., M.E.A.S.A. £400	1. English Electric Co. 2. Reactor School, Harwell	(a) Development work on industrial gas turbines. (a) Course at school of gas turbine technology. (c) Industrial applications of atomic energy.
TOERIEN, Dr. M. J. B.Sc., M.Sc., Ph.D. Assoc. medal for Scientific Research £800	Anthropologisches Institut der Universiteit Zurich	To see and as far as possible describe the bushmen and pygmy material in Europe and to master all the techniques, especially somatological and biometrical, employed there in anthropology today.

Student Bursaries/Studente-Beurse

Chemistry/Skeikunde		
BAMFORD, B. M. E. B.Sc. Student £200	Rhodes University	A study of equilibria in mercuric chloride solutions at various temperatures.
BESSINGER, F. B.Sc., M.Sc. Student £200	Universiteit van Pretoria	'n Onderzoek na vryradikaal reaksies.
BLIGHT, G. E. £200	University of the Witwatersrand	The investigation of filter sands and the establishment of a criterion for the condition that the sand is a filter in itself.
CLUR, D. A. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	The solubility of mercurous chloride at different tem- peratures.
CRUYWAGEN, J. J. B.Sc. Student £200	Universiteit van Stellenbosch	Faktore wat die presipitasie van ammonium forfomolib- daat beïnvloed.—Die verskil en snelheid tussen die eerste presipitasie en tweede presipitasie van ammo- nium-fosfomolibdaat.
EHLERS, A. B.Sc., M.Sc. Student £200	Universiteit van Pretoria	Chemiese ondersoek van die stofwisselingsprodukte van <i>Ceroplastes helichrysi</i> var. <i>Sinoiae</i> Hall.
ELLIS, C. P. B.Sc.(Hons.), F.R.I.C. £200	University of Natal	Viscosity of gases particularly at higher temperatures and inter-molecular forces.
FINKELSTEIN, N. P. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	Liquid junction potentials at mixed electrolyte salt bridges.
FIVAZ, L. E. B.Sc. Student £200	Universiteit van Stellenbosch	1. Vergelyking van die edelmetaal opbrengs van die kwikdruppel en loodkorrel essaïeringmetodes. 2. Direkte spektrografiese bepaling van goud in ertse.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
GELDENHUIS, P. J. B.Sc. Student £100	Universiteit van Pretoria	Ontlading van gasmengsels op grond van hulle ont-ladingspotensiale (ontwikkeling van die tegniek).
GOLTZ, G. E. B.Sc., M.Sc. £150	University of Natal	An investigation of the behaviour of packed liquid-liquid extraction columns. (Previous awards: 1954.)
GORE, W. T. B.Sc. Student £200	Rhodes University	An investigation and comparison of the polarographic and colorimetric methods of determination of molybdenum in soil extracts and plant materials.
GOVINDEN, H. S. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	Construction of a wide frequency range double super-heterodyne conductance bridge and its use in investigation of polarization errors in conductance measurements.
HART, P. M. G. Student £200	University of Cape Town	A comparative study of adsorption isotherms and differential heats of adsorption on oxide catalysts altered by valency induction with special reference to zinc oxide.
HIGGINS, T. H. S. B.Sc., M.Sc. £200	University of Natal	The reaction between calcium fluoride and gaseous boron trichloride.
JOHN, E. V. O. B.Sc. £100	University of the Witwatersrand	A study of the Von Pechmann reaction.
KREUTZER, (Miss) E. J. L. £100	University of the Witwatersrand	Synthesis and degradation of starch in scilla.
LAMONT, C. B.Sc. Student £100	Universiteit van Pretoria	Sintese van organiese stowwe met 'n C-14 atoom in die molekule. (Hoofsaaklik die ontwikkeling van die tegniek.)
LOTZ, C. R. B.Sc. Research Student £200	University of Cape Town	A comparative study of the effects of the nitrides of transition elements on the activation energy for the ammonia decomposition and synthesis.
MANSFIELD, W. R. B.Sc. £100	University of Natal	Chemical plant design and gas absorption.
MATTHEWS, J. W. £200	University of the Witwatersrand	Migration of kink bands in zinc and cadmium crystals.
MCGILLIVRAY, G. B.Sc. Student £200	Rhodes University	The synthesis of new ion exchange resins in their evaluation as relative ion absorbents.
O'SULLIVAN, D. J. M. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	The application of ion exchange resins to optical resolutions.
PINFOLD, T. A. B.Sc. Research Student £200	University of Cape Town	Polarography in anhydrous formic acid.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
SCHULER, B. O. G. B.Sc., M.Sc. £200	University of Natal	Structure of the alkaloids from <i>Voacanga dregeii</i> . (Previous award: 1954 and 1955.)
VAN DEN BERG, J. A. B.Sc., M.Sc. £200	Universiteit van Pretoria	'n Onderzoek na die meganisme van die polimerisasie van olefiene deur middel van vry radikale.
VERBEEK, A. A. B.Sc., B.Sc.(Hons.) £200	University of Natal	The isolation and structure of the alkaloids in <i>Voacanga dregeii</i> . (Previous award: 1955.)
ZAR, (Miss) L. £100	University of the Witwatersrand	A further investigation of the primer in starch synthesis.
Physics/Fisika BAART, E. E. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	Efficiencies and decay times and spectra of fluorescence excited in organic crystals by short wave electrons.
BOONSTRA, E. G. B.Sc., B.Sc.(Hons.) £200	University of Natal	A study of the operation of proportional counters.
ENGELBRECHT, C. A. B.Sc. Student £200	Universiteit van Pretoria	Oor die teorie van kernmodelle.
HENNING, J. J. Student £100	Potchefstroomse Universiteit vir C.H.O.	Studie van die hoekspreiding en meganika by buivorming en kernreaksies van die harde komponent van die kosmiese strale.
HODSON, M. C. B.Sc. £200	University of Natal	Investigation of the lower layers of the ionosphere using the backscatter principle at fixed frequencies in the range 10-70 megacycles.
KRUGER, J. Student £100	Potcherstroomse Universiteit vir C.H.O.	Mu-mesonvangs en gepaardgaande sekondêre effekte, en besonder die vrysetting van neutrone.
