

SUID-AFRIKAANSE  
WETENSKAPLIKE EN NYWERHEID-  
NAVORSINGSRAAD

SOUTH AFRICAN  
COUNCIL FOR SCIENTIFIC  
AND INDUSTRIAL RESEARCH

**SEWENDE  
JAARVERSLAG**

**SEVENTH  
ANNUAL REPORT**

**1951 — 1952**

**P R E T O R I A**

UNIE VAN SUID-AFRIKA

UNION OF SOUTH AFRICA

Posbus 395, Pretoria

4 Oktober 1952

Meneer,

Ek het die eer om hierby aan u voor te lê die Sewende Jaarverslag van die Wetenskaplike en Nywerheidsnavorsingsraad oor die jaar geëindig 4 Oktober 1952.

'n Balansstaat en 'n staat van inkomste en uitgawe oor die boekjaar eindigend 31 Maart 1952, soos nagegaan deur die kontroleur en Ouditeur-Generaal, word ook voorgelê.

Dienswillig die uwe,

P. J. DU TOIT

President: Wetenskaplike en Nywerheidsnavorsingsraad

Sy Edele E. H. Louw,

Minister van Ekonomiese Sake,

Paul Hof,

Minnaarstraat,

PRETORIA.

P.O. Box 395, Pretoria

5th October, 1952.

Sir,

I have the honour to present to you herewith the Seventh Annual Report of the Council for Scientific and Industrial Research for the year ended October 4th, 1952.

A balance sheet and statement of income and expenditure for the financial year ended 31st March, 1952, certified by the Controller and Auditor-General, is also presented.

I have the honour to be,

Sir,

Your obedient Servant,

P. J. DU TOIT

President: Council for Scientific and Industrial Research

The Hon. E. H. Louw,

Minister of Economic Affairs,

Paul Hof,

Minnaar Street,

PRETORIA.

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Aansigte van die W.N.N.R. Uitstalling in die Wetenskapslokaal by die Van Riebeeck Feeskou, Kaapstad.

Views of the C.S.I.R. Exhibit in the Hall of Science at the van Riebeeck Festival Fair, Cape Town.



## Samestelling en Vergaderinge van die Raad

Gedurende die jaar onder behandeling was die Raad as volg saamgestel:

DR. P. J. DU TOIT (PRESIDENT)  
 DR. T. B. DAVIE  
 DR. F. J. DE VILLIERS  
 MNR. F. J. DU TOIT ✓  
 MNR. P. E. ROUSSEAU  
 DR. B. F. J. SCHONLAND  
 PROF. E. T. STEGMANN ✓  
 MNR. T. P. STRATTEN  
 DR. E. TABERNER  
 DR. H. J. VAN ECK ✓  
 DR. R. W. WILCOCKS ✓  
 MNR. J. E. WORSDALE ✓

Dir. R. W. Wilcocks, dr. H. J. van Eck, dr. T. B. Dave en mnr. F. J. du Toit is deur die Goewerneur-generaal herbenoem as lede van die Raad vir 'n tydperk van drie jaar vanaf 5 Oktober 1951. Prof. E. T. Stegmann is benoem as lid van die Raad vir 'n tydperk van drie jaar vanaf 1 Februarie 1952 om die vakature te vul wat ontstaan het as gevolg van die bedanking van dr. M. S. Louw.

Die Raad het twee keer in Pretoria en een keer by die Universiteit van Stellenbosch vergader waar navorsingsdepartemente van die universiteit besoek is en besprekings gehou is met die universiteit se navorsingskomitee. Die Uitvoerende Komitee het seskeer vergader. Hierdie komitee was saamgestel soos volg:

DR. P. J. DU TOIT (VOORSITTER)  
 DR. F. J. DE VILLIERS (plaasvervanger mnr. J. E. Worsdale)  
 DR. H. J. VAN ECK (plaasvervanger mnr. F. J. du Toit)

Die Raad vir Wetenskaplike en Nywerheidsnavorsing: 5/10/51—4/10/52.  
 Staande/Standing: S. M. Naudé (Vise President), E. T. Stegmann, T. P. Stratten, P. E. Rousseau, F. J. du Toit, E. Taberner. Sittende/Sitting: T. B. Davie, B. F. J. Schonland, F. J. de Villiers, P. J. du Toit, H. J. van Eck, R. W. Wilcocks, J. E. Worsdale.

The Council for Scientific and Industrial Research 5/10/51—4/10/52.

## Membership and Meetings of the Council

Membership of the Council during the year was:

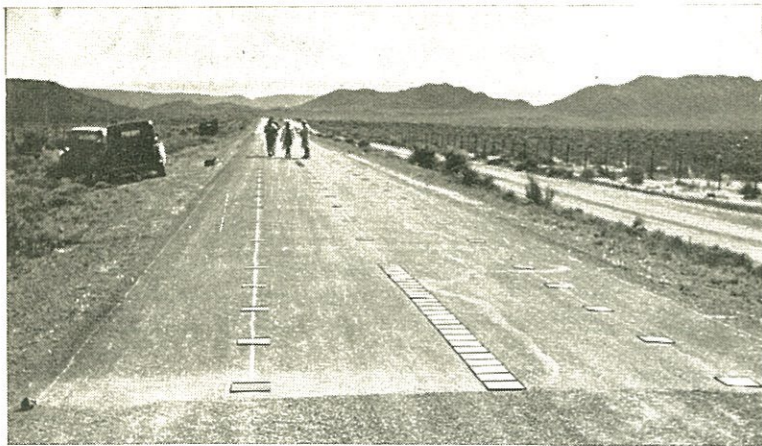
DR. P. J. DU TOIT (PRESIDENT)  
 DR. T. B. DAVIE  
 DR. F. J. DE VILLIERS  
 MR. F. J. DU TOIT  
 MR. P. E. ROUSSEAU  
 DR. B. F. J. SCHONLAND  
 PROF. E. T. STEGMANN  
 MR. T. P. STRATTEN  
 DR. E. TABERNER  
 DR. H. J. VAN ECK  
 DR. R. W. WILCOCKS  
 MR. J. E. WORSDALE

Dr. R. W. Wilcocks, Dr. H. J. van Eck, Dr. T. B. Davie and Mr. F. J. du Toit, were reappointed by the Governor-General as members of the Council for three years from 5th October, 1951. Prof. E. T. Stegmann was appointed as a member of the Council for three years from 1st February, 1952, following the resignation of Dr. M. S. Louw.

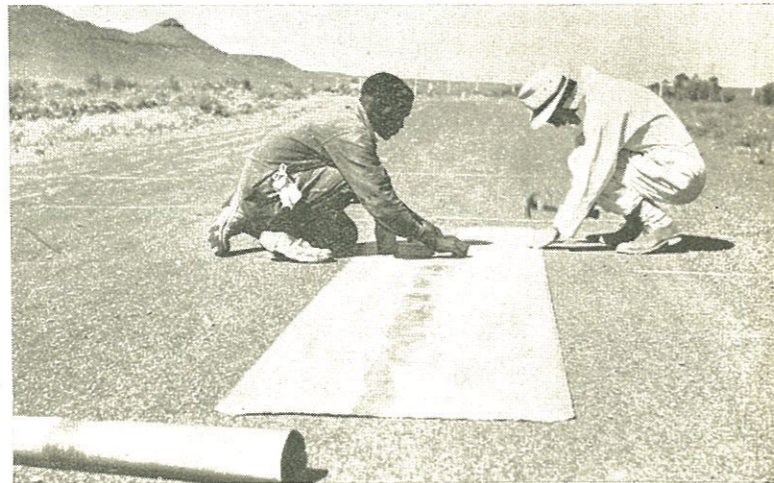
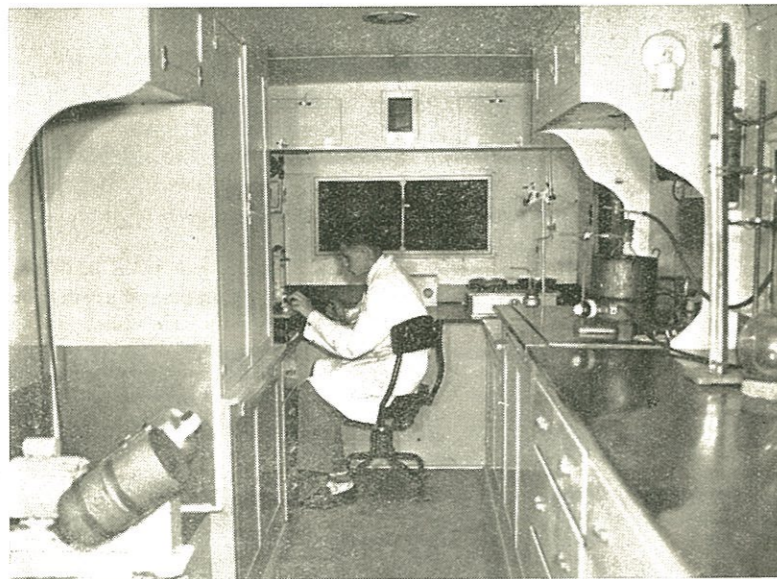
The Council met twice in Pretoria and once at the University of Stellenbosch where research departments of the university were visited and discussions were held with the university's research committee. The Executive Committee met six times. Members of this committee were:

DR. P. J. DU TOIT (CHAIRMAN)  
 DR. F. J. DE VILLIERS (alternate Mr. J. E. Worsdale)  
 DR. H. J. VAN ECK (alternate Mr. F. J. du Toit)





Bituminous Binder Research Unit. Above: Tray test for measuring the uniformity of longitudinal distribution of binder. Centre: Interior of a mobile laboratory used for controlling field experiments. Below: Copper strips are applied to the road before surface dressing to facilitate subsequent removal of samples for testing.



Bitumiese Bindstof Navorsings-eenheid: Bo: Pantoets om die egaligheid van bindstofverspreiding oor die lengte van die pad, te meet. Middel: Binne in die mobiele laboratorium wat gebruik word om veldproewe te kontroleer. Onder: Deur hierdie koperplate op die pad te plaas voordat die oppervlaktedekmateriaal aangewend word, kan monsters op 'n later stadium vir laboratoriumondersoek maklik verwyder word.

## Algemene Oorsig

### Koöperatiewe navorsing

Nywerheids-, Staats- en ander organisasies maak in 'n toenemende mate van die Raad se dienste gebruik. Gedurende die eerste ses jaar is 'n inkomste van meer as £151,000 verkry van donasies, kontrakte, nywerheidsnavorsingsbeurse en bydraes tot nasionale navorsingsprogramme wat deur die Raad se laboratoriums onderneem is. In die finansiële jaar wat in Maart 1952 eindig het, het die inkomste uit hierdie bronne £41,327 beloop. In die huidige finansiële jaar wat in Maart 1953 eindig, word dit op nagenoeg £68,000 beraam en in die daaropvolgende jaar op meer as £75,000.

### Inligtingsdienste

Baie inligting word gratis verskaf. Byvoorbeeld skakelbeamptes verbonde aan die Nasionale Chemiese Navorsingslaboratorium het meer as 500 navrae om inligting gehanteer. Die Afdeling Biblioteek en Inligting het 23,429 boeke, pamflette en tydskrifte uitgeleen—1,000 waarvan aan nywerhede en, daarbenewens, 1,159 deur die leenskema tussen biblioteke.

### Nywerheidsnavorsingsvereniginge

Mnr. H. M. Hamilton, voorheen hoof skeikundige van die „British Insulated Callenders Cable Company”, het in Junie 1952 uit Engeland aangekom om oor te neem as direkteur van die Verfnwywerheidsnavorsingsinstituut in Durban. Hy volg dr. L. Whitby op, wat in Februarie 1952 vertrek het om 'n betrekking in Amerika te aanvaar.

Die Suid-Afrikaanse Woltekstielfnavorsingsinstituut, wat in hul tydelike huisvesting by die Universiteit Rhodes, Grahamstad, aangeby het, het aansoek gedoen om registrasie as 'n nie-winsgewende maatskappy.

Die Leernywerheidsnavorsingsinstituut, Grahamstad, die Visnywerheidsnavorsingsinstituut, Kaapstad, die Suikermeulenywerheidsnavorsingsinstituut, Durban, en die Navorsingseenheid vir Bitumiese Bindstowwe, Pretoria, het volgehou met bevredigende ontwikkeling.

Nywerheidsbydraes tot hierdie ses navorsingsverenigings wat subsidies van die Raad verdien, het gestadig vermeerder.

1946/47	..	..	..	£12,686
1947/48	..	..	..	£13,140
1948/49	..	..	..	£21,251
1949/50	..	..	..	£22,733
1950/51	..	..	..	£34,366
1951/52	..	..	..	£47,478
Totaal	..	..	..	£151,654

## General Review

### Co-operative research

Industrial, Government and other organizations are making increasing use of the Council's services. During the first six years, revenue exceeding £151,000 was realized from donations, contracts, industrial research fellowships and contributions to national research programmes undertaken in the Council's laboratories. In the financial year ended March, 1952, revenue from these sources was £41,327; in the current financial year, ending March, 1953, it is estimated that it will be approximately £68,000 and, in the following year, more than £75,000.

### Information services

Much information is given free of charge. For example, liaison officers attached to the National Chemical Research Laboratory dealt with over 500 inquiries for technical information and advice; the Library and Information Division issued 23,429 books, pamphlets and journals on loan—1,000 to industrial borrowers and, in addition, 1,159 through the inter-library loan scheme.

### Industrial research associations

Mr. G. M. Hamilton, formerly chief chemist of the British Insulated Callenders Cable Company, arrived from England in June, 1952, to take over the directorship of the Paint Industries Research Institute, Durban. He succeeds Dr. L. Whitby, who left in February, 1952, to take up an appointment in America.

The South African Wool Textile Research Institute, which has continued to occupy temporary accommodation at Rhodes University, Grahamstown, has applied for registration as a non-profit company.

The Leather Industries Research Institute, Grahamstown, Fishing Industry Research Institute, Cape Town, Sugar Milling Research Institute, Durban, and Bituminous Binder Research Unit, Pretoria, have all continued to develop satisfactorily.

Industrial contributions to these six research associations which earn subsidies from the Council have increased steadily.

1946/47	..	..	..	£12,686
1947/48	..	..	..	£13,140
1948/49	..	..	..	£21,251
1949/50	..	..	..	£22,733
1950/51	..	..	..	£34,366
1951/52	..	..	..	£47,478
Total	..	..	..	£151,654

## Navorsingsbeurse en -toekennings

Toekennings aan universiteite vir nagraadse navorsing het 14 senior beurse, 48 studentebeurse, 53 navorsings-assistentskappe en talle toekennings vir lopende uitgawes en gespesialiseerde toerusting ingesluit. Publikasies wat van die houers van navorsingstoekennings van die W.N.N.R. ontvang is, verskyn in Bylae ID.

Hierdie jaar het die Raad 'n nuwe beleid aanvaar vir die skepping van beurse vir navorsing in gespesifiseerde gebiede, waarin daar 'n behoefte is aan opgeleide navorsingswerkers, maar waarin daar geen fasiliteite vir navorsingsopleiding aan Suid-Afrikaanse universiteite bestaan nie. Ses beurse is aangebied, drie waarvan beskikbaar is vir navorsing in die Raad se eie laboratoriums en drie aan goedgekeurde navorsingsinrigtings in die buiteland. Dié vir navorsing in die W.N.N.R. se laboratoriums is in die volgende gebiede:

- (a) mediese, landboukundige en nywerheidstoepassing van radio-isotope
- (b) die behandeling van nywerheidsafloopwater
- (c) personeelkeuring van naturellewerkers
- (d) toegepaste geofisika

Die gebiede voorgeskryf vir navorsing in die buiteland is—

- (e) chemiese ingenieurswese
- (f) biochemie van insekte of plante
- (g) moderne berekeningsmetodes
- (h) watervoorsiening en uitbreiding, insluitende alle takke van hidrologiese navorsing en die statistiese ontleding van behoeftes aan water.

Die Raad mag meer as een toekening maak in enige van hierdie gebiede en geen toekennings in die ander nie, afhangende van die standaard van die kandidate.

## Mediese navorsing

'n Nuwe mediese navorsingseenheid is by die Suid-Afrikaanse Mediese Navorsingsinstituut gestig onder dr. A. R. P. Walker, voorheen hoof van die Voedingsseenheid in die Afdeling Biochemie van die Nasionale Chemiese Navorsingslaboratorium. Die personeel van die eenheid, nou bekend as die Navorsingseenheid vir Menslike Biochemie, sal nog deur die W.N.N.R. voorsien word.

Die Navorsingseenheid vir Maatskaplike Geneeskunde onder prof. J. F. Brock by die Universiteit van Kaapstad, is nou bekend as die Navorsingseenheid vir Kliniese Voeding en die Navorsingseenheid vir Maatskaplike Geneeskunde onder dr. S. L. Kark van die Departement van Gesondheid by die Instituut vir Familie- en Gemeenskapsgesondheid, Durban, sal voortaan as Navorsingseenheid vir Gesinsgesondheid bekend staan.

Verslae oor die werksaamhede van die verskillende mediese navorsingseenhede verskyn op bladsye 77-103.

## Research bursaries and grants

Awards to universities for post-graduate research included 14 senior bursaries, 48 student bursaries, 53 research assistantships and numerous grants for running expenses and specialized equipment. Publications received from the holders of C.S.I.R. research awards are listed in Appendix I, and research bursaries and assistantships are summarized in Appendix I.D.

This year the Council adopted a new policy of creating bursaries for directed research in specified fields in which there is a need for trained research workers but in which there are no facilities for research training at South African universities. Six bursaries were offered, three tenable in the Council's own laboratories and three tenable at approved research institutions overseas. Those for research in the C.S.I.R. laboratories are in the following fields:

- (a) medical, agricultural and industrial application of radio-isotopes
- (b) the treatment of industrial effluents
- (c) personnel selection of Native operatives
- (d) applied geophysics

The fields prescribed for research overseas are—

- (e) chemical engineering
- (f) insect or plant biochemistry
- (g) modern computational methods
- (h) water supply and augmentation, including all branches of hydrological research and the statistical analysis of water requirements.

The Council may make more than one award in any of these fields and none in others, depending on the standard of the candidates.

## Medical research

A new medical research unit has been formed at the South African Institute for Medical Research under Dr. A. R. P. Walker, formerly head of a nutrition unit in the Biochemistry Division of the National Chemical Research Laboratory. The staff of the unit, now known as the Human Biochemistry Research Unit, will continue to be provided by the C.S.I.R.