LEASK, M. J. M. B.Sc. £200	University of Natal	A study of auger electron yields.
MANDY, A. W. L. £100	University of the Witwatersrand	1. Verification of some of the mathematical predictions regarding random noise. 2. Effect of various detectors on random noise. 3. Attempt to recover signal from noise by use of various non-linear networks.
NATRASS, H. L. Nat. Dipl. in Eng. (Electrical) Structural and Building £200	University of Natal	A quantitative investigation of the propagation of radio energy at nominal frequencies of 2000 and 3000 megacycles/sec. over a land path and correlation of field strength measurements with the existing meteorological conditions.
PIETERSE, P. H. B.Sc., M.Sc. Student £83 6s. 8d.	Universiteit van Stellenbosch	Die bepaling van die F-waardes van FeI lyne met hoë opwekkingspotensiale.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
PISTORIUS, C. W. F. T. B.Sc. £200	Universiteit van Pretoria	Die Doppler-verskuiwing van waterstof en helium-kanaalstrale en ander gasse.
PLATT, C. M. A. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	An investigation of the spectra, efficiencies and decay times of fluorescence excited in organic crystals by short wave (Schumann) ultra-violet radiations.
VAN BUUREN, H. S. J. Student £100	Potchefstroomse Universiteit vir C.H.O.	Studie van die ontstaan van neutrone deur kosmiese strale.
WISE, E. V. A. B.Sc. Assistant Research Officer £200	University of Cape Town	An investigation into the flow of water at supercritical velocity round curves or through transitions in open channels of parabolic section.
Geology/Geologie GORSKY, (Mrs.) E. Diploma (Ljubljana Yugoslavia) £200	University of Natal	Microscopical and field study of the minerals and rocks from the Lebombo Range. (Previous award: 1955.)
LAMBERT, J. F. B.Sc., M.Sc. £200	University of Natal	A petrographic and economic study of the ultrabasic rocks of the Tugela Valley, Natal.
SMUTS, J. B.Sc. Student £200	Universiteit van Stellenbosch	Spektrografiese ontleding van gesteentes deur middel van die veranderbare interne standaardmetode.
SNYMAN, C. P. B.Sc. Student £200	Universiteit van Pretoria	Die struktuur en metamorfose van die sisteem Transvaal suid van Marble Hall.
VAN ZYL, P. J. B.Sc., M.Sc. £200	Universiteit van Stellenbosch	The Late-Karoo Alkali Complex intrusions of Okorusu and Kalkfeld.
Entomology/Insektekunde BROWN, H. D. B.Sc. Student £200	Rhodes University	Biology of insects associated with pineapples. (Emphasis on pineapple-mealy bug.)
COTTRELL, C. B. B.Sc. Student £200	Rhodes University	Studies on water economy and respiratory metabolism of cattle ticks.
MYERS, M. G. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	Studies on the biology of ants associated with cirtus trees.
Zoology/Dierkunde ALEXANDER, (Miss) A. J. B. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	Further study of the neuromuscular physiology of scorpions.
BALINSKY, J. B. £200	University of the Witwatersrand	The action of activators and inhibitors on the nitrogen metabolism of developmental stages of the frog.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
BUSH, B. M. H. B.Sc., B.Sc.(Hons.) Student £200	Rhodes University	Further studies on reflex activity in the crab <i>Potamon perlatins</i> .
CHANGFOOT, G. H. £200	University of the Witwatersrand	Investigation into tetanus of the heart of <i>Xenopus laevis</i> under differing conditions of temperature, frequency of stimulation under influence of digitoxin veratrine adrenaline.
DE FREITAS, A. J. O. £100	University of the Witwatersrand	An investigation of the gall insect of South Africa.
DE GRAAF, G. £100	University of the Witwatersrand	Ecological investigation of <i>Otomys</i> species on the Witwatersrand.
DE KOCK, (Miss) A. B. £100	University of the Witwatersrand	A study of inheritance in polymorphic species of insects.
FINE, B. C. £100	University of the Witwatersrand	Animal ecology of the Grassveld.
FOURIE, S. B.Sc. Student £200	Universiteit van Stellenbosch	Kraniogenese van <i>Micronisus gabar</i> (die Blouvalkie).
SCHUTTE, C. H. G. B.Sc. Student £200	Potchefstroomse Universiteit vir C.H.O.	Die anatomie van <i>Biomphalaria pfeifferi</i> , die S.A. slakvektor van dermbilharziasis (Vorige toekenning 1955).
VAN DER SPUY, J. S. B.Sc. Student £200	Universiteit van Stellenbosch	Die fisiese kenmerke van kleurlingkinders van ses ouderdomsgroepe (13 jaar tot 18 jaar) vergelyk met blanke Suid-Afrikaanse skoolkinders van ooreenstemmende ouderdomsgroepe.
Botany/Plantkunde DENLEY, (Miss) A. £200	University of the Witwatersrand	Cytology of South African Pteridophytes.
DARBYSHIRE, J. F. B.Sc., B.Sc.(Hons.), Dipl. Agric. Science Student £200	Rhodes University	A study of some aspects of the flora of standing water with particular reference to the algae.
GAFIN, J. E. £200	University of the Witwatersrand	Studies of the starch enzymes in fungi.
GALLWEY, (Miss) B. M. G. B.Sc. £200	University of Natal	Water intake by leaves from rain and dew droplets.
JOOSTE, W. J. B.Sc. Student £200	Potchefstroomse Universiteit vir C.H.O.	Die ondersoek van die mielieparasiet (of siekte) bekend as <i>Helminthosporium turcicum</i> met die oog op die vasstelling van moontlike bestrydingsmetodes veral op die gebied van die anti-biotika.
Civil Engineering/Siviele Ingenieurswese MORRIS, A. R. £200	University of the Witwatersrand	Structural implications of secondary stresses induced due to use of shrinking aggregates in reinforced concrete constructions.
SPARKS, A. D. W. £200	University of the Witwatersrand	An investigation of settlement theory as applied to partially saturated soils.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
Agriculture/Landbou WHITEHEAD, D. L. £200	University of Natal	An investigation of the applicability of existing methods of analysis for structural poly-saccharides to grasses.

Student Bursaries (Overseas)/Studente-Beurse (Oorsee)

BEINART, J. B. Arch. A.R.I.A.	Massachusetts Institute of Technology, Cambridge, Massachusetts, U.S.A.	Research into all the aspects concerned with the industrialized (pre-fabricated) house in the U.S.A. as applicable both in the industrial and architectural fields in South Africa.
HAHN, H. H. B.Sc., M.Sc.	Technische Hochschule, Karlsruhe, Duitsland	The composition of tar obtained as a by-product during the pressure gassification (Lurgi process) of South African coal.
JACH, Dr. J. B.Sc., M.Sc., A.R.I.C.	Oxford, England	Influence of foreign gases on the thermal decomposition of various paraffins.
MORKEI, A. T. B.Sc., M.Sc.	Massachusetts Institute of Technology, Cambridge, Massachusetts, U.S.A.	Die kineties van oksiedlaagvorming op koper.

Directed Research Bursaries (Overseas)/Beurse vir Navorsing onder leiding (Oorsee)

AHLERS, W. C. B.Sc., M.Sc.	Pembroke College, Cambridge	Kinetika van elektron uitruil-reaksies in niewaterige oplossings. (Vorige toekennings: 1952-1955.)
BOSHOF, M. C. B.Sc., M.Sc.	Imperial College, London	A study of the reflection of coloured surfaces. (Previous award: 1955.)
BRADLEY, D. J. B.Sc., B.Sc.(Hons.)	Applied Psychology Research Unit of the Medical Research Council U.K.	Ergonomics—the relation of fatigue to equipment design. (Previous award: 1955.)
CILLIERS, W. A. M.Sc.	Cavendish Laboratory Cambridge	Ionosferiese fisika. (Vorige toekenning: 1955.)
GEORGALA, D. L. B.Sc., Dipl. in Applied Microbiology	Torry Research Station, Scotland	Quantitative and qualitative studies on the bacterial flora of the North Sea cod and the effect of the subsequent handling thereon. (Previous award: 1955.)
NAUDÉ, C. F. B.Sc.	California Institute of Technology, Pasadena	Die verskynsel van kavitasie.
SAVAGE, Miss N.	University of Cambridge	Biochemistry of plant and animal metabolism studies of flavoprotein enzymes. (Previous award: 1955.)
SELLSCHOP, J. P. F. B.Sc., M.Sc.	Cavendish Laboratory, Cambridge	Deuteron Stripping Reactions.

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
TOOHEY, A. C. B.Sc., B.Sc.(Chemical Technology)	Imperial College of Science and Technology	A study of mass transfer phenomena in packed columns (Chemical Engineering).
UYS, J. M.	Massachusetts Institute of Technology, U.S.A.	The investigation of the solubility of H ₂ in synthetic and steelmaking slags with special emphasis on the influence of slag basicity; the influence of alloying elements on the solubility of H ₂ in iron and, possibly a kinetic and/ or equilibrium study of the transfer of H ₂ as H ₂ O through slag to metal.
VOGEL, J. C. B.Sc., B.Sc.(Hons.)	Physikalisches institut der Universitat Heidelberg, Duitsland	Massaspektroskopiese ondersoek van die „Koolstof” wat saam met uraniet in die Witwatersrandse goud- riwwe voorkom (Thucoliet). Vorige toekenning: 1955.)
VAN ROOYEN, M. B.Sc., M.Sc.	University of Princeton or Massachusetts Institute of Technology	Advanced soil mechanics—electro-osmosis in soils. (Previous award: 1955.)

ASSISTANTSHIPS/ASSISTENTSKAPPE

(a) Grant for the employment of skilled research assistants/Toekenning vir die indiensneming van geskoolde navorsings-assistente