The Social Medicine Research Unit under Prof. J. F. Brock at the University of Cape Town is now known as the Research Unit in Clinical Nutrition and the Social Medicine Research Unit under Dr. S. L. Kark of the Union Health Department at the Institute of Family and Community Health, Durban, will be known in future at the Family Health Research Unit.

Reports on the activities of the various medical research units appear on pages 77-103-



In die eerste van die nuwe geboue wat voltooi is, is daar 'n lae-spoed windtunnel van 10 voet deursnee wat deur 'n Suid-Afrikaanse firma vervaardig is, en 'n middelspoed, agthoekige windtunnel van 2 voet deursnee wat in die Sentrale Werkspale van die W.N.N.R. vervaardig is.

In the first of the new buildings to be completed, there is a 10 ft. diameter low velocity wind tunnel, made by a South African firm, and a 2 ft. medium speed, octagonal wind-tunnel made in the Central Workshops of the C.S.I.R.

## Nasionale laboratoriums

Die belangrikste ontwikkeling was in die Navorsingseenheid vir Werktuigkundige Ingenieurswese wat verlede jaar gestig is. Dit was duidelik dat daar op hierdie gebied 'n behoefte aan navorsingsfasiliteite was en dit word geskat dat nywerhede en ander liggame volgende jaar £25,000 sal bydra vir die koste verbode aan werk wat die eenheid vir hulle sal onderneem. Die hoof van die eenheid dr. A. J. A. Roux, is aangestel as direkteur van die Nasionale Fisiese Laboratorium, maar hy sal nog voortgaan om navorsing in verband met werktuigkundige ingenieurswese as 'n hoofafdeling van Nasionale Fisiese Laboratorium te beheer.

## Ontdekkings en uitvindings

Die patentering van ontdekkings en uitvindings deur die personeel, het die aandag van die Raad in 'n toenemende mate in beslag geneem en die Raad het baie aandag bestee aan die ontwikkeling van 'n beleid en die prosedure om die verskeidenheid van gevalle wat vir oorweging voorgelê word te hanteer. 'n Nuwe tegniek vir die seleksie van frekwensies wat in die Telekom-

## National laboratories

The main development has been in the Mechanical Engineering Research Unit which was started last year. It is evident that there was a great need for research facilities in this field and already it is estimated that, next year, industries and other bodies will contribute £25,000 to the cost of work which this unit will undertake on their behalf. The head of the unit, Dr. A. J. A. Roux, has been appointed director of the National Physical Laboratory, but will continue to direct mechanical engineering research as a major division of the National Physical Laboratory.

## Discovery and invention

The patenting of discoveries and inventions by the staff has increasingly occupied the attention of the Council, which has given much thought to evolving a policy and procedures to cover the varied cases which come up for consideration. A new technique of frequency selection which was developed in the Telecommunications Research Laboratory and patented last year, has been taken up by a South African firm



munikasie-navorsingslaboratorium ontwikkel is en verlede jaar gepatenteer is, is aanvaar deur 'n Suid-Afrikaanse firma, wat reeds die eerste twee proefmodelle van 'n kristalbeheerde radio-ontvangtoestel, wat volgens 'n lisensie van die W.N.N.R. vervaardig is, afgelewer het. 'n Anerobiese verteringsproses vir die suiwering van nywerheidsafloopwater, belaa met organiese stowwe, wat ook verlede jaar gepatenteer is, is uitgetoets in 'n peilaanleg by Stellenbosch, onder kontrak met 'n nywerheidsonderneming. Twee nuwe prosesse is gepatenteer—een 'n verbeterde proses vir die defluorering van water en 'n verbeterde proses vir die verseping van wolvette. Dit het aan die lig gekom dat die uitvinding van nog 'n proses vir die produksie van drooglies, veral vir gebruik in die vervaardiging van verf, voorgespring is deur 'n groot Amerikaanse korporasie wat onlangs 'n patent registreer het.

#### Publikasies

Die hoeveelheid publikasies is 'n gebruikelike metode om die navorsingsbedrywighede te meet en in Bylae I is daar 'n lys van 140 geskifte en verslae van die personeel wat gedurende die jaar gepubliseer is; die meeste hiervan is die resultate van oorspronklike navorsing wat in tydskrifte van internasionale faam gepubliseer is. Uittreksels van geskifte saam met algemene notas oor die betrokke navorsingsprogramme verskyn in 'n kwartaalblad *Navorsingsoorsig* wat deur die Raad se skakelafdeling uitgegee word, nadat die geskifte oorspronklik in wetenskaplike en tegniese tydskrifte gepubliseer is.

#### Bouprogram

Die perseel is reeds gereedgemaak, die windtonnelgebou is voltooi en die Navorsingseenheid vir Werktuigkundige Ingenieurswese het reeds ingetrek. Daar is twee windtonnels wat gebruik sal word vir die studie van die werkverrigting van dakventilators, navorsing in verband met die ventilasie van geboue en die noukeurige yking van instrumente vir lugvloeiometings. Daar is voortgegaan met die konstruksie van die siklotronsaal en dit is byna voltooi. Die werk aan die gebou vir die Nasionale Bounavorsingsinstituut, die eerste groot laboratorium wat na die nuwe perseel verskuif sal word, het reeds begin.

Hierdie werk vorm die eerste gedeelte van die bouprogram, die koste waarvan gedek word deur 'n skenking van £225,600 wat in 1946-47 daarvoor bewillig is. 'n Verdere bedrag van £250,000 is bewillig vir die jaar eindigende 31 Maart 1953 vir die tweede deel van die program—die Nasionale Fisiese Laboratorium en geboue vir kernfisika, biofisika en akoestiek. Daar is reeds goeie vordering gemaak met die beplanning van hierdie geboue.

which has delivered the first two trial models of a crystal controlled radio receiver manufactured under licence to the C.S.I.R. An anaerobic digestion process for the purification of industrial effluents charged with organic matter, also patented last year, has been tried out in a pilot plant at Stellenbosch under contract to an industrial concern. Two new processes have been patented—one an improved process for the defluoridation of water and an improved process for the saponification of wool grease. It was found that the discovery of another process for the production of drying oils, particularly for use in the manufacture of paints, had been forestalled by a patent filed recently by a large American corporation.

#### Publications

Publication is a customary yardstick of research activity and in Appendix I there are listed 140 papers and reports from the staff which were published during the year, the majority of them communicating the results of original research in journals of international repute. Abstracts of papers together with general notes on the relevant research programmes, appear in a quarterly *Research Review* issued by the Council's Liaison Division, subsequent to the original publication of the papers in scientific and technical journals.

#### Building programme

The site has been cleared and the wind tunnel building has been completed and occupied by the Mechanical Engineering Research Unit. There are two wind tunnels which will be used for studies of the performance of roof ventilators, research into the ventilation of buildings and accurate calibration of airflow instruments. Construction of the cyclotron hall has continued and is nearing completion; work on the building for the National Building Research Institute, the first major laboratory which will be moved to the new site, has begun.

These works constitute the first part of the building programme, the costs of which are covered by a grant of £225,600 voted for this purpose in 1946-47. A further sum of £250,000 was voted for the year ended March 31st, 1953, for the second stage of the programme—the National Physical Laboratory and buildings for nuclear physics, biophysics and acoustics. The planning of these buildings is already well advanced.

## Skakelafdeling

### NAVORSINGSINLIGTING

Die twee navorsingsbeamptes wat verbonde is aan die Nasionale Chemiese Navorsingslaboratorium dra nog steeds die verantwoordelikheid vir hierdie deel van die werk en vorm in werklikheid die kern van 'n industriële skakelafdeling. Tegniese navrae, onderhandelings wat kontrakte en beurse voorafgaan en sekretariële dienste aan onder-komitees wat handel met projekte, het tot so 'n mate toegeneem dat die stelselmatige opnames van grondstowwe wat ook deur hierdie skakelbeamptes onderneem word, beperk moes word.

#### Industriële opnames

Twee verslae is voorberei:

1. Die voorraad sout en verwante chemiese stowwe in Suid-Afrika.
2. 'n Kritiese oorsig van die kaolienbedryf in Suid-Afrika veral met betrekking tot die moontlike toepassing van raffineringstegniese.

Hierdie verslae wat in die eerste instansie vir huis-houdelike gebruik bedoel is, en uiteindelik vir publikasie, mag lei tot navorsingsprojekte.

Benewens hierdie twee verslae, het twee verslae gedurende die jaar verskyn, waaraan die betrokke skakelbeamptes medeskrywers met ander was:

3. Titanium—'n kritiese oorsig, veral met betrekking tot die benutting van Suid-Afrikaanse hulpbronne.
4. Walvisverwerking II: Die samestelling van party walvislewerekstrakte.

#### Navrae

Die aantal navrae waarmee gehandel is was net minder as 500. Die tipe navraag wat ontvang word het merkbaar verbeter en dui daarop dat vraers meer bewus is van die soort hulp wat die W.N.N.R. in staat is om te verleen. Die beantwoording van vrae weens die feit dat hul besonder uitvoerig en omvattend moet wees, neem alhoemeer tyd in beslag—in party gevalle hou die briedwisseling vir maande aan.

Meer en meer navrae lei tot navorsingskontrakte en beurse, meer as dertig waarvan gedurende die afgelope jaar tot stand gebring is. Hierdie onderhandelings behels die voorbereiding van kosteberekenings, kontrak-dokumente, ens. en ook 'n groot deel van die finale kosteberekening en administrasie.

#### Nywerheidsnavorsingsverenigings

Die huidige ses navorsingsverenigings ontwikkel nog steeds tot groter stabiliteit. 'n Vergadering van direkteure van navorsingsverenigings en direkteure van W.N.N.R. nasionale laboratoriums is in Pretoria belê ten einde nuwe verwikkelings en gemeenskaplike probleme te bespreek.

## Liaison Division

### RESEARCH INTELLIGENCE

This branch of work has continued to be the responsibility of the two officers attached to the National Chemical Research Laboratory who, in effect, constitute the nucleus of an industrial liaison section. Technical inquiries, negotiation of contracts and fellowships and secretarial services to project sub-committees have been an increasing commitment which to some extent has limited the undertaking of systematic surveys of raw materials.

#### Industrial surveys

Two reports have been prepared:

1. The supply of salt and related chemicals in South Africa.
2. A critical survey of the kaolin industry in South Africa with special reference to the feasibility of introducing refining techniques.

These reports, which are intended for internal use in the first place and eventually for publication, may result in research contracts or projects.

In addition, two publications have appeared during the year in which the officers concerned are joint authors with others:

3. Titanium—a critical review with special reference to the utilization of South African resources.
4. Whale processing II: The composition of some whale liver extracts.

#### Inquiries

The number of inquiries dealt with was just short of 500. The type of inquiry received has noticeably improved and reveals an increasing awareness of the type of assistance the C.S.I.R. is in a position to offer. Answers require in general to be more detailed and comprehensive and take up an increasing amount of time, correspondence in some cases continuing for months.

More inquiries are leading to research contracts and fellowships, of which about thirty have been negotiated during the year, including preparation of cost estimates, contract documents, etc., and much of the final costing and administration.

#### Industrial research associations

The existing six research associations have continued to develop towards greater stability. A meeting of the directors of research associations and of C.S.I.R. national laboratories was arranged in Pretoria, to discuss new developments and common problems.

Ingevolge die besluit van die Gefedereerde Kamer van Nywerhede om die moontlikheid te ondersoek vir die oprigting van 'n vereniging vir nywerheidsontwerp volgens die W.N.N.R. se stelsel vir nywerheidsnavorsingsverenigings, het die hoof van die afdeling die W.N.N.R. verteenwoordig op 'n rigtingskomitee wat voorstelle geformuleer het vir voorlegging aan die betrokke industrie. Daar is in kontak gebly met die Gefedereerde Kamer van Nywerhede wat hierdie saak nog steeds oorweeg.

#### Kwytstelling van inkomstebelasting op navorsingsuitgawes

Aansoeke om sertifisering van navorsingsuitgawes op kapitaaltoerusting word nog steeds deur die Skakel-beamptes ondersoek.

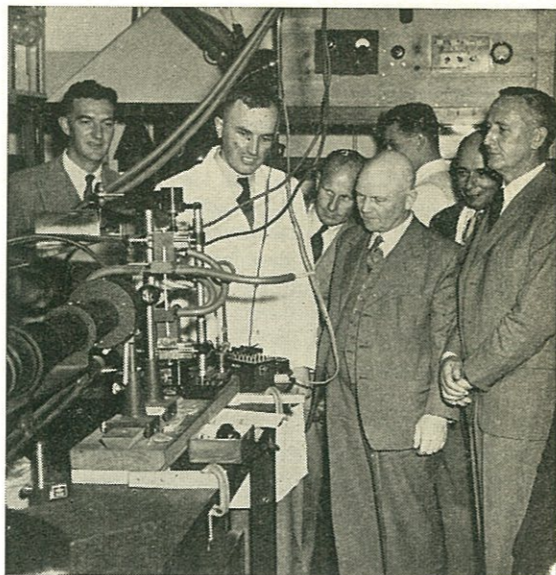
#### MEDEDELING VAN DIE RESULTATE VAN NAVORSING

##### Streekskomitees

Die Natalse Streeksnavorsingskomitee onder voorsitterskap van mnr. T. E. Peppercorn het twee openbare

Regs: Die tegniek van spektrochemiese analise word verduidelik aan lede van die Verfnwywerheid-Navorsingsinstituut wat die W.N.N.R. laboratoriums na hul Jaarvergadering wat gedurende Mei 1952 in Pretoria gehou is, besoek het.

Onder: Voorsitter van die Natalse Streeksnavorsingskomitee, mnr. T. E. Peppercorn, Besturende Direkteur van Dunlop, Suid-Afrika, Bpk., Durban, het vertrek om 'n betrekking by die Dunlop Maatskappy in Londen te aanvaar. Mnr. S. Stephenson, Besturende Direkteur van die firma James Brown & Co., Durban, is die nuwe voorsitter van hierdie komitee.



Above: Spectrochemical analysis being described to members of the Paint Industries Research Institute who visited the C.S.I.R. laboratories after their Annual General Meeting in Pretoria, in May 1952.

Left: Chairman of the Natal Regional Research Committee, Mr. T. E. Peppercorn, Managing Director of Dunlop South Africa, Ltd., Durban, has left to take up an appointment with the Dunlop Company in London. Mr. S. Stephenson, Managing Director of James Brown & Co., Durban, is the new Chairman of this Committee.

Consequent upon the decision of the Federated Chamber of Industries to investigate the possibility of setting up an industrial design association under the C.S.I.R.'s research association scheme, the head of the division represented the C.S.I.R. on a steering committee which drafted proposals for submission to organized industry. Contact has been maintained with the F.C.I., which is still reviewing this whole question.

#### Remission of income tax on research expenditure

Applications for the certification of research expenditure on capital items continue to be investigated by liaison officers.

#### COMMUNICATION OF THE RESULTS OF RESEARCH

##### Regional committees

The Natal Regional Research Committee, under the chairmanship of Mr. T. E. Peppercorn, arranged two public lectures in Durban, by Dr. S. Biesheuvel on personnel selection, and by Mr. J. E. Jennings on Native housing.

lesings in Durban gereël, een deur dr. S. Biesheuvel oor personeelkeuring en die ander deur mnr. J. E. Jennings oor Naturellebehuising.

Die doelwit van dr. Biesheuvel se besoek was om die Tegniese Advieskomitee van die Natalse Kamer van Nywerhede te adviseer oor die toepassing van aanlegstoetse vir Naturelle wat in nywerhede werk. Die uitnodiging is aan hom gerrig deur bemiddeling van die W.N.N.R. se streeksnavorsingskomitee. Mnr. Jennings s uitgenooi deur die streekskomitee self.

Die Middellandse Streeksnavorsingskomitee, onder voorsitterskap van mnr. H. Schander, het weereens veel presteer deur belangstelling gaande te hou in die Raad se werksaamhede. Hierdie komitee is tans 'n behoorlik gekonstitueerde liggaam met sy eie konstitusie en bankrekening. 'n Uitstalling foto's van die Raad se laboratoriums is in die Port Elizabethse Openbare Biblioteek gereël.

##### Navorsingsoorsig

Daar is tans nagenoeg 3,000 name op die adreslys vir *Navorsingsoorsig*. Benewens navorsingsliggame en organisasies waarmee ons in kontak is, is hierdie lys opgestel deur gebruik te maak van „antwoord-strokies” wat ons ons teruggestuur is deur die lede van sekere wetenskaplike en tegniese verenigings aan wie vorige uitgawes gestuur is. 'n Inhoudsopgawe van Volume I is tesame met die Junie 1952 uitgawe uitgestuur.

##### Adresboek van navorsingsinrigtings

Aanvraag vir hierdie publikasie duur voort en, aangesien dit feitlik uit druk is, word die uitgee van 'n hersiene, geïllustreerde uitgawe oorweeg.

'n Afrikaanse omsetting is voltooi en gedistribueer.

##### Openbare betrekkings

Die Pers, handels en ander tydskrifte en die S.A.U.K. nuusdiens is gereeld voorsien van inligting oor die werksaamhede van die Raad en sy laboratoriums.

##### Tentoonstellings

Die W.N.N.R. se deelname in die Wetenskapslokaal by die Van Riebeeck Feeskou was die Skakelafdeling se eerste poging tot die tentoonstelling van wetenskaplike werk.

Die modelle wat gebruik is en ondervinding wat tydens die Van Riebeeck Feeskou opgedoen is, is gebruik in 'n uitstalling van dergelike grootte en omvang tydens die Nywerheidskou wat van 30 Augustus tot 6 September in Pretoria gehou is.

The main purpose of Dr. Biesheuvel's visit was to advise the Technical Advisory Committee of the Natal Chamber of Industries on the application of aptitude testing to Natives in industrial employment. The invitation was issued through the C.S.I.R.'s regional research committee. The invitation to Mr. Jennings came from the regional committee itself.

The Midland Regional Research Committee under the chairmanship of Mr. H. Schander has again done much to stimulate interest in the Council's activities. It is now a properly constituted body with its own constitution and banking account. An exhibition of photographs of the Council's laboratories was arranged in the Port Elizabeth Public Library.

##### Research Review

There are now approximately 3,000 names on the mailing list for *Research Review*. Apart from research institutions and organizations with which we are in contact, this list has been compiled from "reply slips" returned by the members of certain scientific and technical societies to whom the earlier issues were sent. An index to Volume I was sent out with the June, 1952, issue.