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
AARTS, Dr. W. H. B.Sc., M.Sc., Ph.D. Senior Lecturer	University of the Witwatersrand	Further investigation of change of resistivity on plastic deformation of face centred cubic alloy systems. At present work is being done on palladium-silver and indium lead. (Previous awards: 1954, 1955.)
BADENHUIZEN, Prof. N. P. D.Sc. (cum laude) Professor of Botany	University of the Witwatersrand	Starch metabolism. (Previous awards: 1951-1955.)
BOTHA, Prof. P. J. M.Sc., Ph.D. Professor in Plantfisiologie	Potchefstroomse Universiteit vir C.H.O.	Die fisiologie van parasitiese blomplante.
BOZZOLI, Prof. G. R. D.Sc.(Eng.) Professor of Electrical Engineering	University of the Witwatersrand	(a) Study of long sparks in the atmosphere. (b) Study of sparks in oil. (c) Study of corona on transmission lines. (d) Sphere gap calibration. (Previous award: 1955.)
DAY, Prof. J. H. Ph.D., F.R.S.S.A. Professor of Zoology	University of Cape Town	1. Estuarine survey. 2. Ecology of shallow seas. (Previous awards: 1950-1955.)
DU TOIT, Prof. C. A. M.Sc.(cum laude), PhD. MALAN, Dr. M. E. M.Sc.(cum laude), D.Sc. Onderskeidelik Professor en Senior Lektrise in Dierkunde	Universiteit van Stellenbosch	1. Kraniologie van die Anura. 2. Gastrulasie van die bergskilpad en die skedelontwikkeling van die soogdiere. (Vorige toekennings: 1955.)
DUYVENE DE WIT, Prof. Dr. J. J. Dr. Phil. Nat (cum laude) Professor in Dierkunde	Universiteit van die Oranje Vrystaat	Verskillende biologiese aspekte van die Rhodeinae; etologie, genetika, taksonomie, voortplantingsfisiologie. (Vorige toekennings: 1953, 1954, 1955.)
FITZSIMONS, Dr. V. B.Sc., M.Sc. D.S. Director Tvl. Museum	Transvaal Museum	Geology and age of the South African ape-man bearing deposits. (Previous award: 1955.)
GOULD, Prof. A. J. Ph.D., D.Sc., M.I.C.E., M.I.Mech.Eng., M.I.N.A. Professor of Electrical Engineering	University of Natal	Examination of some fundamentals of fatigue phenomena. (Previous awards: 1952, 1954, 1955.)
HALES, Prof. A. L. B.A., M.A., N.Sc., M.Sc., Ph.D. Director Bernard Price Institute of Geophysical Research	University of the Witwatersrand	1. Investigation of crustal structure by seismic observations of Witwatersrand earth tremors. 2. Investigations relating to the structure of the crust of the earth and its history, especially in the field of the paleomagnetism of sedimentary rocks. (Previous awards: 1952-1954.)
HOLLIMAN, Prof. F. G. B.A., M.A., Ph.D. Professor of Organic Chemistry	University of Cape Town	Pigments of <i>Pseudomonas aeruginosa</i> . (Previous awards: 1951-1955.)
ISAAC, Prof. W. E. B.Sc., Ph.D. Harry Bolus Professor	University of Cape Town	Investigations on the ecology and geographical distribution of South African seaweeds and ant-ecological studies on selected species. (Previous awards: 1952-1955.)

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
JAMES, Prof. R. W. B.A., M.A., B.Sc. Natural Science Tripos, F.R.S.(S.A.) Professor of Physics	University of Cape Town	The structure of crystals of organic metallic compounds and other organic crystals. (Previous awards: 1954, 1955.)
KRUGSMAN, Dr. B. J. Ph.D. Senior Lecturer	University of Cape Town	1. Salinity of perception and osmoregulation in aquatic animals. 2. Heart physiology of invertebrate animals. (Previous awards: 1951-1955.)
OMER-COOPER, Prof. J. M.A., M.Sc., TWYMAN, Prof. E. S. M.Sc., Ph.D. Professor of Zoology and Botany respectively	Rhodes University	Biological survey of the standing waters of the Eastern Cape Province. (Previous award: 1955.)
SMITH, Prof. J. L. B. B.A., M.Sc., Ph.D., F.R.S.(S.A.) Research Professor	Rhodes University	Fishes. (Previous awards: 1954, 1955.)
STEYN, W. J. A. M.Sc. Lecturer in Soil Science	Rhodes University	Mineral status of plants and soils. (Previous awards: 1954-1955.)
TWYMAN, Prof. E. S. B.Sc., M.Sc., Ph.D. Professor of Botany	Rhodes University	1. Nutritional survey of Eastern Province. 2. Water culture investigations on the functions of minor elements. 3. The absorptions of cations by plant tissue from culture solutions. (Previous awards: 1954, 1955.)
VAN EEDEN, Dr. J. A. M.Sc., D.Sc.	Potchefstroomse Universiteit vir C.H.O.	Taksonomie van Suid Afrikaanse varswaterslakke en as voortvloeiende daaruit die opbou van 'n nasionale versameling van S.A. varswaterslakke.
WARREN, Prof. F. L. A.R.C.S., B.Sc., Ph.D., D.Sc., E.R.I.C. Professor of Chemistry and Chemical Technology	University of Natal	South African plants of toxic and medicinal interest with special reference to alkaloids of hypertensive significance. (Previous awards: 1951-1955.)

(b) Grants for the employment of unskilled research assistants/Toekennings vir die indiensneming van ongeskoolde navorsingsassistenten

JAMES, Prof. R. W.	University of Cape Town	The structure of crystals of organic metallic compounds and other organic crystals. (Previous awards: 1954-1955.)
LEISEGANG, Dr. E. C. B.Sc., M.Sc., Ph.D. Senior Lecturer	University of Natal	Infrared spectroscopy. (Previous awards: 1952-1955.)
LUTJEHARMS, Prof. Dr. W. J. Phil.D., F.R.S.(S.A.) Professor in Plantkunde	Universiteit van die Oranje Vrystaat	Mikrobiologie van die stikstofkringloop (veral semibiotiese en nie semibiotiese stikstof nitrifikasie en verdere stikstofomsettings vnl. in grasveld humus. (Vorige toekennings: 1953-1955.)

**MEDICAL, DENTAL AND NUTRITIONAL RESEARCH/
MEDIËSE, TANDHEELKUNDIGE EN VOEDINGNAVORSING**

BURSARIES — BEURSE

Senior Bursaries/Senior Beurse

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
MEYER, Dr. H. M.B., Ch.B.(U.P.) 1948, M.Med.(U.P.) 1954, (met lof) Oogarts	Universiteit van Pretoria	Effek van rook op die flikker fusie-frekwensie en die direkte effek van vasodilatore op dieselfde.
VAN ZYL, Dr. A. B.Sc.(Stell.) 1944, Secondary M.Sc.(Stell.) 1948, Ph.D.	National Institute for Medical Resesrch, London, U.K.	1. The Biosynthesis of thyroxin and thyroglobulin and the intermediary metabolism of Iodine with special reference to the identification of oxidising enzyme systems. 2. The <i>in vitro</i> action of hyroxin and triiodothyronin on the oxidation of fatty acids. (Previous award: 1955.)

ASSISTANTSHIPS/ASSISTENTSKAPPE

Grants for the employment of skilled research assistants/Toekennings vir die indiensneming van geskoolde navorsings-assistente

BARNARD, Dr. P. J. J. M.B., Ch.B., M.R.C.P., M.D. Senior Lektor	Universiteit van Pretoria	Pulmonale arteriosklerose, <i>cor Pulmonale</i> . (Vorige toekennings: 1953, 1954, 1955.)
DE JAGER, Prof. C. L. B.A., B.D.S. Professor/Tandarts	Universiteit van Pretoria	1. Die opname van die patologiese letsels van die mondholte met spesiale aandag aan die karies insidensie by die nie-blanke rasse van Suid-Afrika. 2. Mikroskopiese studie van die oppervlakstruktuur van tande met behulp van die replikametode. 3. Suurvorming in die mondholte. (Vorige toekenning: 1955.)
GOETZ, Prof. R. F. M.B., Ch.B.(Frankfort), M.D.(Berne) Research Professor in Surgery	University of Cape Town	The study of the control of the cerebral circulation in the giraffe. Organization of a second expedition to carry out experiments on the live giraffe at "Eyland" during August and September, 1956. A team of American scientists will join in the work. (Previous awards: 1948, 1949, 1950, 1952, 1953, 1954, 1955.)
HEEREMA, Dr. (Miss) J. C. Oogarts (Utrecht) Ophthalmic Surgeon	University of Cape Town	Keratoplasty of the cornea. Reaction of the epithelium. (Previous awards: 1952-1955.)
HEYNS, Prof. O. S. M.A., D.Sc., F.R.C.A.G. Professor of Obstetrics and Gynaecology	University of the Witwatersrand	Mechanics of abdomen. (Previous awards: 1948, 1950-1955.)
KINNEAR, Dr. A. A. C.A.B., M.D., D.Sc. Senior Lektor	Universiteit van Pretoria	Biochemie van metlaatsheid. (Vorige toekenning: 1955.)

<i>Name and Qualifications Naam en Kwalifikasies</i>	<i>Where tenable Waar geldig</i>	<i>Subject of Research Onderwerp van Navorsing</i>
MERSKEY, Dr. C. M.D., M.R.C.P., 1st Asst. Dept. of Medicine, U.C.T.	University of Cape Town	<ol style="list-style-type: none"> 1. Studies of coagulation defects of (a) inherited disease (including the racial factors in blood coagulation); (b) acquired disease. This is a continuation of a previous published work in haemophilia and leukaemia and will also include the effect of contact of blood in glass and silicone surfaces on the coagulation mechanism. 2. Studies in nutritional disease with especial reference to (a) Blood coagulation; (b) Gastrointestinal function. This work is an analysis of the coagulation defect of kwashiorkor, pellagra and scurvy as well as a consideration of the absorption of haemopoietic factors.
MEYER, Prof. B. J.	Universiteit van Pretoria	<ol style="list-style-type: none"> 1. Insulienagtige stowwe in sekere plante. 2. Lathyrisme en vasculêre letsels. 3. Die invloed van nikotiensuur, riboflavin en vit E op lipoproteïne. 4. Faktore wat koma-dosis insulien by nie-diabetikers bepaal.
OETLE, Dr. A. G. B.Sc., B.Sc.(Hons.), M.B., Ch.B. Cancer Research Fellow	S.A.I.M.R.	<ol style="list-style-type: none"> (a) The development and breeding of a colony of pure strains (<i>Mastomys</i>). (b) The study of this species; description of the behaviour, normal anatomy and histology; comparison of wild and laboratory stock and description of the spontaneous tumours effecting these. (c) Experiments on factors influencing the spontaneous cancers appearing in these viz. effect of strain differences, fibre content of diet, castrating, mating. (Previous award: 1955.)
PIJPER, Prof. A. M.D., D.Sc. (Leiden) Emeritus Professor in Patologie	Universiteit van Pretoria	Flagella beweeglikheid en struktuur van bakterieë. (Vorige toekennings: 1948, 1949, 1950-1955.)

Grants for the employment of unskilled research assistants/Toekennings vir die indiensneming van ongeskoolde navorsings-assistente

MARCHAND, Dr. P. E. M.B., B.Ch., Ch.M., F.R.C.S. Thoracic Surgeon	University of the Witwatersrand	The problems of vascular grafts of the thoracic aorta.
UNDERWOOD, Prof. W. E. M.A., Nat. Sci. Tripos, M.R.C.S., L.R.C.P., F.R.C.S., M.B., B.Ch. Professor of Surgery	University of the Witwatersrand	<ol style="list-style-type: none"> 1. The problem of portal hypertension and liver necrosis. 2. Ancillary consideration of blood volume. 3. The biochemistry of certain aspects of replacement therapy in special relation to (1) and (2). 4. Deodenal function. (Previous award: 1955.)