##### Directory of research organizations

Orders for this publication continue and, as it is virtually out of print, the production of a revised illustrated edition is being contemplated.

A limited edition in Afrikaans was completed and issued.

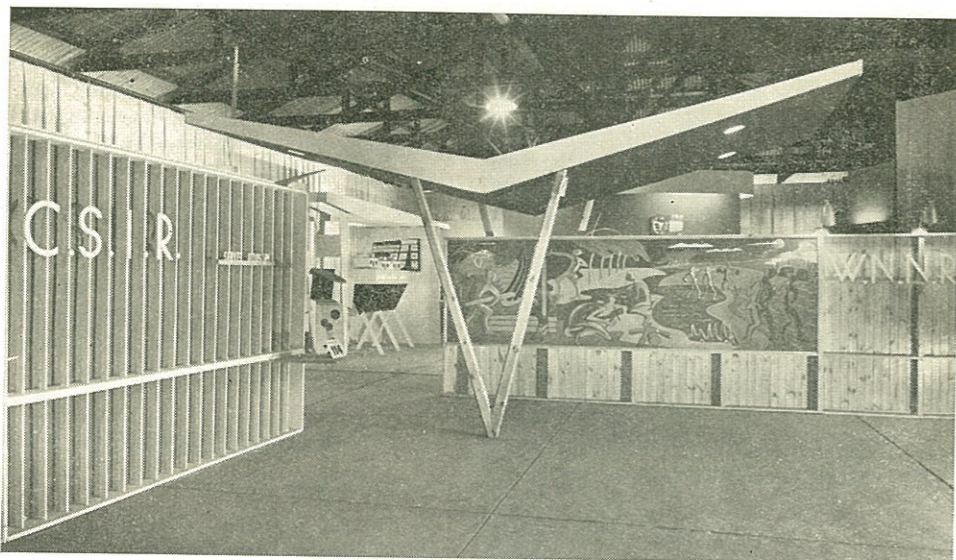
##### Public information

The Press, trade and other journals, and the S.A.B.C. news services have been provided regularly with information about the activities of the Council and its laboratories.

##### Exhibitions

The C.S.I.R.'s participation in the Hall of Science at the Van Riebeeck Festival Fair involved the Liaison Division in its first major effort at staging a scientific exhibit.

The models and experience from the Van Riebeeck Exhibition were used in staging an exhibit similarly comprehensive as to subject and extensive as to size at the Pretoria Industrial Exhibition from August 30th to September 6th.



Ingang tot die W.N.N.R. Uitstalling, Pretoriase Nywerheidskou, Augustus 1952.

Entrance to the C.S.I.R. Exhibit, Pretoria Industrial Exhibition, August, 1952.

Nog 'n uitstalling wat radio-isotope, stralingsmetings en personeelkeuring behels het, is op uitnodiging van die S.A. Mediese Vereniging tydens hul Jaarvergadering wat vanaf 21 tot 25 September in Johannesburg gehou is, tentoongestel.

#### Algemene openbare betrekings

Wanneer 'n beroep gedoen word op die Skakelafdeling om besoekers deur die laboratoriums te neem, tref die Skakelbeamptes die nodige reëlins hiervoor.

#### Internasionale wetenskaplike betrekings

Die werk wat betrokke is by Suid-Afrika se lidmaatskap van die internasionale wetenskaplike unies is die verantwoordelikheid van een van die skakelbeamptes wat dan ook die President bystaan in sake soos internasionale konferensies soos die Wetenskaplike Konferensie van die Britse Gemenbes, en die Raad se betrekkinge met die Wetenskaplike Raad vir Afrika suid van die Sahara en die Kommissie vir Tegiese Samewerking in Afrika suid van die Sahara.

Dieselfde beampte is die hoof van die Afdeling ook behulpsaam met te voorsien aan die behoeftes van die Raad se skakelkantore in Londen en Washington wie se werksaamhede tans ingeskakel is by die van die Skakelafdeling in Pretoria. Reëlins is ook getref vir twee skakelbeamptes van die kantoor in Pretoria om vroeg in 1953 beamptes in Londen en Washington te vervang.

A third exhibit confined to radio-isotopes, radiation measurements and personnel selection, was staged by invitation at the Annual Congress of the S.A. Medical Association in Johannesburg, September 21st to 25th.

#### General public relations

Whenever called upon to do so, Liaison Officers make arrangements for visitors to be shown around the C.S.I.R. laboratories.

#### International relations in science

Dealing with matters arising out of South Africa's membership of the international scientific unions is the responsibility of one of the liaison officers, who also assists the President in matters connected with international conferences, such as the British Commonwealth Scientific Conference, and in the Council's relations with the Scientific Council for Africa south of the Sahara and the Commission for Technical Cooperation in Africa south of the Sahara.

The same officer assists the Head of the Division in dealing with the needs of the Council's scientific liaison offices in London and Washington whose activities have been linked with those of the Liaison Division, Pretoria. Arrangements were made for two liaison officers from Pretoria to replace officers in London and Washington early in 1953.

#### Patente

Die beampte wat handel met internasionale wetenskaplike aangeleenthede was die President ook behulpsaam met die behandeling van vraagstukke wat ontstaan het a.g.v. aansoeke om patente vir uitvindings en ontdekkings deur die Raad.

#### WETENSKAPLIKE SKAKELKANTOOR, LONDEN

Die Wetenskaplike Skakelkantoor in Londen is in noue voeling met die navorsings en ontwikkelingswerk van baie van die wetenskaplike liggame in die Verenigde Koninkryk. Die aanstelling van 'n tweede Skakelbeampte het die kantoor in staat gestel om sy werksaamhede uit te brei, veral op die belangrike gebied van wetenskaplike en tegnologiese rapporteerders en ondersoekingswerk. Die kantoor het daartoe bygedra dat die Raad en ander liggame op hoogte van sake gehou is in verband met nuwe ontwikkelings en neigings in wetenskaplike navorsing. Baie navrae is mee gehandel en 17 verslae oor meer omvattende ondersoek is gelewer. Aangesien die navorsingsgebied, sowel suiver as toegepaste, besonder omvattend is, is dit slegs moontlik om dit gedeeltelik te dek en bied die uitkies van vraagstukke wat ondersoeking verg 'n besondere probleem. Die verslae wat ontvang word van Suid-Afrikaanse laboratoriums word as leidraad gebruik maar verdere leiding van ander navorsingsliggame i.v.m. nuwe navorsingsprojekte wat reeds onderneem is of wat oorweeg word en besondere navorsingsgebiede wat besondere aandag verg, sal verwelkom word. Hierdeur sou dit verseker word dat die beperkte hulpmiddels waarvoor die kantoor beskik so ekonomies en doeltreffend moontlik benut sal word.

Ander werksaamhede was soos volg:

1. Die kantoor is die Raad nog steeds behulpsaam met die werwing van personeel deur vakatures te adverteer en deur applikante te ondersoek.
2. Waar nodig, word reëlins getref vir die uitruil van publikasies. Op versoek, is meer as 200 publikasies en enkel-fotostaat of mikrofilmafdrukke van artikels wat nie in Suid-Afrika beskikbaar is nie, verkry.
3. Ingevolge dringende tekort aan sekere soorte toerusting was dit weereens nodig dat heelwat tyd bestee moes word aan die opspoor van, en onderhandelings vir, toerusting vir die Raad se laboratoriums. Die kantoor het opgetree as agent vir die aankoop van radioaktiewe isotope en reëlins is getref vir die wegstuur van 108 besendings.
4. Die Hoof Wetenskaplike Skakelbeampte het weereens die Raad en ander Suid-Afrikaanse organisasies op verskillende komitees verteenwoordig.

#### Patents

The officer who deals with international scientific affairs has assisted the President with all questions which have arisen over the patenting of inventions and discoveries by the Council

#### SOUTH AFRICAN SCIENTIFIC LIAISON OFFICE, LONDON

The Scientific Liaison Office in London has maintained close touch with the research and development work of many scientific organizations in the United Kingdom. The appointment of a second Liaison Officer has enabled it to extend activities, particularly in the important field of scientific and technological reporting and investigation. The office helped to keep the Council and other organizations informed of new developments and trends in scientific research. Many inquiries were dealt with and 17 reports on larger investigations were issued. As the range of research, both pure and applied, is extremely wide, it is possible to cover it only partially, and the problem of selection is always a difficulty. The reports from South African laboratories are used in deciding where emphasis should be placed, but increased guidance from other research organizations about new research projects undertaken or contemplated, and specific fields of research which should be given special attention, would be welcomed. This would ensure that the limited resources of the office are most economically and fruitfully used.

Other activities were as follows:

1. The office continued to act for the Council in the recruitment of staff by advertising vacancies and interviewing applicants.
2. Where necessary, arrangements for the exchange of publications were made. On request, well over 200 publications, and single photostat or microfilm copies of articles not available in South Africa, were obtained.
3. Due to severe shortages of certain types of equipment it has once again been necessary for a considerable effort to be devoted to the location of, and negotiation for, equipment for the Council's laboratories. The office has acted as agent for the purchase of radio-active isotopes and arrangements for the despatch of 108 consignments, were made.
4. The Chief Scientific Liaison Officer continued to represent the Council and other South African organizations on various committees.

5. Die volgende verslae is uitgereik:

- Die aanwending van wetenskap deur Industrie (hoof trekke van 'n monsterversoek uitgevoer deur die D.S.I.R.).
- Enige verwysings tot werk wat gedoen is op die meet van partikelgroottedistribusie.
- Notas oor die Britse Wassery-Navorsingsverenigings.
- Enige notas oor hidrouliese navorsing by die Imperial College (Londen).
- Notas oor die massaverbouing van die Alga Chlorella vir voedsel.
- Enige studies na meteorologiese fisika te Cambridge Universiteit.
- Die C.I.B.A. stigting.
- Navorsing op wolke-fisika. Imperial College, Londen.
- Notas oor ysterpoeier in die Verenigde Koninkryk.
- Verslag oor die Britse Gelatien en Gom Navorsingsvereniging.
- Notas oor die uitwerking van elektrisiteit op visse.
- Voedsel-Wetenskapsinrigtings en beleid (in die V.K.).
- Nywerheidsontwerpinrigtings in die V.K.
- Brandweernavorsingsinrigtings in die V.K.

**SUID-AFRIKAANSE WETENSKAPLIKE SKAKEL-KANTOOR, WASHINGTON**

Met die ondervinding wat gedurende die afgelope ses jaar opgedoen is kan die Raad se Wetenskaplike Skakelkantoor in Washington hom tans toelê op 'n aantal min of meer bepaalde algemene funksies wat nie veel verander van jaar tot jaar nie. Sy belangrikste funksie is die amptelike verteenwoordiging van die Suid-Afrikaanse wetenskap in die Verenigde State en Kanada. In die hoedanigheid dien dit as skakel tussen die regeringswetenskaplike liggame in bogenoemde twee lande en ooreenstemmende liggame in die Unie. Deur middel van persoonlike besoeke kan die Wetenskaplike Skakelbeampte die uitruil van inligting i.v.m. veranderings in beleid, organisasie en administrasie bewerkstellig en ook die uitruil van wetenskaplike inligting bestendig. Goeie betrekkinge is ook geskep en instand gehou met die wetenskaplikes in die talryke regeringsburo's, die universiteite, navorsingstigtings en industriële laboratoria's, en op hierdie manier is baie Suid-Afrikaanse wetenskaplikes in aanraking gebring met hul kollegas in Noord-Amerika. Deur wetenskaplike vergaderings en konferensies by te woon was dit vir die Wetenskaplike Skakelbeampte moontlik om die Suid-Afrikaanse standpunt te stel en om sodoende belangstelling in die werk wat hier gedoen word te wek, dit gee weer op sy beurt aanleiding tot direkte uitruiling van inligting tussen die navorsers self, wat wedersyds tot voordeel strek. Die

5. The following reports were issued:

- The use of Science by Industry (outline of a sample survey carried out by D.S.I.R.).
- Some references to work on the measurement of particle size distribution.
- Notes on the British Launderers Research Association.
- Some notes on Hydraulic Research at Imperial College (London).
- Notes on the mass cultivation of the Alga Chlorella for food.
- Some meteorological physics studies at Cambridge University.
- The C.I.B.A. Foundation.
- Cloud Physics Research. Imperial College, London.
- Notes on Iron Powder in the United Kingdom.
- Report on the British Gelatine and Glue Research Association.
- Notes on the effects of electricity on fish.
- Food Science Establishments and Policy (in the U.K.).
- Industrial Design Establishments in the U.K.
- Anti-fire Establishments in the U.K.

**SOUTH AFRICAN SCIENTIFIC LIAISON OFFICE, WASHINGTON**

After the experience of some six years operation, the Council's Liaison Office in Washington has settled down to perform a number of fairly definite general functions which do not vary greatly from year to year. Its primary function is the official representation of South African science in the United States and Canada. As such it serves as a channel of communication between the government scientific institutions in these countries and corresponding officials in the Union. By personal visits the Scientific Liaison Officer has been able to stimulate the exchange of information on changes of policy, organization and administration, and in addition has promoted a healthy exchange of scientific information. Cordial relations have been established and maintained with the scientists in the numerous government bureaux, the universities, research foundations and industrial laboratories, and by this means many S.A. scientists have been put in direct touch with their opposite numbers in North America. By attending and speaking at scientific meetings and conferences it has been possible for the Scientific Liaison Officer to present the South African point of view, and thus stimulate an interest in work at home which leads to a direct and mutually profitable exchange of information between the workers themselves. The Scientific Liaison Officer represented the S.A. Chemical Institute

Wetenskaplike Skakelbeampte het die S.A. Chemiese Vereniging verteenwoordig tydens die 75ste Jaargadering van die Amerikaanse Chemiese Vereniging in September 1951 en was ook Suid-Afrika se verteenwoordiger op die Sestiende Konferensie van die Internasionale Unie van Suiwer en Toegepaste Chemie.

Soos in vorige jare het die Skakelkantoor die verantwoordelijkheid gedra vir die beskikbaarstelling van gedrukte inligting in beide rigtings. Die biblioteek van wetenskaplike en tegniese publikasies van Suid-Afrikaanse oorsprong beloop tans meer as 2,500 items op die kaartindeks, en ingevolge die maandelikse byvoeginsly wat plaaslik versprei word, is daar 'n gereelde aanvraag vir hierdie publikasies deur Amerikaanse laboratoria's. Namate die kantoor ook meer bekend raak, ontvang dit ook 'n toenemende hoeveelheid dokumente van Amerikaanse oorsprong wat na die W.N.N.R. Biblioteek gestuur word. Terselfertyd het die kantoor weereens gehelp om die W.N.N.R. mikrofilmdiens instand te hou deur herdrukke en enkelfoto-staatskopieë of mikrofilms van artikels wat in tydskrifte verskyn het, en wat nie in Suid-Afrika beskikbaar is nie, te verkry.

Die beantwoording van navrae wat aan die Skakelafdeling gerig is deur industrie of wat in die W.N.N.R. laboratoria's ontstaan, neem nog steeds 'n groot deel van die skakelafdeling se tyd in beslag.

Die bekendste aktiwiteit van die Wetenskaplike Skakelkantoor in Washington is die diens wat dit aan besoekers lewer. Gedurende die maande wat 'n besoek aan die Verenigde State voorafgaan, reël die Skakelkantoor 'n reisplan en tref dit reëlings vir huisvesting en vervoer en word die nodige bestellings gemaak. Amptelike toestemming word ook verkry vir besoekers om Amerikaanse staats- en ander wetenskaplike liggame te besoek. Wanneer besoekers dan ook in die Verenigde State aankom tree die kantoor op as basis en verleen dit ook hulp i.v.m. hul verdere reise.

Gedurende die eerste paar jaar van sy bestaan was die Wetenskaplike Skakelkantoor ook betrokke met die aankoop van toerusting vir die W.N.N.R. laboratoria's. Meeste van hierdie werk word tans deur gewone handelskanale onderneem maar die Skakelkantoor is nog verantwoordelik vir die aankoop van alle radioisotope van die V.S. se Atoomkragkommissie en vir die uitvoer daarvan na Suid-Afrika. Dit het die Raad se koopsagents ook bygestaan wanneer tegniese probleme hul voorgedoen het in verband met die bestel van wetenskaplike toerusting.

Dr. R. M. Kark van die Universiteit van Illinois het weereens opgetree as die Raad se Mediese Ere Skakelbeampte in die Verenigde State en het gereeld verslag gelewer van die jongste ontwikkelings op die gebied van die mediese wetenskap.

at the 75th Anniversary Meeting of the American Chemical Society in September, 1951, and was the South African representative at the Sixteenth Conference of the International Union of Pure and Applied Chemistry.

As in previous years, the Liaison Office has maintained a steady flow of printed information in both directions. The library of scientific and technical publications of South African origin now numbers over 2,500 items on its card index, and as a result of the monthly accessions list distributed locally, there is a steady demand for these publications from American laboratories. Conversely, as this office has become better known, there has been an increased inward flow of documents for forwarding to the C.S.I.R. Library. At the same time it has continued to assist in maintaining the C.S.I.R. microfilm service by obtaining reprints and single photostats on microfilms of articles in publications not available in the Union.

Answering queries either originating in the C.S.I.R.'s laboratories or brought to the Liaison Division by industry has continued to occupy a large part of the time of the liaison staff.

The best-known of the activities of the Scientific Liaison Office in Washington is its service to visitors. In the months preceding a visit to the United States, the Liaison Office draws up an itinerary, makes all the necessary appointments and arrangements for travel and accommodation, and obtains official clearance for the visitor to enter American Government and other scientific institutions. When the visitors have arrived in the U.S. the office has served as a base, and given them general assistance in their further travels.

During the first few years the Scientific Liaison Office was deeply involved in the purchase of equipment for the C.S.I.R. laboratories. The greater part of this work is now done through normal commercial channels, but the Liaison Office is still responsible for the purchase of all radio-isotopes from the U.S. Atomic Energy Commission for export to South Africa, and has assisted the Council's buying agents when technical problems have arisen in connexion with the ordering of scientific equipment.

Dr. R. M. Kark of the University of Illinois has continued to act during the year as the Council's Honorary Medical Liaison Officer in the United States, and has submitted regular reports on the latest developments in medical science.