Publications

Publikasies

A.—C.S.I.R. PUBLICATIONS/W.N.N.R. PUBLIKASIES

Library and Information Division

C.I.S.R. Information (monthly accession list).
Register of current scientific research at South African universities, 1955.
Books and Pamphlets on Printing and Publishing—Library Class List No. 9.
Books and Pamphlets on Ceramics—Library Class List No. 10.

Biblioteek en Inligtingsafdeling

W.N.N.R. Inligting (maandelikse biblioteekbyvoegingslys)
Register van die huidige navorsing aan Suid-Afrikaanse universiteite, 1955.

National Institute for Personnel Research

Journal of the N.I.P.R. (thrice yearly).

Nasionale Instituut vir Personeelnavorsing

National Building Research Institute

Information Sheets (Series DIS)—bi-monthly selections of technical enquiries with replies.
Bulletin (Series D.B.)—twice yearly.
Save pounds while building. Council for Scientific and Industrial Research, Pretoria, Oct. 1956.

Nasionale Bounavorsingsinstituut

Telecommunications Research Laboratory

Monthly basic radio propagation predictions for Southern Africa.
Monthly bulletin of ionospheric characteristics observed at Johannesburg and Cape Town.

Telekommunikasie-navorsingslaboratorium

National Institute for Road Research

Binder Distributors—Bulletin No. 1.

Nasionale Padnavorsingsinstituut

Bindstofsproeiers—Bulletin No. 1.

Liaison Division

Research Review—quarterly.
Annual Report of the C.S.I.R.
Science News Selections—weekly. (For the Technical and Daily Press in S.A.)

Skakelafdeling

Navorsingsoorsig—driemaandeliks.
Jaarverslag van die W.N.N.R.
Keur van Wetenskaplike Nuus—weekliks. (Vir die Tegiese en Daaglikse Pers in S.A.)

B.—PAPERS IN SCIENTIFIC JOURNALS BY MEMBERS OF THE C.S.I.R. STAFF

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**C.—PUBLICATIONS RECEIVED FROM MEMBERS OF MEDICAL RESEARCH UNITS
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Tuberkulose-navorsingseenheid
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Virusnavorsingseenheid
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STATEMENT No. 2

CAPITAL FUND

STATEMENT OF TRANSACTIONS FOR THE YEAR ENDED 31ST MARCH, 1956

Details	EXPENDITURE		RECEIPTS		Totals as at 31st March, 1956
	1955-56	Totals as at 31st March, 1956	1955-56	Totals as at 31st March, 1956	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
(A) <i>Building and Reserve Capital Account—</i>					
Land and Buildings	233,741 13 6	661,636 2 3	.. .. .	1,744,288 0 0	231,614 18 11
Balance unexpended	(-) 65,974 10 4	234,759 6 1	.. .. .	12,767 3 2	81,795 8 4
TOTALS	£167,767 3 2	£896,395 8 4	.. .. .	1,547 13 8	18,867 17 8
(B) <i>Equipment Capital Account—</i>					
Stores on Hand	8,251 1 3	81,447 12 1	.. .. .	.. .. .	.. .. .
Furniture, Fittings and Office Equipment	12,934 14 9	92,490 15 9	.. .. .	.. .. .	.. .. .
Laboratory and Workshop Equipment	68,514 11 10	778,882 3 11	.. .. .	.. .. .	.. .. .
Vehicles and Cycles	5,251 13 10	19,129 1 4	.. .. .	.. .. .	.. .. .
Books and Journals	6,668 8 5	61,523 2 5	.. .. .	.. .. .	.. .. .
Buildings (Leasehold) .. .. .	.. .. .	11,168 8 1	.. .. .	.. .. .	.. .. .
Cost of Assets	101,620 10 1	1,044,641 3 7	.. .. .	.. .. .	.. .. .
Balance Unexpended	36,647 3 7	142,118 13 9	.. .. .	.. .. .	.. .. .
TOTALS	£138,267 13 8	£1,186,759 17 4	.. .. .	.. .. .	.. .. .
TOTALS OF (A) AND (B)	£306,034 16 10	£2,083,155 5 8	.. .. .	.. .. .	.. .. .

ALLOCATION OF UNEXPENDED BALANCE

	£	s.	d.
(1) Firm commitments on Capital Fund (estimated)	69	185	0
(2) Held by Universities for the purchase of Capital Equipment	9	056	5
(3) Reserved for capitalisation of equipment manufactured in the C.S.I.R.	17	623	9
(4) Not earmarked	45	553	18
TOTALS	£142,118	13	9

Pretoria, 19th September, 1956.

S. M. NAUDÉ
PresidentA. J. MILLER-SMIT,
Secretary/Treasurer
(A.O. R.46/1)

KAPITAALFONDS

STAAT VAN TRANSAKSIES VIR DIE JAAR GEËINDIG 31 MAART 1956

Besonderhede	UITGAWE		ONTVANGSTE		Totale op 31 Maart 1956
	1955-56	Totale op 31 Maart 1956	Besonderhede	1955-56	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
(A) <i>Gebou- en Reserwkapitaalrekening—</i>					
Gronde en geboue	233,741 13 6	661,636 2 3	.. .. .	291,720 0 0	1,744,288 0 0
Onbestede saldo	(—)65,974 10 4	234,739 6 1	.. .. .	12,767 3 2	231,614 18 11
TOTALE	£167,767 3 2	£896,395 8 4	.. .. .	1,547 13 8	6,589 0 9
(B) <i>Toeristiekapitaalrekening—</i>					
Voorrade voorhande	8,251 1 3	81,447 12 1	.. .. .	.. .. .	.. .. .
Meubels, toebehore en kantoortoerusting	12,934 14 9	92,490 15 9	.. .. .	.. .. .	.. .. .
Laboratorium- en werkwinkeltoerusting	68,514 11 10	778,882 3 11	.. .. .	.. .. .	.. .. .
Voertuie en fiese	5,251 13 10	9,129 1 4	.. .. .	.. .. .	.. .. .
Boeke en tydskrifte	6,668 8 5	61,323 2 5	.. .. .	.. .. .	.. .. .
Geboue (verpog)	—	11,168 8 1	.. .. .	.. .. .	.. .. .
Koste van bate	101,620 10 1	1,044,641 3 7	.. .. .	.. .. .	.. .. .
Onbestede saldo	36,647 3 7	142,118 13 9	.. .. .	.. .. .	.. .. .
TOTALE	£138,267 13 8	£1,186,759 17 4	.. .. .	.. .. .	.. .. .
TOTALE VAN (A) EN (B)	£306,034 16 10	£2,083,155 5 8	.. .. .	£306,034 16 10	£2,083,155 5 8

Besonderhede	TOEWYSING VAN ONBESTEDE SALDO		Totale op 31 Maart 1956
	1955-56	Totale op 31 Maart 1956	
	£ s. d.	£ s. d.	£ s. d.
(1) Vaste verpligings ten opsigte van kapitaalfonds (geskat)	69,185 0 0	69,185 0 0	69,185 0 0
(2) Gebou deur Universiteit vir die aankoop van kapitaaltoerusting	9,956 5 8	9,956 5 8	9,956 5 8
(3) Gereisveer vir kapitalisasie van toerusting deur die W.N.N.R. vervaardig	17,623 9 10	17,623 9 10	17,623 9 10
(4) Nie toegewys nie	45,353 18 3	45,353 18 3	45,353 18 3
TOTALE	£142,118 13 9	£142,118 13 9	£142,118 13 9

Pretoria, 19 September 1956.

S. M. NAUDÉ,
President

A. J. MILLER-SMIT,
Sekretaris/Treasurier
(A.O. R.46/1)

RUNNING EXPENSES ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1956

	1955-56		1955-56	
	£	s. d.	£	s. d.
To—				
Headquarters and Administration, including rent and general services to laboratories	152,376	16 9	139,179	18 3
Less: Transport charges recovered from laboratories	13,196	18 6		
Library and Information Division			15,351	18 10
London Office			10,487	17 3
Washington Office			10,269	8 1
Liaison Division			17,281	19 7
Central Workshops			50,542	11 11
National Building Research Institute			91,991	12 1
National Physical Laboratory			144,696	14 10
Telecommunications Research Laboratory			24,801	3 7
National Chemical Research Institute			143,430	4 5
National Nutrition Research Institute			35,457	19 5
National Institute for Personnel Research			82,305	0 2
National Mechanical Engineering Research Institute			68,136	11 8
Defence Research			17,030	5 3
Pneumoconiosis Research Unit			1,117	9 11
National Institute for Road Research			1,212	9 7
Medical Research Administration			3,016	1 5
Grants and Subsidies			195,943	12 3
(a) Research Grants to Universities, Museums and others	61,985	17 0		
(i) General Sciences			£49,337	3 9
(ii) Medical Research			12,648	13 3
(b) Medical Research Units and S.A.I.M.R.	56,044	19 8		
(c) Industrial Research Institutes	77,912	15 7		
TOTAL RUNNING EXPENSES			1,052,252	18 6
Less: Running Expenses capitalised in equipment manufactured			12,236	10 2
Balance being excess of revenue over expenditure transferred to Appropriation Account			1,040,016	8 4
			104,260	1 6
			<u>£1,144,276</u>	<u>9 10</u>

	1955-56		1955-56	
	£	s. d.	£	s. d.
By—				
Parliamentary Grant				
Revenue from Investigations and Tests				
Sale of Radio-active Isotopes				
Donations				
Revenue from Fellowships and Grants apportioned from 1954-55	10,031	19 6		
Receivable during 1955-56	41,717	12 4		
Less: Apportioned to 1956-57	51,749	11 10		
	18,438	15 10		
Revenue from Publications			1,324	14 6
Royalties			202	10 0
Workmen's Compensation Claims recovered			24	12 8
Administrative Services			537	3 6
Sundry Revenue			361	10 6
Grant for Pneumoconiosis Research			1,117	9 11
Grant for Road Research			1,212	9 7
Appropriated from Appropriation Account in terms of Section 14(4) of Act No. 33 of 1945			162,562	7 4
			<u>£1,144,276</u>	<u>9 10</u>

NOTE: The following are firm commitments of the Council:
 (i) For Running Expenses (estimated)
 (ii) For Research Grants

	£	s. d.
(i) For Running Expenses (estimated)	32,051	0 0
(ii) For Research Grants	21,913	6 6
	<u>£53,964</u>	<u>6 6</u>

S. M. NAUDÉ,
 President

Pretoria, 19th September, 1956.