## Afdeling Biblioteek en Inligting

Die afgelope jaar is gekenmerk deur 'n gestadiglike uitbreiding van dienste aan W.N.N.R. wetenskaplikes en aan navraers van buite. Die voorlopige Internasionale Komitee insake Bibliografie en Dokumentasie van UNESCO het die W.N.N.R. Afdeling Biblioteek en Inligting aangewys as die nasionale sentrum vir wetenskaplike en tegniese inligting in Suid-Afrika. Hierdie inligting is verstrekkend deur die Suid-Afrikaanse Biblioteekvereniging wat dien as skakel met UNESCO betreffende bibliografiese aangeleenthede.

Die Biblioteek het 'n besonder gewaardeerde skenking van Finland ontvang in die vorm van 'n stel publikasies van die Finlandse Akademie vir Wetenskap. Hierdie publikasies is formeel oorhandig deur mnr. A. Yontila die Chargé d'Affairs vir Finland op 19 September 1952.

Die volgende paragrawe verstrekkend meer uitvoerige besonderhede oor party van die jaar se werksaamhede.

### Boekevoorraad en lenings

Met uitgang van Augustus 1952 was daar altesame 14,566 ingebinde boeke in die biblioteek. Gedurende die jaar is 23,429 publikasies deur W.N.N.R. personeel en ander persone geleen. Die volgende tabel dui die aantal publikasies aan wat elke maande deur die verskillende kategorieë leners (d.w.s. staatsdepartemente, nywerheidsfirmas, ens.) geleen is.

AANTAL PUBLIKASIES WAT UITGELEEN IS/NUMBER OF PUBLICATIONS ISSUED ON LOAN

Maand	Aan W.N.N.R. personeel		Aan Staatsdepartemente	Aan Nywerheidsfirmas	Aan Inrigtings en individu's	Interbiblioteeklenings	Totaal
	Tydskrifte	Boeke					
Month	To C.S.I.R. Staff		To Government Departments	To Industrial Firms	To Institutions and Individuals	Inter-Library Loans	Total
	Periodicals	Books					
<b>1951</b>							
September ..	1,116	378	44	65	73	153	1,829
Oktober ..	1,535	496	45	93	48	118	2,335
November ..	1,348	352	63	135	43	96	2,037
Desember ..	891	190	31	66	48	37	1,263
<b>1952</b>							
Januarie ..	1,514	434	49	71	58	75	2,201
Februarie ..	1,354	550	40	103	58	80	2,185
Maart ..	1,560	460	66	94	43	122	2,345
April ..	1,146	311	69	60	61	104	1,751
Mei ..	1,277	433	18	79	107	137	2,051
Junie ..	1,123	344	26	67	116	89	1,765
Julie ..	1,098	396	54	57	93	86	1,784
Augustus ..	1,272	347	24	111	67	62	1,883
Totale ..	15,234	4,691	529	1,001	815	1,159	23,429

3,807 boeke en pamflette is gedurende die jaar geklassifiseer en 3,669 gekatalogiseer.

## Library and Information Division

This year has seen a quiet and steady expansion in services to C.S.I.R. scientists and to outside inquirers. The provisional International Committee of Bibliography and Documentation at Unesco has designated the C.S.I.R. Library and Information Division as the national centre for scientific and technical information in South Africa. This information was conveyed by the South African Library Association, which acts as the liaison with Unesco on bibliographical questions.

The Library received a very welcome gift from Finland of a set of the publications of the Finnish Academy of Sciences. These were formally presented by Mr. A. Yontila, the Finnish Chargé d'Affairs, on September 19th, 1952.

The following paragraphs give more detailed information on some of this year's activities.

### Bookstock and issues

At the end of August, 1952, the number of bound volumes in the library was 14,566. During the year, 23,429 publications were borrowed by C.S.I.R. staff and others. The following schedule shows the number of publications borrowed each month by the various categories of borrowers (e.g. government departments, industrial firms, etc.).

The number of books and pamphlets classified during the year was 3,807 and 3,669 were catalogued.

### Tydskrifte

Die Afdeling ontvang tans 1,087 lopende tydskrifte, wat in die volgende groepe ingedeel kan word:

Tydskrifte waarop ingeteken word (belangrike wetenskapstydskrifte) ..	582
Tydskrifte wat gratis deur uitruiling ontvang word ..	505
Navorsings en tegniese tydskrifte ..	212
Handels en huishoudelike tydskrifte	101
Biblioteeksbyvoegingslyste en uittreksels ..	89
Mediese tydskrifte (minder belangrikes) ..	13
Algemeen ..	90
Totaal ..	1,087

Gedurende die jaar is die volgende ou nommers van tydskrifte aangekoop, drie waarvan in die vorm van mikrokaarte is:

Académie des Sciences. Comptes rendus. 1896-1914  
 Angewandte Chemie 1901-1917  
 Annalen der Physik 1896-1943  
 Journal de Chimie Physique 1922-1950  
 Justus Liebig's Annalen der Chemie 1832-1943 (op mikrokaarte)  
 Kolloid Zeitschrift 1906-1944 (op mikrokaarte)  
 Oesterreichische Akademie der Wissenschaften—Abt. IIb (Chemie) 1889-1949  
 Physikalisches Zeitschrift 1899-1943/44  
 Zeitschrift für anorganische und allgemeine Chemie 1892-1944 (op mikrokaarte).

'n Hele aantal korter reekse en aparte volumes is aangekoop om bestaande stelle aan te vul.

'n Lys is saamgestel van duplikaat tydskrifte wat die biblioteek tot op datum versamel het en hierdie lys is gestuur aan alle groot biblioteke in die Unie waarvan negentien om items op die lys gevra het.

### „W.N.N.R. Inligting”

Die uiteensetting van *W.N.N.R. Inligting*, die Afdeling se maandelikse byvoegingslys, is in Januarie 1952 verander. Dit word tans in geklassifiseerde i.p.v. alfabetiese orde uiteengesit. Dit is gedoen om twee redes:

- (1) Om die personeel tyd te spaar in die dubbele werk wat betrokke is by die toekenning van alfabetiese sowel as klassifiseringsnommers, en
- (2) om biblioteekverbruikers in Suid-Afrika te help om vertrouwd te raak met die Universele Desimale Klassifikasie en ook om nouere samewerking te bewerkstellig met biblioteke in Afrika suid van die Sahara wat ook die U.D.K., maar in verskillende tale, gebruik.

### Periodicals

The Division currently receives 1,087 journals in the following categories:

Journals received by subscription (major scientific journals) ..	582
Journals received free or on exchange:	505
Research and technical periodicals ..	212
Trade and house journals ..	101
Library accessions lists and abstracts	89
Medical journals (minor) ..	13
Miscellaneous ..	90
Total ..	1,087

During the year the following back sets of journals were purchased, three being in the form of microcards:

Académie des Sciences. Comptes rendus. 1896-1914  
 Angewandte Chemie 1901-1917  
 Annalen der Physik 1896-1943  
 Journal de Chimie Physique 1922-1950  
 Justus Liebig's Annalen der Chemie 1832-1943 (on microcards)  
 Kolloid Zeitschrift 1906-1944 (on microcards)  
 Oesterreichische Akademie der Wissenschaften—Abt. IIb (Chemie) 1889-1949  
 Physikalisches Zeitschrift 1899-1943/44  
 Zeitschrift für anorganische und allgemeine Chemie 1892-1944 (on microcards).

Many shorter runs and separate volumes were bought to fill in existing sets.

A list was drawn up of duplicate periodicals collected to date, and this list was circulated to all important libraries in the Union and nineteen libraries wrote asking for items on the list.

### “C.S.I.R. Information”

The arrangement of *C.S.I.R. Information*, the Division's monthly list of accessions, was changed in January, 1952, from an alphabetical to a classified order. This was done with two purposes in mind:

- (1) To save staff time in the double work of assigning alphabetical headings in addition to the classification numbers, and
- (2) To help library-users in South Africa to become acquainted with the Universal Decimal Classification and also to make possible closer co-operation with libraries in Africa south of the Sahara, which use U.D.C. but different languages.

#### Fotografiese kopieë

Enkel-fotografiese kopieë van artikels wat in tydskrifte verskyn het en wat nie algemeen beskikbaar is nie, word nog steeds vir Suid-Afrikaanse wetenskaplikes verkry. Gedurende die jaar is 381 afskrifte van artikels op die manier verkry. Hiervan is 97 in Suid-Afrika en 109 in Amerika verkry.

#### Mikrokaart-leesapparaat

Die mikrokaart-leesapparaat het twee reise gedurende die jaar afgelê—een na die Universiteit van die Witwatersrand waar dit tydens 'n vergadering van die Suid-Transvaalse tak van die Suid-Afrikaanse Biblioteekvereniging gedemonstreer is, en 'n ander na die Van Riebeeck Feeskou in Kaapstad.

#### Advies aan ander biblioteke

Etlke firmas en inrigtings is gehelp met die administrasie van hul eie tegniese biblioteke, onder andere die Transvaalse Kamer van Mynwese, Sasol, African Explosives, Klipfontein Organiese Produkte en die Elektrisiteitsvoorsieningskommissie.

'n Student van die Universiteit van Kaapstad se Skool vir Biblioteekswese het gedurende April 1952 as deel van haar opleiding 'n week in die biblioteek deurbring.

#### Wetenskaplike Raad vir Afrika suid van die Sahara

Op versoek van die Sekretaris,-Generaal van die Wetenskaplike Raad vir Afrika suid van die Sahara, het die hoof van die Afdeling 'n referaat voorberei oor *Library Co-operation in Africa*.

#### Wetenskaplike Konferensie van die Britse Gemenebes van Nasies, Australië, 1952

Die Hoof van die Afdeling het 'n verhandeling geskryf vir die Wetenskaplike Konferensie van die Britse Gemenebes oor *Wetenskaplike en Tegniese Inligtingsdienste in Suid-Afrika*.

#### Photographic copies

South African scientists have continued to use the services of this division to obtain single photographic copies of articles in periodicals not readily available to them. During the year 381 copies of articles were obtained, of these 97 were from South African sources and 109 from American sources.

#### Microcard reader

The microcard reader made two journeys during the year, one to the University of the Witwatersrand, where it was demonstrated at the meeting of the Southern Transvaal Branch of the South African Library Association, and another to the Van Riebeeck Festival Fair in Cape Town.

#### Advice to other libraries

Several firms and institutions have been assisted with advice on the administration of their own technical libraries, for example, the Transvaal Chamber of Mines, Sasol, African Explosives, Klipfontein Organic Products, the Electricity Supply Commission.

A student of the University of Cape Town School of Librarianship spent one week in April, 1952, doing practical work in the library as part of her training.

#### Scientific Council for Africa south of the Sahara

At the request of the Secretary-General of the Scientific Council for Africa south of the Sahara, the Head of the Division prepared a paper on *Library Co-operation in Africa*.

#### British Commonwealth Scientific Official Conference, Australia, 1952

The Head of the Division wrote a paper for the British Commonwealth Scientific Official Conference on *Scientific and Technical Information Services in South Africa*.

## Nasionale Chemiese Navorsingslaboratorium

### INLEIDING

#### Advieskomitees

Die Raad is weereens dank verskuldig aan die Nasionale Advieskomitee vir Chemiese Navorsing en aan die lede van sy verskillende onder-komitees vir hulle hulp by die formulering van die laboratorium se navorsingsprojekte. Onder-komitees is tans saamgestel om die Raad van advies te bedien oor aangeleenthede soos die volgende:

- Steenkool en sy neweprodukte
- Minerale produkte
- Plante en diereprodukte
- Korrosie en oppervlakte-dekmateriale
- Voeding
- Waterbehandeling
- Rivieropnames
- Mikrobiologiese chemie
- Hoog polimêre.

Hierbenewens is 'n onder-komitee in die lewe geroep om advies te verleen oor die vraagstukke verbonde aan die ekstraerbare bestanddele van plante. Dit sal hulp verleen aan navorsers by ander inrigtings en navorsingsliggame deur jaarliks verslag uit te bring oor werk wat verrig is op inheemse Suid-Afrikaanse plantmateriaal en deur advies te verleen oor die fasiliteite wat beskikbaar is vir farmakologiese toetsing. Die komitee is ook voornemens om 'n lys te maak van spesifieke vraagstukke ten einde belangstelling te wek in hierdie studiegebied.

#### Koöperatiewe nywereidsnavorsing

'n Beurs Koöperatiewe nywerheidsnavorsing vir navorsing op grondboontjies is beëindig en die navorsingsbeurshouer verplaas na die personeel van die ondersteuner van die beurs waar hy verantwoordelik sal wees vir die kommersiële ontwikkeling van die prosesse wat hy gedurende sy dienstryd as beurshouer bestudeer het.

Die beurs wat ingestel is deur die Raad van Toesig oor die Suiwelnwyerheid vir die ondersoek van afloopwaters van suiwelfabrieke in die Unie, Suidwes-Afrika en Swaziland, is tans in werking. Toestande in fabrieke word ondersoek en ondersoek is tans aan die gang wat ons in staat sal stel om individuele fabrieke te adviseer oor die mees doeltreffende en ekonomiese metodes vir die oplossing van hul probleme.

'n Navorsingsbeurs is ook ingestel vir die bestudering van die samestelling en eienskappe van visolies, veral met betrekking tot die verwerking daarvan vir gebruik deur verfnywerhede.

## National Chemical Research Laboratory

### INTRODUCTION

#### Advisory Committees

The Council once again takes pleasure in recording its appreciation of the assistance given by the members of the National Advisory Committee on Chemical Research, and its Sub-Committees, in determining the research programme of the laboratory. Sub-Committees at present constituted advise on such matters as:

- Coal and Derived Products
- Mineral Products
- Plant and Animal Products
- Corrosion and Surface Coatings
- Nutrition
- Water Treatment
- River Surveys
- Microbiological Chemistry
- High Polymers.

In addition to these a further Sub-Committee has now been formed to advise on plant extractive problems. It will assist workers in other institutions by presenting each year a report on work carried out on materials of South African origin, by recommending procedures to be followed in the collection and identification of plant materials, and by advising on the provision of facilities for pharmacological testing. In addition, the Committee intends to list specific problems with a view to promoting interest and activity in this field.

#### Co-operative industrial research

A groundnut research fellowship has been terminated, the research fellow being transferred to the staff of the sponsor in order to take over the supervision and commercial development of the processes studied by him during tenure of the fellowship.

The fellowship established by the Dairy Industry Control Board for an investigation into the effluent problems of dairy factories in the Union, South West Africa and Swaziland is now in operation. Conditions at factories are being examined and investigations are in progress which should make it possible to advise individual factories as to the most effective and economic methods of solving their problems.

A research fellowship has also been established for the study of the constitution and properties of marine oils with particular reference to their processing for use by the paint industries.



Bo: Voorsitter van die Nasionale Advieskomitee vir Chemiese Navorsing Dr. T. J. Wilken-Jorden, Bestuurder, Wetenskaplike en Navorsingsafdeling, Yskor, Pretoria.

Regs: 'n Hoë-druk, hoë-temperatuur, met lood-uitgevoerde reaktor word tans gebruik vir die ondersoek van die verwerking van wolwas en chroomerts.

Aangesien die omvang van die betrokke navorsingsprojekte so snel uitbrei, het die S.A. Wolraad die waarde van die beurse wat dit by die Raad ingestel het vermeerder ten einde meer doeltreffende wetenskaplike en tegniese hulp te verleen aan die navorsingsbeurshouers.

Werk vorder ook op die mikrobiologiese aspekte van die verwerking van betonrioolpype ingevolge 'n beurs wat op aandrang van belangstellende munisipaliteite ingestel is deur die Vereniging van Munisipale Ingenieurs en andere.

'n Nuwe reëling wat van groot belang sal wees vir nyweraars is een waardeur 'n beampte van 'n nywerheidsonderneming tydelik aangestel word in die N.C.N.L. om aldaar vraagstukke wat van besondere belang is vir die besondere nywerheidsonderneming te bestudeer. Wanneer sy dienstermyn verstreke is, is die betrokke beampte beskikbaar om die prosesse wat hy by die W.N.N.R. bestudeer het, toe te pas en te kontroleer.

'n Groot kontrakonderneming is tans aan die gang en behels 'n proses vir die eksploitasie van chroomertse.

Owing to the rapidly widening scope of the projects involved, the S.A. Wool Board has increased the value of the fellowships which it has established with the Council, in order to make provision for more adequate scientific and technical assistance for the research fellows.

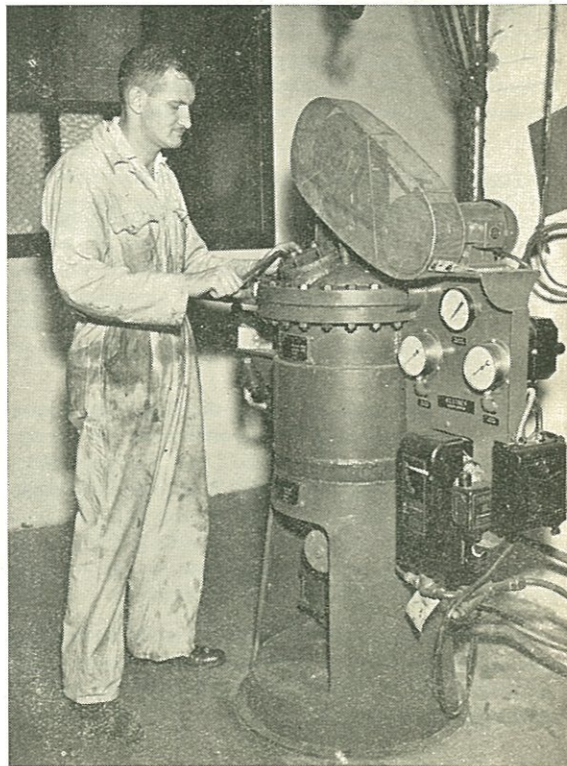
Work on microbiological aspects of the corrosion of concrete sewers is also proceeding under a research fellowship established through the Institution of Municipal Engineers by interested municipalities and others.

Another type of arrangement which should be of great interest to industrialists is one whereby an officer from an industrial corporation has been seconded to the N.C.R.L. for the investigation of problems of particular interest to the corporation. When the period of secondment is completed, the officer concerned will be directly available to develop and control the processes which he is investigating while with the C.S.I.R.

A major contract investigation in progress concerns a process for the utilization of chrome ores.

Left: Chairman of the National Advisory Committee on Chemical Research Dr. T. J. Wilken-Jorden, Manager, Scientific and Research Department, Iscor, Pretoria.

Below: A high-pressure, high-temperature, lead-lined reactor being used for investigating the processing of wool wax and chrome ore.



#### Navorsingsaktiwiteite

Die aantal publikasies (59) wat in die bylaag tot hierdie verslag verskyn is 'n aanduiding van die werksaamhede van die laboratorium.

#### MINERALE PRODUKTE

##### Kleisoorte en verwante stowwe

Die neerslag montmorilloniet wat twee jaar gelede in die omgewing van Burghersdorp uitgeken is, word tans kommersiële ge-eksploteer. 'n Noukeurige studie van die eienskappe van hierdie kleisoort is egter nog nie voltooi nie.

Werk duur voort op die attapulgieneerslae waarvan daar in die laaste jaarverslag melding gemaak is. 'n Voorlopige verslag, wat gebaseer is op 'n beperkte opname, is in samewerking met die Geologiese Opname voltooi, en 'n meer omvattende opname is tans aan die gang. Daar was heelwat belangstelling in hierdie ondersoek, en ten minste een firma gebruik reeds materiaal van hierdie oorsprong by die raffinering van smeerolies. Apparaat is opgestel vir 'n noukeurige raming van hierdie en ander kleimineraale vir gebruik by die raffinering van olie ten einde Suid-Afrikaanse produkte te formuleer en om sodoende aan plaaslike behoeftes te voorsien.

Kaolien was in die verlede slegs in die Unie beskikbaar soos dit uit die myne gehaal is, en gevolglik was die swak gehalte daarvan 'n struikelblok vir die ontwikkeling van die keramiekbedryf en ook vir die gebruik daarvan in die vervaardiging van papier en rubber. 'n Verslag is derhalwe voorberei wat handel met die moontlikhede om gesuiwerde kaolien in Suid-Afrika te produseer, en dit is voornemens om spesifieke kaolienneerslae met hierdie doel voor oë te ondersoek.

In 'n voortsetting van werk op die sogenaamde „chocolate” plastiese kleisoorte van die Transvaal, was daar aanduidings dat die organiese stof wat daarin gevind word die uitwerking wat die elektroliete het op die viskositeit van suspensies tot 'n groot mate verminder, en dat dit dus 'n belangrike faktor is in die gebruik daarvan.

Die ondersoek van 'n groot aantal grondsoorte wat aanleiding gee tot die „oplig” van geboue het daarop gedui dat die mineraal wat daarvoor verantwoordelik is, in die meeste gevalle montmorilloniet is.

Werk op kolloïedes van tipiese Suid-Afrikaanse grondsoorte duur voort in samewerking met die Afdeling Skeikundige Diens van die Departement van Landbou, en 'n sistematiese ondersoek van kolloïedes van solonetiese grondsoorte bykans voltooi. In samewerking met die Stasie vir Eksperimente insake Suiker is 'n ondersoek van kolloïedes van tipiese grondsoorte afkomstig van die suikerriet gebiede in Natal ook voltooi.

'n Voorkoms saponiet is uitgeken maar aangesien die neerslag nie groot is nie, sal die werk beperk wees.

#### Research activities

The number of publications (59) listed in Appendix I indicates that the laboratory is in an active and productive state.

#### MINERAL PRODUCTS

##### Clays and related materials

The montmorillonite deposit, which was identified in the Burghersdorp area two years ago, is now being exploited commercially. A detailed study of the properties of this material has, however, not yet been completed.

Work on the attapulgitic deposits reported last year has been continued. A preliminary report, based upon a limited survey, has been completed in co-operation with the Geological Survey, and a more detailed survey is in progress. There has been considerable commercial interest in the investigations, and one firm at least is already using material from this source in the refining of lubricating oils. Apparatus has been assembled for a detailed evaluation of these and other clay mineral occurrences for oil refining, with a view to developing South African products to meet local needs.

Kaolin has in the past been available in the Union only as mined, and the resultant lack of consistency in quality has been an obstacle to the growth of ceramic industries and to its use in paper and rubber manufacture. A report has therefore been prepared on the possibilities of producing refined kaolins in South Africa, and it is planned to investigate specific kaolin deposits from this point of view.

In a continuation of work on “chocolate” plastic clays from the Transvaal, it has been shown that organic matter present in them greatly reduces the effect of electrolytes on the viscosities of suspensions prepared from them, and is thus a significant factor in their use.

Examination of a large number of soils which gave rise to “heaving” under buildings showed that the mineral responsible in most cases was montmorillonite.

Work on colloids from typical South African soils has continued in collaboration with the Division of Chemical Services of the Department of Agriculture, and a systematic examination of colloids from solonchic soils is nearly complete. In collaboration with the Sugar Experiment Station, an examination of colloids from typical soils of the sugar cane areas in Natal has also been completed.

An occurrence of saponite has been identified, but the deposit is not large, and work on it will be limited.

Kleimonsters afkomstig van verskillende plekke en wat deur belangstellendes ingestuur is, is ondersoek en 'n aantal navrae is ontvang inverband met die weg-vretende aksie van grondsoorte op pype wat daarin gelê is.

#### Chromium

Die opname van Transvaalse chromiete is uitgebrei om monsters afkomstig van die Pilansbergse omgewing in te sluit. Die graad van hierdie erts is aansienlik hoër as die van die meeste Transvaalse erts. Ondersoek van 'n hoogs titaanhoudende erts het daarop gedui dat titaan teenwoordig is in die vorm van 'n spinel en nie as ilmeniet nie. Hierdie navorsingsprogram is nou afgehandel.

Op die gebied van chroom-chemie, word heelwat tyd bestee aan vertroulike ondersoeke wat onder kontrak onderneem is, en daar is heelwat vordering gemaak.

'n Bestudering van yster en chromium amalgaam, verkry deur oplossings wat hierdie metale bevat met 'n kwikkatode te elektroliseer, is tans aan die gang. Die amalgame word vinnig ontleed deur die kwik te verwyder van 'n geweegde monster deur middel van vakuumbestudering, deur die metaalagtige residu op te los en deur die yster en chromium polarografies te bereken.

Gedurende die suiwering van afvalwaters verkry van die van suurvtering van chromiete, is dit nodig gevind om meer kennis oor oplosbaarheid in te win en is daar derhalwe begin met aanvoerk i.v.m. die oplosbaarheid van aluminium en magnesiumsulfate in swaelsuuroplossings.

Gedurende die jaar is rubidium- en sesium-trioksalatochromiaat as kristalle van superreinheid voorberei vir die X-straalanalise van hul strukture.

#### Steenkool

Studies van die struktureienskappe van steenkool, waarmee begin is omdat hul moontlik van toepassing is tot die verskynsel van spontane ontbranding, duur voort.

Die verskil tussen die interneoppervlakte van steenkool by lae temperatuuradsorpsie en deur benattings-warmte in metanol is verder bestudeer, en dit wil voorkom asof metanol hoofsaaklik 'n swelmiddel is. Die werk het heelwat belangstelling verwek en hoewel dit nog nie algemeen aangeneem is nie, is dit deur sowel Nederlandse as Amerikaanse werkers ondersteun. Sorpsie van metielamien was groter as die van metanol, waarskynlik te wyte aan 'n toename in die swelkrag deur formasie van soutsakels met suurgroepe.

Random clay samples submitted by interested persons have been examined, and a number of enquiries have concerned the corrosive action of soils on pipelines laid in them.

#### Chromium

The survey of Transvaal chromites was extended to include some samples from the Pilansberg area, where the grade of ore is distinctly higher than in most Transvaal deposits. Examination of a highly titaniferous ore indicated that titanium is present in the form of a spinel and not as ilmenite. This programme has now been concluded.

In the field of chromium chemistry, a great deal of effort has been centred on confidential contract investigations, in which considerable progress has been achieved.

A study of iron and chromium amalgams, produced when solutions containing these metals are electrolysed with a mercury cathode, is under way. Rapid analysis of the amalgams is achieved by distilling off the mercury from a weighed sample under vacuum, dissolving the metallic residue and estimating iron and chromium polarographically.

In purification of liquors from acid digestion of chromites, more knowledge of solubilities was found necessary and preliminary work has been started on the solubility of aluminium and magnesium sulphates in sulphuric acid solutions.

During the year preparation of rubidium- and caesium-trioksalato-chromiates as crystals of high purity was carried out for X-ray analysis of their structures.

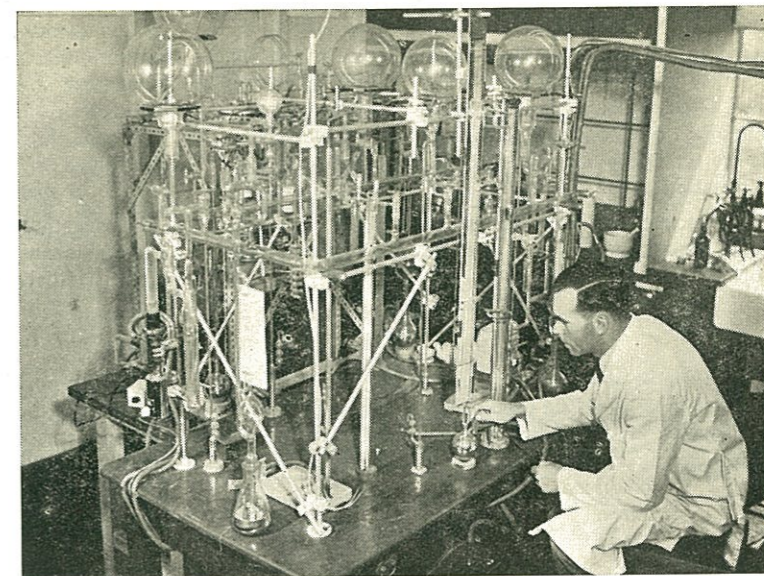
#### Coal

Studies of the surface properties of coal, initiated because of their possible significance in respect of spontaneous combustion phenomena, have continued.

The discrepancy between internal surface of coal by low temperature adsorption and by heat-of-wetting in methanol has been further studied, and strong evidence has been obtained for the view that methanol is essentially a swelling agent. The work has aroused attention in the literature and, though agreement is not complete, it has been supported by both American and Dutch workers. Sorption of methylamine exceeded that of methanol, presumably due to an increase in swelling power by formation of salt linkages with acidic groups.

General purpose high vacuum apparatus used in fundamental studies of the production of dolomitic limes.

Hoë-vakuumaapparaat vir algemene doeleindes word gebruik in fundamentele studies van die produksie van dolomiet kalkgesteentes.



#### Dolomiet

As voortsetting van werk waarvan daar voorheen melding van gemaak is—die meganisme wat betrokke is by die termiese ontbinding van dolomietkristalle—is die fisiese struktuur van die ontbinde produkte ondersoek. Kristallietgroottes is bepaal deur bestudering van die verbreding van X-straaldiffraksielyne. Oppervlakte en poriegrootte is verkry van die adsorpsie van argon. By 900° C. is merkbare styging in kristallietgrootte en vermindering van oppervlakte en poriegrootte waargeneem. 'n Noukeurige ontleding van hierdie bevindings mag lig werp op die moeilikheide wat teengekom word in die gebruik van dolomietkalk in Suid-Afrika en elders.

Gedurende verdere studies van die meganisme wat betrokke is by die termiese ontbinding van karbonaatkristalle en vaste toestandreksies in die algemeen, is die isotopiese uitruiling van bestempelde koolsuurgas met kalsietkristalle van gegradeerde groottes ondersoek deur middel van die massaspektrometer by verskillende temperature.

Twee afsonderlike prosesse is waargeneem:

- (i) 'n taamlik vinnige uitruiling by die kristaloppervlakte,
- (ii) 'n besonder stadige uitruiling te wyte aan diffusie binne die kristalrooster.

#### Mangaan

Laboratoriumbestudering van 'n proses vir die behandeling van mangaan „wad” wat gevind word in die Graskopdistrik in die Oos-Transvaal, is voltooi. Die „wad” wat ongeveer 30% mangaandioksied op 'n droë basis bevat, word teen hoë temperature in die teenwoordigheid van swaeldioksied of swaeldioksied wat

#### Dolomite

In continuation of work reported earlier on the mechanism of the thermal decomposition of dolomite crystals, the physical structure of the decomposition products has been investigated. Crystallite sizes were determined from X-ray line broadening. Surface areas and pore volumes were obtained from the adsorption of argon. Around 900° C. marked increases in crystallite size and decreases in surface area and pore volume were observed. A detailed analysis of these findings may explain some of the difficulties experienced in the use of dolomitic limes in South Africa and elsewhere.

In further studies of the mechanism of the thermal decomposition of carbonate crystals and of solid state reactions in general, the isotopic exchange of labelled carbon with calcite crystals of graded sizes has been investigated by means of the mass spectrometer at various temperatures.

Two distinct processes have become apparent:

- (i) a fairly rapid exchange at the crystal surface,
- (ii) an extremely slow exchange due to diffusion within the crystal lattice.

#### Manganees

Laboratory study of a process for the treatment of manganese „wad” occurring in the Graskop district of the Eastern Transvaal has been completed. The „wad”, which contains about 30% manganese dioxide on a dry basis, is heated at high temperatures in the presence of sulphur dioxide or sulphur dioxide containing gas



gasmengsels bevat soos dié wat verkry word van gewone pirietbranders, verhit. Onder gekontroleerde temperatuurtoestande, is dit moontlik om 'n produk te verkry waaruit mangaansulfaat wat feitlik vry is van yster, uitgelooq kan word. Benutting van swaeldioksied is hoog en die loogwater sal geskik wees vir elektrolise vir die produksie van elektrolitese mangaandioksied of mangaanmetaal.

Ondersoeke na die chemiese verwerking van lae-graadse mangaanertse van die Postmasburgse omgewing is tans mee begin.

#### Sout

Die Unie se soutposisie is deur 'n beampte van die Skakelafdeling in oorsig geneem ten einde die probleme van aanbod in verhouding tot die steeds toenemende industriële aanvraag vir hierdie handelsartikel en vir die alkalieë en chloriene wat daaruit geproduseer mag word, te definieer.

#### WATER

##### Hergebruik van rioolafloopwaters

Met die oog op die belangrikheid van die hergebruik van rioolafvalwaters, is die suiwing daarvan deur chlorinerings- en flokkuleringsbehandelings bestudeer. Die doeltreffendste flokkulering is verkry deur chlorinerings gevolg deur behandeling met aluminiumsulfaat. Die gebruik van geaktiveerde aardes het die gehalte van die water wat uiteindelik geproduseer is aansienlik verbeter. Die koste verbonde aan behandeling van hierdie tipe is bereken op 1.5-2.5 pennies per 1,000 gellings. Aangesien die hoeveelhede mineraalsoute in rioolafvalwaters van groot belang is vir die moontlik hergebruik-waarde daarvan, is 'n noukeurige opname van rioolafvalwaters tans aan die gang in die Witwatersrandse omgewing.

##### Demineralisasie van watervoorrade

Ingevolge 'n versoek van die Administrasie van Suidwes-Afrika, is metodes ondersoek vir die verwydering van flouried uit grondwatervoorrade. Daar is gevind dat die materiaal wat verkry word deur kommersiële kalk superfosfaat met bytsodaoplossings te laat reageer, fluoriedione uit water kan verywder. Na versadiging kan dit in aktiewe vorm vernuut word deur behandeling met bytsoda. In samewerking met die Departement Gesondheid, is 'n peilaanleg by Pienaar-rivier in die Transvaal met welslae in werking gestel. Om die kommersiële eksploitasie van hierdie uitvinding te bevorder en om die verkoop van klein eenhede wat kan voorsien in die behoeftes van afgesonderde dorpie en plase moontlik te maak, is aansoek gedoen om patente.

mixtures such as would be obtained from conventional pyrites burners. Under controlled conditions of temperature, it is possible to obtain a product from which manganese sulphate, substantially free from iron, can be leached. Utilization of sulphur dioxide is high and the leach liquor would be suitable for subsequent electrolysis for the production of electrolytic manganese dioxide or manganese metal.

Investigations of the chemical processing of low grade manganese ores from the Postmasburg area are in their initial stages.

#### Salt

The salt position in the Union has been reviewed by an officer of the Liaison Division with a view to defining the problems of supply in relation to the rapidly increasing industrial demands for this commodity and for the alkalis and chlorine which might be produced from it.

#### WATER

##### Re-use of sewage effluents

In view of the considerable significance attached to the possibilities of re-using sewage effluents, their purification by chlorination and flocculation treatments has been studied. Most effective flocculation was achieved by chlorination followed by aluminium sulphate treatment. The use of activated earths caused further improvements in the final waters. The cost of such treatment was calculated to be 1.5-2.5 pence per 1,000 gallons. Since the quantities of mineral salts present in sewage effluents are of great importance in assessing the possibilities of re-using them, a detailed survey of sewage effluents in the Witwatersrand area is in progress.

##### Demineralization of water supplies

Following on a request from the South West African Administration, methods have been investigated for removing fluorides from ground water supplies. It has been found that the material obtained by interaction of commercial superphosphate of lime with caustic soda solutions has the property of removing fluoride ions preferentially from water. After saturation it can be regenerated in active form again by further caustic soda treatment. In collaboration with the Department of Public Health, a pilot plant has been operated successfully at Pienaar's River in the Transvaal. In order to assist the commercial development of this discovery, and to promote the sale of small units capable of meeting the needs of isolated villages and farms, patent applications have been filed.

'n Bestudering van die herwinning van soutwater uit brakwaters deur verdamping deur die son, is ook mee begin en word aandag ook bestee aan demineralisasie volgens ander metodes.

##### Afloopwaters van wynstokerye

Peilaanlegondersoeke van die suiwing van wynstokeryafloopwaters deur anerobiese vertering is bemoeilik deur die voorkoms van koper in die afloopwaters in veel hoër konsentrasies as wat gedurende die laboratoriumstudies aangetref is. Die peilaanleg het bevredigend gefunksioneer tot met 82% van die kapasiteit waarvoor dit ontwerp is; teen hierdie kapasiteit kon versuiwing van 99% verkry word met 'n behoud-enistydperk van vyf dae. Op hierdie stadium is die suiweringsproses egter deur koper ge-afekteer en pogings om die toevoer te vermeerder het gelei tot onbevredigende suiwing. Metodes vir die verwydering van koper, en vir die vermindering van swaeldioksiedkonsentrasies in die afloopwaters word bestudeer as voorloper tot 'n verdere reeks peilaanlegstoetse.