A. J. MILLER-SMIT,
 Secretary/Treasurer
 (A.O. R.46/1)

REKENING VAN LOPENDE UITGAWES VIR DIE JAAR GEËINDIG 31 MAART 1956

Aan—	1955-56		1955-56	
	£	s. d.	£	s. d.
Hoofkwartier en Administrasie, insluitende huur en algemene dienste aan laboratoriums	152,376	16 9	139,179	18 3
<i>Min:</i> Vervoerkoste verhaal van laboratoriums	13,196	18 6		
Biblioteek en Inligtingsafdeling			15,351	18 10
Londense Kantoor			10,487	17 3
Washingtonse Kantoor			10,269	8 1
Skakelafdeling			17,281	19 7
Sentrale Werkwinkel			50,542	11 11
Nasionale Bounavorsingsinstituut			91,991	12 1
Nasionale Fisiese Laboratorium			144,696	14 10
Telekommunikasies-navorsingslaboratorium			24,800	3 7
Nasionale Chemiese Navorsingslaboratorium			143,430	4 5
Nasionale Voedingnavorsingsinstituut			35,457	19 5
Nasionale Instituut vir Personeelnavorsing			82,405	0 2
Nasionale Navorsingsinstituut vir Werktuigkundige Ingenieurswese			68,136	11 6
Verdedigingsnavorsing			17,030	5 3
Pneumokoniöse Navorsingsseenheid			1,117	9 11
Nasionale Padnavorsingsinstituut			1,212	9 11
Administrasie van Mediese Navorsing			3,016	1 5
Toekennings en Subsidies			195,943	12 3
(a) Navorsingstoekennings aan Universiteite, Museums en andere	61,985	17 0		
(i) Algemene wetenskappe	449	337 3 9		
(ii) Mediese navorsing	12,648	13 3		
(b) Mediese navorsingsseenhede en S.A.I.M.N.	56,044	19 8		
(c) Nywerheidsnavorsingsinstituut	77,912	15 7		
TOTALE BEDRYFSKOSTE			1,052,252	18 6
<i>Min:</i> Bedryfskoste gekapitaaliseer in toerusting vervaardig			12,236	10 2
Saldo, nl. bedrag waarmee inkomste uitgawe oorskry, oorgegedra na die Appropriasierekening			1,040,016	8 4
			104,260	1 6
			<u>£1,144,276</u>	<u>9 10</u>

Per—	1955-56	
	£	s. d.
Parlementêre toekenning	848,550	0 0
Inkomste uit ondersoek en toetse	83,717	8 6
Verkope van Radio-aktiewe Isotope	9,148	7 4
Skenkings	2,000	0 0
Inkomste uit beurse en toekennings oorgebring van 1934-35	33,310	16 0
Ontvangbaar gedurende 1955-56	10,031	19 6
	41,717	12 4
<i>Min:</i> Oorgegedra na 1956-57	51,749	11 10
	18,438	15 10
Inkomste uit publikasies	1,324	14 6
Tantome	292	10 0
Werkerskadeoostellingsese verhaal	141	12 8
Administratiewe Dienste	537	3 6
Diverse Inkomste	361	10 6
Toekening vir Pneumokoniösenavorsing	1,117	9 11
Toekening vir Padnavorsing	1,212	9 11
Toewysing uit Appropriasierekening ingevolge artikel 14(4) van Wet No. 33 van 1945	162,562	7 4

	£	s. d.
	32,051	0 0
	21,913	6 6
	<u>£53,964</u>	<u>6 6</u>

S. M. NAUDÉ,
President

A. J. MILLER-SMIT,
Sekretaris/Treasurier
(A.O. R.46/1)

OPMERKING: Onderstaande is die Raad se vaste verpligtinge:
(i) Onder Bedryfskosterekening (geskat)
(ii) Vir Navorsingstoekennings

Pretoria, 19 September 1956.

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STATEMENT No. 4

APPROPRIATION ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1956

	1955-56			1955-56		
	£	s.	d.	£	s.	d.
To—						
Appropriation by Council to—						
(a) Building and Reserve Capital Account	12,767	3	2	175,329	10	6
(b) Running Expense Account	162,562	7	4			
				175,329	10	6
Balance for allocation by the Council in terms of Section 14(4) of Act No. 33 of 1945				104,260	1	6
				<u>£279,589</u>	<u>12</u>	<u>0</u>
By—						
Balance brought forward for allocation by Council in terms of Section 14(4) of Act No. 33 of 1945	162,562	7	4			
Interest on investment for allocation to Building and Reserve Capital Account	12,767	3	2			
				175,329	10	6
Excess of Revenue over Expenditure transferred from Running Expenses Account	104,260	1	6			
				<u>£279,589</u>	<u>12</u>	<u>0</u>

S. M. NAUDÉ,
President

Pretoria, 19th September, 1956.

A. J. MILLER-SMIT,
Secretary/Treasurer

(A.O. R.46/1.)

STAAT No. 4

APPROPRIASIEREKENING VIR DIE JAAR GEËINDIG 31 MAART 1956

	1955-56			1955-56		
	£	s.	d.	£	s.	d.
Aan—						
Toewysings deur die Raad aan—						
(a) Geboue- en Reserwekapitaalrekening	12,767	3	2	175,329	10	6
(b) Bedryfskosterekening	162,562	7	4			
				175,329	10	6
Saldo vir toewysing deur die Raad ingevolge artikel 14(4) van Wet No. 33 van 1945				104,260	1	6
				<u>£279,589</u>	<u>12</u>	<u>0</u>
Per—						
Saldo oorgedra vir toewysings deur die Raad ingevolge artikel 14(4) van Wet No. 33 van 1945	162,562	7	4			
Rente op beleggings vir toewysing aan Geboue- en Reserwekapitaalrekening	12,767	3	2			
				175,329	10	6
Bedrag waarmee inkomste die uitgawe oorskry, oorgedra van die Bedryfskosterekening	104,260	1	6			
				<u>£279,589</u>	<u>12</u>	<u>0</u>

S. M. NAUDÉ,
President

Pretoria, 19 September 1956.

A. J. MILLER-SMIT,
Sekretaris/Treasurer