##### Afloopwaters van suiwelnywerhede

As deel van die ondersoeke wat gedoen word ingevolge die beurs wat deur die Raad van Toesig oor die Suiwelnywerheid beskikbaar gestel is, is 'n memorandum voorberei oor die hantering van melk en melkprodukte gedurende verwerking, ten einde die konsentrasie melkprodukte in die afloopwaters van suiwelnywerhede te verminder. Terselfdertyd is 'n reeks biologiese filters ook in gebruik geneem met die oog op die bepaling van hul doeltreffendheid en kapasiteit wanneer verskillende soorte afloopwaters daardeur vloei en onder verskillende werkingsomstandighede.

##### Bytsure

'n Skema vir die verwydering van bytsure en die hergebruik daarvan is vir 'n onderneming wat geperste staal vervaardig, voorberei.

##### Ammoniakwater

'n Lid van die personeel van 'n korporasie (SASOL) wat besig is met die opbou van 'n aanleg vir die vervaardiging van olie uit steenkool is tydelik verplaas na hierdie laboratorium om metodes vir waterbehandeling en verwydering van afloopwaters te bestudeer. As voorloper tot 'n ondersoek van hierdie vraagstuk, het die navorsingsbeampte die Verenigde Koninkryk en die Vasteland besoek waar hy die metodes wat daar gebruik word, bestudeer het.

A study of the recovery of fresh water from saline waters by solar distillation has been begun, and demineralization by other methods is also receiving attention.

##### Wine distillery effluents

Pilot plant investigations of the purification of wine distillery effluents by anaerobic digestion, have been complicated by the occurrence of copper in the effluents in much higher concentrations than were encountered in laboratory studies. The plant operated satisfactorily up to 82% of its designed capacity, giving 99% purification in a retention time of five days. By this stage, however, copper was affecting the digestion, and attempts to increase the feed further, led to unsatisfactory degrees of purification. Methods for removal of copper, and for the reduction of sulphur dioxide concentrations in the effluents are being worked out in preparation for a further series of pilot plant trials.

##### Dairy effluents

As part of the fellowship investigations being carried out for the Dairy Industry Control Board, a memorandum has been prepared on the handling of milk and milk products in processing, with a view to decreasing the concentration of milk products in dairy factory effluents. At the same time a series of biological filters has been put into operation with a view to determining their effectiveness and capacity with different types of effluent and under varying conditions of operation.

##### Pickle liquors

A scheme for the disposal of pickle liquors and their re-use has been prepared for a company manufacturing pressed steel products.

##### Gas liquors

An officer has been seconded from a corporation (SASOL), which is constructing a plant for the manufacture of oil from coal, to study methods of water treatment and effluent disposal. In preparation for an investigation of this problem, the officer has visited the United Kingdom and the Continent to study methods in use there.



Neem van monsters water in strome en van afloopwaters wat daarin vloei.

#### Rivieropnames

Vir die ontwikkeling van landboukundige en industriële hulpbronne is die versamel van basiese gegewens oor die watervoorrade van alle rivierbekkens in die Unie nodig. Hierdie gegewens kan slegs verkry word deur omvattende stroomopnames te maak en, in samewerking met die Departement van Besproeiing en plaaslike owerhede, word alhoemeer aandag hieraan bestee.

In die Witwatersrandse omgewing is die voorlopige opname en noukeurige kaartering voltooi en is daar reeds begin met die kwantitatiewe opname. Vir hierdie doel word vloei-metings by 'n aantal plekke aangeteken. Gevolglik begin dit nou moontlik word om 'n duidelike beeld te kry van die uitwerking van besoedeling op die Witwatersrand en van die invloed daarvan op die hergebruikwaarde van die water wat terugloop na die Vaalrivier vir die Klip-, Bleshoek- en Suikerbosrand-riviere.

Heelwat vooruitgang is gemaak met die opname van die Bergrivier in die Kaap. Dit was nodig om monsteringsmetodes vir die biologiese aspekte van hierdie opname te standardiseer en is die gekose metodes deeglik getoets voordat hulle elders toegepas is. 'n Groot aantal organismes is versamel en hulle word geklassifiseer, en

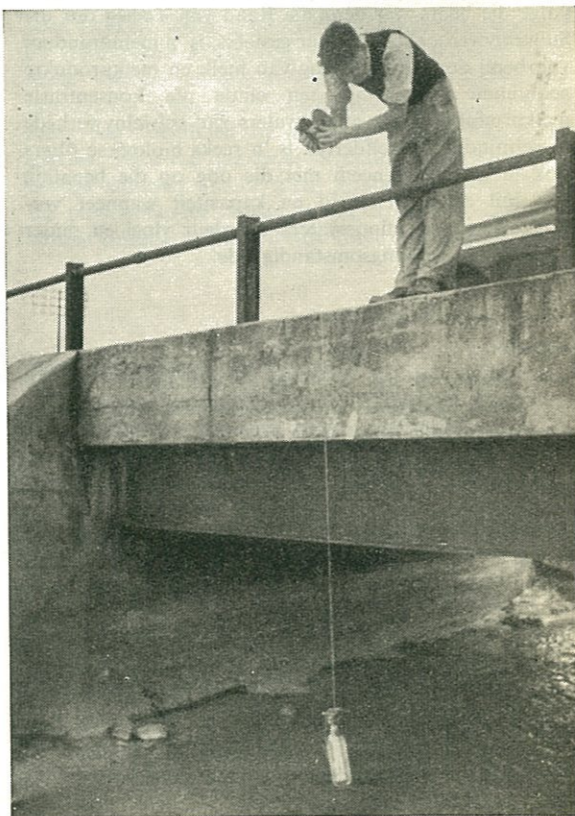
#### River surveys

The full development of agricultural and industrial resources requires the accumulation of basic data on the water supplies of all river basins in the Union. These can be obtained only by extensive stream surveys, and in collaboration with the Department of Irrigation and with local authorities, an increasing amount of attention has been devoted to such surveys.

In the Witwatersrand area, the preliminary survey and detailed mapping have been completed, and the quantitative survey has already commenced. For this purpose, flow measurements are being recorded at many points. As a result, an accurate picture is emerging of pollution effects on the Witwatersrand, and of their influence on the re-use value of the water which drains back to the Vaal via the Klip, Blesbok and Suikerbosrand Rivers.

Considerable progress has been made with the survey of the Berg River in the Cape. It has been necessary to standardize methods of sampling for the biological aspects of this survey and the selected methods have been thoroughly tested in preparation for their application elsewhere. A very large number of organisms have been collected, and these are being classified and,

Taking samples of water in streams and of effluents flowing into them.



waar moontlik, uitgeken. Vir laasgenoemde doeleinde, is baie van die organismes na deskundiges oorsee gestuur. Die uitwerking van besoedeling op die waterflora en fauna in sekere munisipale en geïndustrialiseerde gebiede is ook waargeneem.

In Natal is die voorlopige opname van die Tugelarivier voltooi, en sal die gegewens nou gebruik word vir die beplanning van 'n noukeurige opname.

#### PLANT PRODUKTE

##### Suikerrietwas

Die hoë was-inhoud (25-30%) van slyke wat verkry word deur die aanwending van sure gedurende die proses wat suiwing voorafgaan, bied interessante moontlikhede vir die ekonomiese herwinning van suikerrietwas. Dit was uitermate moeilik om hul te skei van die gesuiwerde sap deur filtrasie of ander metodes, en verdere werk is nodig op hierdie aspek van die werk en ook op die voordele en nadele van die gesuiwerde sap gedurende die prosesse wat daarna toegepas word vir die herwinning van suiker. Hierdie werk word tans gestaak totdat die nodige peilaanlegsuiwingsfasiliteite beskikbaar word.

##### Bitterstofgehalte van die Cucurbitaceae (Komkommerfamilie)

Daar is gevind dat bitter groente van die cucurbitaceae groep (murg-van-groente, lemoen-pampoentjies, waatlemoen) verantwoordelik is vir baie gevalle van vergiftiging, en voortspruitend hieruit, is 'n ondersoek van die voorkomsyfer van bitter giftige eienskappe in die Cucurbitaceae deur die Afdeling Tuinbou van die Departement van Landbou in 1950 onderneem, en is dit sedert 1951 deur die N.C.N.L. voortgesit. Bitterstowwe is verkry van *Cucumis myriocarpus*, *C. leptodermis*, *C. africanus*, en *C. metuliferus* (bitter wildekomkommers) en ook van *Lagenaria leucantha* (kalbas) en *Citrullus vulgaris* (wattlemoen). Hulle is van mekaar geskei deur papierverdelingskromatografietegnieke, en hul eienskappe en struktuur word tans bepaal. Hul bevat slegs koolstof, waterstof en suurstof.

##### Hout

As voortsetting van werk wat voorheen gedoen is op die ekstraerbare van swartwattelhout (*Acacia mollissima*) is die suiwing van die oplosbare lignien van die kernhout en splinthoutekstraerbare bestudeer. Die oplosbare lignien word in ekstraerbare van dié soort gevind tesame met tannienstowwe wat nou daaraan verwant is. 'n Aantal oplosbare sisteme vir gebruik in die papierkromatografiese uitkenning en suiwing van die lignien is gevind en 'n hoeveelheid van die suiwer lignien is deur kromatografie op 'n sellulose poeierkolom voorberei.

where possible, identified. For the latter purpose many have been sent to specialists overseas. The effects of pollution on the aquatic flora and fauna in certain municipal and industrialized areas have been observed.

In Natal, the preliminary survey of the Tugela River has been completed, and the data will now be used for the planning of the detailed survey.

#### PLANT PRODUCTS

##### Cane wax

The high wax content (25-30%) of muds produced by the application of an acid preclarification process to cane juice offer attractive possibilities for the economic recovery of cane wax. They have proved exceedingly difficult to separate from the clarified juice, by filtration or other methods, and further work is required on this aspect and on the relative advantages and disadvantages of the clarified juice in subsequent sugar recovery operations. This is at present being delayed until pilot plant clarification facilities become available.

##### Bitter principles from the Cucurbitaceae (Cucumber family)

Bitter tasting cucurbitaceous vegetables (vegetable marrows, gem squash, water melons) have been found responsible for many cases of poisoning, and arising from this, an investigation into the occurrence of bitter poisonous principles in the Cucurbitaceae was started in the Division of Horticulture of the Department of Agriculture in 1950, and has been continued in the N.C.R.L. since 1951. Bitter principles have been obtained from *Cucumis myriocarpus*, *C. leptodermis*, *C. africanus*, and *C. metuliferus* (bitter wild cucumbers) as well as from *Lagenaria leucantha* (bottle gourd) and *Citrullus vulgaris* (water melon) varieties. They have been separated from one another by paper chromatographic techniques, and their characterization and structure determination is in hand. They contain carbon, hydrogen and oxygen only.

##### Wood studies

In continuation of earlier work, on the extractives of black wattle (*Acacia mollissima*) wood, the purification of the "native" (i.e. soluble) lignin from heart and sapwood extracts has been studied. The native lignin is found in such extracts in association with closely related tannin materials. A number of solvent systems for use in the paper chromatographic identification and purification of the lignin have been found, and a quantity of the pure lignin has been prepared by chromatography on a powdered cellulose column.

Hierdie eksperimente maak deel uit van 'n bestudering van die lignienfraksie van wattlehout. Aangesien heelwat van die verwarring wat daar heers op die gebied van lignien-chemie toegeskryf kan word aan die gebruik van ligniene waarvan die suiwering ontoereikend is vir struktuurstudies, is die suiweringsmetodes wat ontwikkel is van belang vir die bestudering van ligniene van ander bronne.

Houthidrolise-studies is vertraag omdat heelwat moeite ondervind is met die aankoop van die nodige toerusting.

#### Seegrasse

Die seisoenstudies wat uitgevoer is in samewerking met die Departement Plantkunde van die Universiteit van Kaapstad was beperk tot seegrasse waaruit agar en algin vervaardig word. Grasse wat carrageenin produseer sal later ondersoek word. Monsters is gereeld versamel en ontleed en die gegewens waarop meer bepaalde ondersoeke gebaseer kan word, word nou beskikbaar.

Die aanvoorstadiums van 'n fisies-chemiese bestudering van agars word op bladsy 00 beskryf en aandag is bestee aan die afsondering en suiwering van agars wat vir hierdie werk gebruik word. Die aard van die stikstofagtige bestanddele van die grasse is veral in dié verband van belang.

Die navorsingsbeampte wat na die Universiteit Bristol gestuur is vir opleiding in moderne koolhidraatmetodes is besig met 'n studie van die chemie van fukoïedien van die twee seegrasse *Ascophyllum nodosum* en *Fucus vesiculosus*.

#### Sonneblomme

Die belangrikheid van die oliesaad proteïenes in Suid-Afrika het gelei tot 'n ondersoek van die proteïenes van sonneblomsaad. Die ekstraksie van die suiwer proteïen is moeilik, te wyte aan die noue assosiasie met die klorogeniese suur daarin; verskillende ekstraermetodes is uitgetoets maar almal was tot dusvêr onsuksesvol. Hierdie ondersoek is nog in die aanvoorstadiums.

#### Tabak

In samewerking met die Sentrale Tabaknavorsingstasie te Rustenburg is 'n studie gemaak van die chemiese veranderinge wat in die tabakblaar plaasvind gedurende die drogingsproses. Die sappe wat uitgedruk is uit drie verskillende soorte tabakblare gedurende verskillende stadiums van uitdroging, is vir polyfenole, suikers en aminosure ondersoek. 'n Aansienlike styging in die vryproliene-inhoud is opgemerk na gelang die drogingsproses vorder en gedurende die latere stadiums is glisien vrygestel. 'n Verhandeling waarin die voorlopige

These experiments form one part of a study of the lignin fraction of wattle wood. Since much of the confusion in the field of lignin chemistry has been due to the use of inadequately purified lignins for structural studies, the purification methods developed are of some significance for the study of lignins from other sources.

Wood hydrolysis studies have been further delayed because of difficulties in obtaining necessary equipment.

#### Seaweeds

Seasonal studies, carried out in collaboration with the Department of Botany at the University of Cape Town, have been confined to agar and algin-producing weeds. Carrageenin-producing weeds will be investigated later. Samples have been collected and analyzed regularly, and the data are becoming available on which more specific investigations can be based.

The initial stages of a physico-chemical study of agars are described below (p. 00) and attention has been devoted to the isolation and rigorous purification of agars for this work. The nature of the nitrogenous constituents of the weeds has become of interest in this connexion.

The officer sent to Bristol University for training in modern carbohydrate methods has been studying the chemistry of fucoidin from the two seaweeds *Ascophyllum nodosum* and *Fucus vesiculosus*.

#### Sunflower

The importance of oil-seed proteins in South Africa has led to an investigation of sunflower seed protein. The extraction of the pure protein is difficult owing to its close association with the chlorogenic acid present; various methods of extraction have been tried to overcome this difficulty, but so far without success. This investigation is in its early stages.

#### Tobacco

In collaboration with the Central Tobacco Research Station at Rustenburg, a study has been made of the chemical changes occurring in tobacco leaf during curing. The juices expressed from three different varieties of tobacco leaves, at different stages in curing, were examined for polyphenols, sugars, and amino acids. A marked increase in the content of free proline was noted as curing proceeded, and in the latter stages glycine was liberated. A paper describing the preliminary results

resultate beskryf word is persklaar gemaak. Verdere toepassing van die tegniek wat gebruik is sal 'n vinnige toename in kennis van die drogingsproses ten gevolge hê.

#### DIEREPRODUKTE

##### Wol

Die navorsingsbeurshouer wat vir die afgelope twee jaar aan die Universiteit Leeds studeer het, het so pas na die Unie terug gekeer. Gedurende sy verblyf aldaar het hy die voorreg gehad om geassosieer te wees met interessante en waarskynlik veelbetekenende vooruitgange in die studie van wolvesels.

##### Wolvet

*Onverseepbare fraksie.* Groter hoeveelhede van die 1:2-glikolfraksies wat voorheen geïsoleer is, is voorberei en die volle karakterisering van die individuele bestanddele word tans d.m.v. infra-rooi spektroskopiese metodes uitgevoer.

*Suurfraksie.* Die totale  $\alpha$ -hidroksiesuurfraksie is uit wolvet sure geïsoleer deur gebruik te maak van die teenstroom oplosmiddel ekstraksietegniek van Craig; daar is 'n veel groter hoeveelheid verkry (25%) as wat voorheen vermeld is. Verlengde gebruik van die tegniek van Craig het gelei tot 'n afsondering van die totale  $\alpha$ -hidroksiesuurfraksie in sy konstituerende  $C_{14}$ ,  $C_{16}$  en  $C_{18}$  mengsels tesame met onbekende mengsels waarvan die kettinglengte waarskynlik korter is en wat tans ondersoek word. Dit wil voorkom as of die  $C_{18}$   $\alpha$ -hidroksiesuur 'n vertakte-ketting suur is, in teenstelling met die  $C_{14}$  en  $C_{16}$  mengsels wat nie vertak nie. Die totale  $\alpha$ -hidroksiesuurfraksie is gereduseer met litium aluminium hidried om  $\alpha$ -glikole te gee wat ooreenstem met die wat gevind word in die onverseepbare fraksie (sien hierbo); die studie van hierdie glikole het die bevindings wat gemaak is van die studie van  $\alpha$ -hidroksiesure self, gestaaf.

Die sintese van die *iso*-sure van wolvet is op vier verskillende maniere benader en daar is gevind dat 'n onlangse wysiging van die klassieke anodiese sintese volgens Kolbe die gerieflikste metode is. 'n Aantal besonder suiwer *iso*-sure is volgens hierdie metode voorberei en hulle is handig as verwysingsmengsels vir struktuurstudies van ander wolvetbestanddele en hul eienskappe bevestig die teenwoordigheid van die *iso*-suurreeks in die wolvet. Die infrarooi absorpsiekurwes van hierdie mengsels word opgeteken.

*Tegnologiese studies.* Die Raad het 'n voorlopige patent uitgeneem om die proses vir die verseping van wolvet met kalk, te dek. Die optimum toestande vir die kalkreaksie is verkry na 'n hele reeks toetse uitgevoer is gedurende waarvan die veranderlikes sistematies bestudeer is.

has been submitted for publication. Further application of the techniques used should lead to a rapid increase in knowledge of the curing process.

#### ANIMAL PRODUCTS

##### Wool

The research fellow who has been at Leeds University during the past two years has just returned to the Union. During his time there he was fortunate in being associated with some interesting and possibly far reaching advances in the study of wool fibres.

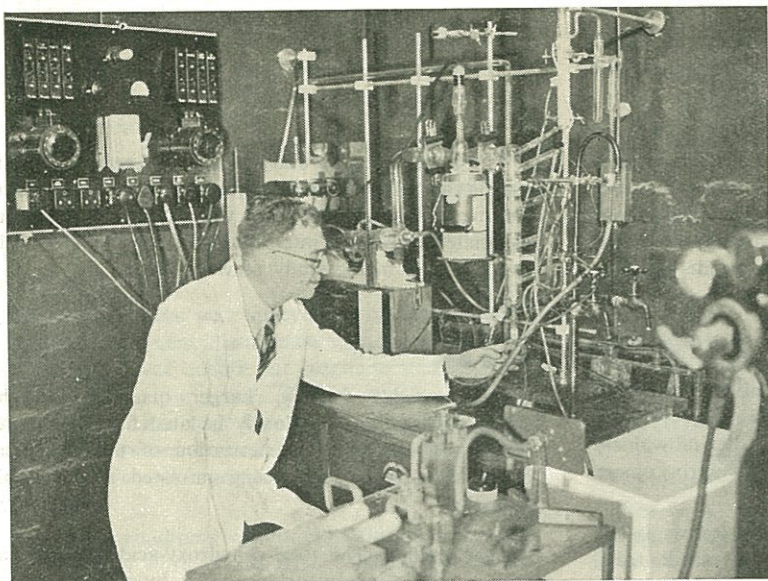
##### Wool wax

*Unsaponifiable fraction.* Larger quantities of the 1:2-glycol fractions previously isolated have been prepared and the full characterization of the individual components is in hand using infra-red spectroscopic methods.

*Acid fraction.* The total  $\alpha$ -hydroxy-acid fraction has been isolated from wool wax acids by making use of Craig's counter-current solvent extraction technique; it is much larger in amount (25%) than previously reported. Extended use of Craig's technique has resulted in a separation of the total  $\alpha$ -hydroxy-acid fraction into its constituent  $C_{14}$ ,  $C_{16}$  and  $C_{18}$  compounds together with unknown compounds which are probably of shorter chain length and are now being investigated. The  $C_{18}$   $\alpha$ -hydroxy-acid appears to be a branched chain acid unlike the  $C_{14}$  and  $C_{16}$  which are unbranched. The total  $\alpha$ -hydroxy-acid fraction has been reduced with lithium hydride to give  $\alpha$ -glycols similar to those present in the unsaponifiable fraction (see above); the study of these glycols has proved to be a convenient check on the conclusions drawn from the study of the  $\alpha$ -hydroxy-acids themselves.

Four different approaches to the synthesis of the *iso*-acids of wool wax have been tried out, a recent modification of the classical Kolbe anodic synthesis proved to be the most convenient method. A number of very pure *iso*-acids have been prepared by this route, they are useful as reference compounds for structural studies on other wool wax components and their properties confirm the presence of the *iso*-acid series in wool wax. The infra-red absorption curves of these compounds are being recorded.

*Technological studies.* The Council has taken out a provisional patent to cover the lime saponification of wool wax. The optimum conditions for the lime reaction were obtained after a considerable number of experiments in which the variables were systematically studied.

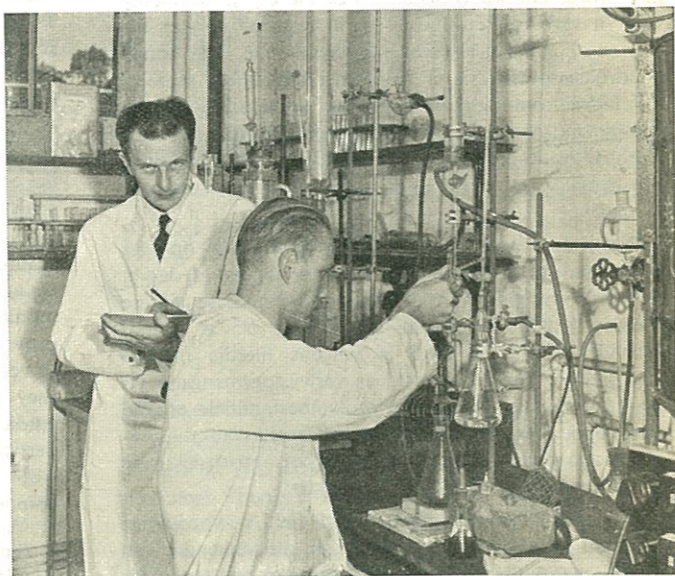


Above: A multi-stage short-path "molecular" still developed for the separation without alteration of the components of marine oils.

Below: Separating the acid-components of fish oils by reverse phase partition chromatography.

Bo: 'n Multi-stadium, kortpad, "molekulêre" distilleerapparaat wat ontwerp is vir die skeiding, sonder verandering, van die bestanddele van visolies.

Onder: Skeiding van die suurbestanddele van visolies deur omgekeerde-fase verdelingskromatografie.



Die teenwoordigheid van spore van swaarmetale in wolvet is nadelig vir party toepassings daarvan en daar is gevind dat hierdie spore feitlik verwyder kan word deur 'n suur-suiweringsproses wat ontwikkel is gedurende werk op die verbetering van ruwolvet ten opsigte van die kleur en reuk daarvan.

Die laboratorium werk saam met 'n handelonderneming wat die afskeiding van oplosmiddels van wolvet en wolvetonverseepbares bestudeer.

#### Vet in menshare

In 'n aanvullende ondersoek word die metodes wat ontwikkel is vir die bestudering van die bestanddele van wolvet toegepas tot vet wat geëkstraer is uit Bantochare.

#### Visolies

'n Bestudering van die samestelling van die sure wat verkry word deur die verseping van pelsolie word deur die Vis-olie Navorsingsbeurshouer en sy assistent onderneem. Hierdie studie behels 'n besonder ingewikkelde skeidingsprobleem vir die afsondering van die suiwer individuele sure aangesien die hoogs-versadigde sure wat teenwoordig is gedurende kolomdistillering vinnig termiese polimerisering ondergaan. 'n Verskeidenheid moderne skeidingstegnieke, insluitende molekulêre distillering, omgekeerde faseverdelingskromatografie en teenstroom distribusie word op die suurmengsels uitgetoets. Daar word gehoop dat hierdie studies, tesame met die wat benede beskryf word (Polimerisering van olies) meer helderheid sal gee i.v.m. die meganisme van reaksies wat kommersiël gebruik word vir visolies, naamlik, outoksidatiewe en termiese polimerisasie.

#### Die Kaapse kreef

Die ondersoek van perswaters van kreefafval (met uitsondering van die sterte) en van kreefsterte duur voort. 'n Opname van die algemene samestelling van eersgenoemde het die teenwoordigheid aangedui van olie, onoplosbare en oplosbare proteïenes en nieproteïene stikstofatige bestanddele. Laasgenoemde is van belang aangesien dit 'n aminosuur wat nie dadelik uitgeken kon word nie bevat (sarkoseen?) en dit het weer op sy beurt gelei tot 'n ondersoek van die distribusie van hierdie aminosuur in die organe van die kreef.

Ondersoeke van die stertspier proteïenes van kreef het getoon dat 'n groter persentasie „myosien” (actien plus regte myosien) deur 'n waterige oplossing kaliumchloried uit die fyngemaakte vlees geëkstraer kan word; in hierdie opsig verskil hierdie materiaal van die proteïenes in vispiere. Dit is waarskynlik dat hierdie verskynsel toegeskryf kan word aan 'n verskil in die relatiewe ekstraerbaarhede van actien en ware myosien onderskeidelik uit spierproteïenes. Elektroforetiese studies het hierdie werk heelwat vergemaklik.

The presence of traces of heavy metals in wool wax is deleterious for some applications, and it has been found that these are substantially removed by an acid refining process which was developed during efforts to improve crude wool wax in respect of its colour and odour.

The laboratory is collaborating with a commercial concern which is studying the solvent segregation of wool wax and wool wax saponifiables.

#### Human hair wax

In a subsidiary investigation, the methods developed for the study of wool wax components are being applied to wax extracted from Bantu hair.

#### Marine oils

A study of the constitution of the acids obtainable by saponification of pilchard oil is being undertaken by the Marine Oil Research Fellow and his assistant. This involves a very difficult separation problem in obtaining the pure individual acids since the highly unsaturated acids present suffer rapid thermal polymerization during column distillation. A variety of modern separation techniques including molecular distillation, reversed phase partition chromatography and counter-current distribution are being tried out on the acid mixture. It is hoped that these studies will, together with those described below (Polymerization of Oils), throw more light on the mechanism of reactions employed commercially with fish oils, viz. autoxidative and thermal polymerization.

#### The Cape rock lobster or crawfish

The investigation of press liquors from rock lobster offal (excluding tails) and from rock lobster tails has been continued. A survey of the general composition of the former has revealed the presence of oil, insoluble and soluble proteins and non-protein nitrogenous constituents. The qualitative amino acid composition of the proteins has been studied as has that of the non-protein nitrogenous constituents. This last proved of some considerable interest in that it contained an amino acid which could not, at first, be identified (sarcosine?) and this, in turn, has led to an examination of the distribution of this amino acid in the organs of the crawfish.

Investigation of rock lobster tail muscle proteins revealed that a greater percentage of "myosin" (actin plus true myosin) is extractable by aqueous potassium chloride than by aqueous sodium chloride from the minced flesh; in this respect the material differs from fish muscle proteins. It is probable that this phenomenon is due to a difference in the relative extractibilities of actin and true myosin respectively from muscle proteins. Electrophoretic studies have considerably facilitated this work which is in active progress.

## Polimerisasie van olies

Die ondersoek van die termiese polimerisasie van metiel  $\beta$ -elaeostearate duur voort en die deur hitte-veranderde monomer (teenwoordig in totale nie-polimere wat na reaksie herwin is) is van onveranderde monomer geskei deur her-kristallisering teen lae temperatuur. Hidrogenasie van die deur hitte-veranderde monomer gee aanleiding tot 'n versadigde ester wat nie metiel stearaat is nie; dit word verder bestudeer. Die dimeer wat gedurende die termiese reaksie gevorm word, word aan 'n dehidrogenasieproses onderwerp en word gevolg deur oksidering wanneer benzenoëdsure gevorm word; die struktuur van laasgenoemde behoort lig te werp op die struktuur van die dimeer en die polimerisasiemeganisme. Ten einde die mengsel van benzenoëde sure wat verkry is op te los, is die papier-verdelingskromatografie van benzenoëde sure bestudeer en gepubliseer as bydrae tot die bestudering van steenkool waar oksidering tot dieselfde produkte lei. Die vryradikale polimerisasie van olies deur gebruik van di-*tert*-butiel peroksied as waterstof ontvanger is bestudeer. Dit is bewys dat die aaneenskakeling bewerkstellig word sonder verlies van onversadigheid en dat 'n groot deel van die onversadigheid in halfdrogende olies (b.v. sonneblomsaadolie) gelyktydig omgesit word tot die verlengde gekonjueerde tipe.

Litium-aluminium-hidriedreduksie van baie soorte peroksiede verskaf 'n gerieflike metode vir die bestudering van hul struktuur (sien laaste Jaarverslag). Verdere studies van die meganisme van hierdie reaksie het getoon dat die -O-O- aaneenskakeling gedurende die oorspronklike reaksie opgesplits is en dat slegs een helfte van die totale waterstof van litium-aluminium-hidried vir die reduksie van sekere dialkielperoksiede beskikbaar was. Die natrium borohidried reduksie van peroksiedes word tans ondersoek met die doelwit om peroksiedes van vetesters, sonder dat die estergroep versteur word, te reduseer. Hierdie reaksies sal dan toegepas word tot outoksideerde olies en hul derivate.

## VOEDING

### Kalsium metabolisme in die Bantoe

Ondersoeke duur voort op verskillende aspekte van hierdie vraagstuk, naamlik (1) die samestelling en histologie van Bantoe-ribbeene; (2) die kalsium en ander voedingsmiddele in Bantoe borsmelk; (3) serum kalsium waardes in Bantoe moeders wat reeds kinders gehad en wat hul vir lang tydperke voed; (4) die rol van kalsiuminname i.v.m. groei, veral die invloed wat dit het op lengte. Terwyl ander aspekte wat ondersoeking verg, tans oorweeg word, wil dit voorkom, uit waarnemings wat reeds gemaak is, dat stigmata wat spesifiek toegeskryf kan word aan 'n lae kalsiuminname, soos by die Bantoe die geval is, nie voorkom nie.

## Polymerization of oils

The investigation of the thermal polymerization of methyl  $\beta$ -elaeostearate has been continued and the heat-altered monomer (present in total non-polymer recovered after reaction) has been separated from unchanged monomer by low temperature recrystallization. Hydrogenation of the heat-altered monomer gives rise to a saturated ester which is not methyl stearate; it is being studied further. The dimer formed during the thermal reaction is being submitted to a dehydrogenation process followed by oxidation when benzenoid acids result; the structure of the latter should provide valuable clues as to the structure of the dimer and the polymerization mechanism. In order to resolve the mixture of benzenoid acids obtained as above, the paper chromatography of mixtures of benzenoid acids has been studied and published as a contribution towards the study of coal where oxidation leads to the same products. The free-radical polymerization of oils using di-*tert*-butyl peroxide as hydrogen acceptor has been studied. It has been shown that the linking is accomplished without loss of unsaturation, and that a large proportion of the unsaturation in semi-drying oils (e.g. sunflower seed oil) is simultaneously converted to the desired conjugated type.

Lithium aluminium hydride reduction of many types of peroxides provides a convenient method for their structural study (see last Annual Report). Further studies of the mechanism of this reaction showed that the -O-O- linkage was split during the initial reaction and that only one half of the total hydrogen of lithium aluminium hydride was available for the reduction of certain dialkyl peroxides. The sodium borohydride reduction of peroxides is currently being investigated with the aim of reducing peroxides of fatty esters without affecting the ester groups. These reactions will next be applied to autoxidised oils and their derivatives.

## NUTRITION

### Calcium metabolism in the Bantu

Investigation has continued on several aspects of this problem, viz. (1) the composition and histology of Bantu ribs; (2) the calcium and other nutrient contents of Bantu breast milk; (3) serum calcium values in long-lactating multiparous Bantu mothers; (4) the role of calcium intake in the attainment of height. While other aspects for investigation are under consideration, it would seem, from observations already made and other relevant information, that stigmata specifically attributable to a low calcium intake, as prevails with the Bantu, are not apparent.

## Yster metabolisme in die Bantoe

'n Omvattende histologiese en chemiese ondersoek is uitgevoer op etlike organe en weefsels van Bantoe pasiente wat tekens het van hemosiderose of abnormale hoë ysterafsetting. Dit is duidelik dat die anatomiese distribusie van yster in die Bantoe heeltemaal verskil van die wat waargeneem word in idiopatiese hemochromatose. Onder etlike groepe Bantoe wat in verskillende streke woon is daar ook gevind dat besonder hoë serum yster en ysterbindingskapasiteite algemeen voorkom. Die mate tot waarin laasgenoemde waarnemings verwant is, (1) aan die dikwels hoë ysterinname (waarvan daar in vorige jaarverslae melding gemaak is), of (2) tot die abnormaal hoë afsetting van yster wat dikwels waargeneem is, word tans ondersoek.

### Bilharzia

Waarnemings is gemaak ten einde die bloedverlies en eierlading in urinêre schistosomiase in volwasse Naturelle te bepaal. Agt pasiente, meeste waarvan uit Sentraal Afrika afkomstig is en wat swaar besmet is (deur sistoskopies gestaaf) met klaarblyklike hematuria is vir 10 opeenvolgende dae waargeneem. Die uriene het getoon dat, in teenstelling met wat algemeen aangeneem word, die kleur geen aanduiding gee van die hoeveelheid bloed wat verloor is nie. Daarenbove is die bloedverlies gering; die gemiddelde maksimum verlies was 6 ml. per dag. So 'n geringe verlies kan nie hipochromiese bloedarmoede veroorsaak nie, want alle pasiente, behalwe een, het normale hemoglobien hoogtes gehad. Die eierlading het ook aansienlik verskil van dag tot dag—party keer niks, ander kere weer tienduise. Hierdie ondersoek, die mees omvattende van sy soort wat onderneem is, sal daartoe bydra om die huidige verwarring wat op hierdie gebied heers, op te helder.

### Voedingstudies by die Diepkloof Verbeteringsgestig

In samewerking met die Afdeling vir Voeding en Gesondheidsvoorligting van die Unie Gesondheidsdepartement, is ondersoeke van 'n lang-termyn aard uitgevoer op groepe jong Bantoe in wie die uitwerking van twee diëte bestudeer is. Die eerste diët was volmaak uit 'n voedingstandpunt; die tweede het ooreengestem met dié wat gewoonlik in stedelike lokasies gevolg word. Dit is ontmoontlik om die bevindings in 'n paar woorde op te som (party is reeds gepubliseer) maar die kliniese en ander verskille tussen die twee groepe aan die einde van die eksperiment was minder as wat verwag is.

### Metabolisme studies by die Baragwanathse hospitaal

Waarnemings van balans, deur gebruik van 'n metaboliese bed, is mee begin gedurende en na behandeling van 'n aantal Bantoebabas wat aan ondervoeding ly (kwashiorkor, appelkoossiekte ens). Daar bestaan feitlik geen inligting oor die metabolisme van voedingsmiddele

## Iron metabolism in the Bantu

A comprehensive histological and chemical investigation has been carried out on several organs and tissues of Bantu subjects showing haemosiderosis or abnormally high iron deposits. It has become apparent that the morbid anatomical distribution of iron in the Bantu is quite different from that observed in idiopathic hemochromatosis. Among several regional groups of Bantu, it has also been found that very high serum irons and iron binding capacities are common. To what extent these latter observations are related (1) to the frequently high iron intake (mentioned in previous reports), or (2) to the abnormally high deposition of iron often observed, is being investigated.

### Bilharzia

Observations have been carried out to determine the blood loss and egg load in urinary schistosomiasis in adult Africans. Eight subjects, mainly from Central Africa, suffering severely from the infestation (verified by cystoscopy) with obvious haematuria, were observed for 10 consecutive days. Observations on the urines indicated that, contrary to popular opinion, the colour is no guide to the amount of blood lost. This loss, moreover, is small, an average maximum of 6 ml. per diem being recorded. Such a loss is hardly conducive to hypochromic anaemia, for all subjects save one had normal haemoglobin levels. Finally, the egg load varied greatly from day to day—sometimes nil, sometimes tens of thousands. This investigation, the most comprehensive of its type undertaken, should help to clarify the present confused state of knowledge prevailing on the subject.

### Nutritional studies at Diepkloof Reformatory

In collaboration with the Division of Nutrition and Health Education of the Union Health Department, long-term observations have been carried out on groups of young Bantu in which the effects of two diets have been studied. The first diet was nutritionally adequate; the second resembled that commonly consumed in urban locations. It is impossible, in a few words, to summarize the findings (some of which have been published already), but the clinical and other differences between the two groups at the end of the experiment were less than was anticipated.

### Metabolism studies at Baragwanath Hospital

Balance observations, using a metabolic bed, have been initiated during and after treatment on a number of Bantu infants suffering from manifestations of malnutrition (kwashiorkor, summer diarrhoea, etc.). Information on the metabolism of nutrients when these

in pasiente wat aan hierdie siektes ly nie en daar is reeds 'n aantal besonder interessante waarnemings gemaak gedurende ons bestudering daarvan.

#### Die Vitamiene C-inhoud van gestoofde kool wat op groot skaal voorberei is

Gestoofde kool is 'n gewilde kossoort by Naturelle wat op die goudmyne werk, en op versoek van die Hoof Mediese Beampte van een van die mynondernemings is proewe gedoen om te bepaal of gestoofde kool wat op groot skaal in stoompotte voorberei is meeste van die Vitamiene C behou. Daar is gevind dat dit wel die geval is.

#### Mediese navorsingsekspedisie na Tsane, Kalahariwoestyn, 1951

Hierdie ekspedisie wat 'n klinisiën, tandheelkundige, bakterioloog en parasitoloog en voedingsdeskundige ingesluit het, is onderneem om voorlopige gegewens te versamel oor primitiewe Naturelle wat in 'n afgesonderde streek in die hartjie van die Kalahariwoestyn woon. In die kort tyd wat beskikbaar was is heelwat inligting versamel.

### FISIESE CHEMIE

#### Studies van die sorpsie van gasse

Daar is gevind dat vloeï van kapillêre kondensaat in porieë met 'n radius van ongeveer 30 Å die normale wette van kapillêre vloeï gehoorsaam en daar is dieselfde viskositeit in die porieë as in die vloeistof self.

Studies van oppervlaktediffusie van geadsorbeerde molekules duur voort. Vir die sisteem silika-gelbutaan is adsorpsiespoed gemeet d.m.v. 'n adsorpsiebalans. Klem is veral gelê op die afhanklikheid van diffusie koëffisiënte van oppervlaktedekking en die bepaling van aktiveringsenergie.

#### Metaalkorrosie

Die uitwerking van sulfaatreducerende bakterieë is verder bestudeer. In outotropiese medium, oefen die bakterieë geen invloed uit op die korrosiespoed van yster nie of op die korrosiepotensiaal daarvan nie en is vrye waterstof wat deur die verwerende materiaal vrygestel is in die gasatmosfeer gevind. Dit is derhalwe onwaarskynlik dat die bakterieë katodiese depolarisasie teweegbring. In heterotropiese medium, neem korrosiespoed toe, maar dit is waarskynlik te wyte aan die snelle formasie van sulfiedes deur die bakterieë.

#### Hoogpolimere studies

Vir die bestudering van molekulêre gewigte van visstandolies in die gebied 1,000–10,000, word alle moontlike ondersoekingsmetodes in oënskou geneem—iso-termiese distillering, differensiële dampdruk, ebullic-

diseases are present (they are responsible for a high mortality) is practically nil, and already a number of interesting observations have been made.

#### The Vitamin C content of braised cabbage prepared on a very large scale

Braised cabbage is a very popular article of diet with Africans employed on the gold mines, and at the request of the chief medical officer of one of the mining houses, experiments were carried out to determine whether pressure cooked braised cabbage prepared on a large scale retains most of its Vitamin C. This was found to be the case.

#### Medical research expedition to Tsane, Kalahari Desert, 1951

This initial expedition, which included a clinician, dental surgeon, bacteriologist and parasitologist, and nutritionist, was undertaken to obtain preliminary data on primitive Africans dwelling in an isolated region in the heart of the Kalahari Desert. In the short time available, considerable information was obtained.

### PHYSICAL CHEMISTRY

#### Studies of gaseous sorption

Flow of capillary condensate in pores of about 30 Å radius has been found to obey normal laws of capillary flow, and the liquid shown to possess the same viscosity in such pores as it has in bulk.

Studies on "surface diffusion" of adsorbed molecules are being continued. For the system silica-gel butane rates of adsorption have been measured by means of an adsorption balance. The dependence of diffusion coefficients on surface coverage and the determination of activation energies have received special attention.

#### Metallic corrosion

The action of sulphate reducing bacteria has been further studied. In autotrophic medium, the bacteria influence neither the rate of corrosion of iron nor its corrosion potential, and free hydrogen liberated by the corroding metal has been detected in the gaseous atmosphere. It is unlikely therefore that the bacteria produce cathodic depolarization. In heterotrophic medium, corrosion rates increase, but this is probably due to rapid formation of sulphides by the bacteria.

#### High polymer studies

In order to study molecular weights of marine stand-oils in the range 1,000–10,000, an intensive review is being made of methods, including isothermal distillation, differential vapour pressure, ebulliometry and

metrie, en osmotiese druk met polyviniel-alkoholmembrane. Die moontlikheid dat ligstrooiingsmetodes in hierdie gebied gebruik kan word, word ook bestudeer.

Veel aandag is bestee aan die aanwending van ligstrooiing tot molekulêre gewig van geasetiliseerde agar en geasetiliseerde stysel. Eersgenoemde is aan fraksionele uitsakking onderwerp en die fraksies is vergelyk deur sowel ligstrooiing en osmotiese druk. Die lae-gewig molekulêre gewigfraksies stem ooreen, maar die hoëre gewig molekulêre fraksie bevat 'n bestanddeel wat 'n sterk voorentoe-strooiing van die lig veroorsaak.

Elektroforese van sonneblomsaad proteïene is uitgevoer. Twee proteïene-bestanddele is waargeneem, maar die grense het met verloop van tyd aansienlik uitgebrei en het weer by omkeer van die stroom ingekrimp—dit is dus onwaarskynlik dat enige van hierdie bestanddele homogeen is.

Die toepassing van elektroforese tot spierproteïene van kreefsterte word ook bestudeer.

#### Radiochemie

In samewerking met die Tabak-Navorsingstasie is 'n studie gemaak van die uitwerking van verskillende metodes van toediening van bemestingstowwe tot tabakplante. Hiervoor is superfosfaat wat met p32 bestempel is, gebruik. Opeenvolgende toediening van klein hoeveelhede van die bemestingstof het die fosfaatname verhoog vergeleke met 'n enkele toediening van die bemestingstof. In die grondsoort waarin die plante groei kon plante genoeg fosfaat uit die grond kry sodat hulle, hoewel hulle aan die begin stadiger gegroei het net soveel fosfaat bevat het en ook net so groot was as die plante wat met die bemestingstof behandel is.

Deur gebruik van radioaktiewe isotope word metings uitgevoer van self-diffusie koëffisiënte in vloeistowwe.

### ANALITIESE LABORATORIUM

Hierdie laboratorium was weereens besig met te voorsien in die behoeftes van ander afdelings. 'n Verbeterde metode vir die skatting van kwik in spore in uriene is uitgewerk en toegepas tot 'n ondersoek na die oorsake van akrodinia in babas. Dit was moontlik om d.m.v. hierdie ondersoek te bewys dat hoë konsentrasies van kwik in die uriene eie is aan die siekte, wat genees kan word deur die toediening van BAL.

osmotic pressures with polyvinyl alcohol membranes. The possibility of using light-scattering methods in this region is also under investigation.

Much attention has been given to the application of light-scattering to molecular weights of acetylated agar and of acetylated starch. The former has been subjected to fractional precipitation and the fractions compared by both light-scattering and osmotic pressure. The lower molecular weight fractions agree well, but the higher molecular weight fraction contains a constituent which causes a strong forward scattering of light.

Electrophoresis of sunflower seed protein has been carried out. Two protein components were observed, but the boundaries spread considerably with time and narrowed again on reversing the current, so that it is doubtful if either component is homogenous.

The application of electrophoresis to muscle proteins of crawfish tails is being studied.

#### Radiochemie

In collaboration with the Tobacco Research Station, a study has been made of the effect of different modes of application of fertiliser to tobacco plants, using superphosphate labelled with p32. Successive small applications of fertiliser enhanced the rate of phosphate uptake, compared with a single application of fertiliser. On the soil used, however, established plants were able to obtain enough phosphate from the soil so that, though they started more slowly, mature, unfertilized plants contained as much phosphate and were as big as fertilized plants.

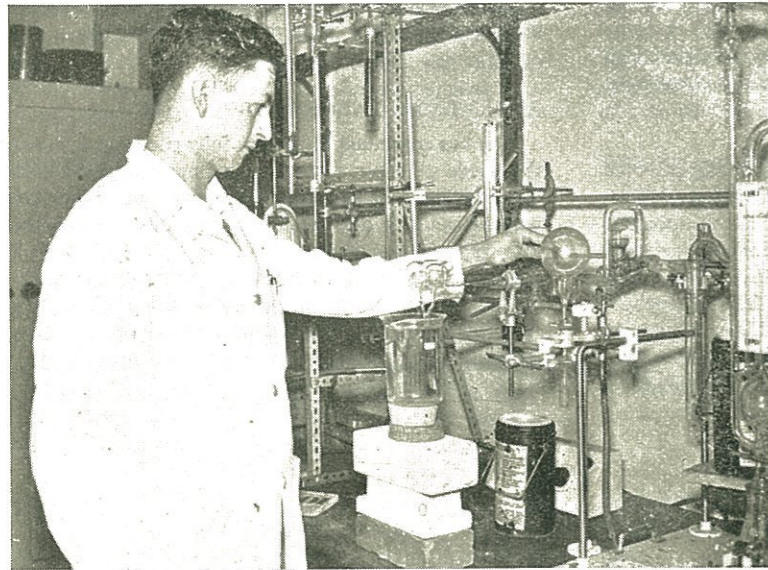
Measurements are being made of self-diffusion coefficients in liquids, using radioactive isotopes.

### ANALYTICAL LABORATORY

This has continued to be very fully occupied in serving the needs of other sections. An improved method for the estimation of mercury in traces in urine has been worked out and applied in an associated investigation into the causes of acrodynia or "pink disease" in infants. In this it was possible to confirm that high concentrations of mercury in the urine characterize such cases, which can be cured by administration of BAL.

Toediening van superfosfaat bemestingstof „bestempel” met radioaktiewe fosfor ( $P^{32}$ ).

Superphosphate fertilizer „labelled” with radioactive phosphorus ( $P^{32}$ ) being broadcast.



Below: Isothermal distillation apparatus used in determination of the molecular weights of separated components of marine oils, etc.

Onder: Isotermiese distilleerapparaat gebruik vir die bepaling van die molekulêre gewigte van die geskeide bestanddele van visolies, ens.

## Nasionale Fisiese Laboratorium

### INLEIDING

Die Raad betuig sy dank aan lede van die Advieskomitee van die Nasionale Fisiese Laboratorium vir hul hulp en leiding.

In die lig van ondervinding wat in dié land en gedurende besoeke oorsee opgedoen is, is veel aandag bestee aan die beplanning van die nuwe gebou.

Die werk wat gedurende die afgelope jaar verrig is kan waarskynlik die beste ingedeel word volgens die funksies wat deur die laboratorium vervul moet word en resorteer onder drie hoofde.

### Basiese navorsing

Die laboratorium moet 'n groep fisikusse beskikbaar stel, elkeen waarvan 'n deskundige op sy besondere gebied is. Hierdie doel kan alleen bereik word indien elkeen van hierdie persone hom voltyds kan wy aan navorsing op sy eie gespesialiseerde gebied.

Konstruksie van die siklotronegebou, die vloer waarvan 30 voet onder die oppervlakte van die grond is. Ten einde gronddruk te weerstaan, is die mure gebou van swaar bewapende beton, 2 voet dik.

## National Physical Laboratory

### INTRODUCTION

The Council records its gratitude to members of the Advisory Committee of the National Physical Laboratory, for their help and guidance.

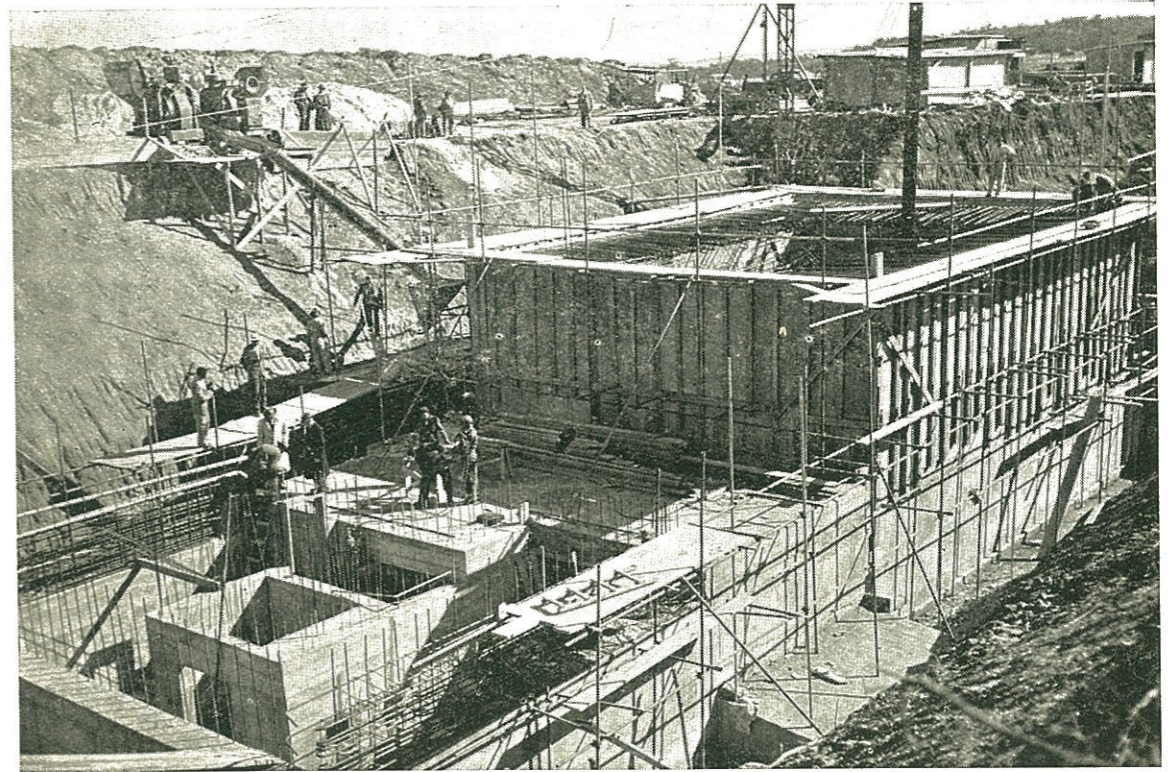
Much attention has been given to the planning of new buildings in the light of the experience which has been gained both here and on visits overseas.

The work of the past year can perhaps best be described under three main headings according to the functions which the laboratory has to serve.

### Basic research

It must provide a group of physicists each of whom is a leader in his particular field. This can be achieved only if each of the individuals concerned is actively engaged in research in his own specialized subject.

Construction of the cyclotron building, the floor of which is 30 feet below ground surface; to withstand soil pressure, the walls are of heavily reinforced concrete, 2 ft. thick.



### Standaard en gespesialiseerde toetsing

Fisika is in hoofsaak 'n metingswetenskap. Die laboratorium moet hom derhalwe toelê op die ontwikkeling van sy eie meetegnieke. Sodoende word dit die natuurlike tuiste van die fundamentele fisiese standaarde van die land. Die laboratorium se tweede belangrike funksie is gevolglik die verskaffing van gespesialiseerde toetsfasiliteite aan die wetenskap en aan nywerhede.

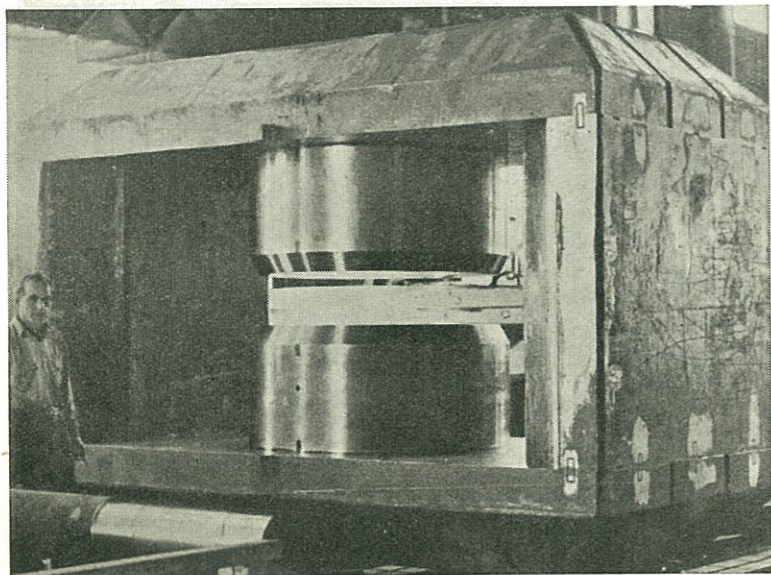
### Toegepaste fisika

Hierdie aspek van die werk word onder twee hoofde behandel: gespesialiseerde analitiese tegnieke en instrumentasie.

## BASIESE NAVORSING

### Kernfisika

Sowat vier jaar gelede het hierdie laboratorium begin met 'n projek waardeur 'n nasionale sentrum vir kernfisiese navorsing opgebou sou word. Nadat die saak noukeurig in oorweging geneem is, is daar besluit om 'n siklotron te bou wat die basiese radioaktiewe materiale vir hierdie navorsingswerk sal produseer. 'n Fisikus en 'n ingenieur wat oorsee gestuur is om die gebruik en ontwerp van so 'n instrument te bestudeer het die ontwerp daarvan sowel as dié van die geboue wat daarby hoort, voltooi. Aansienlike vooruitgang is gemaak met die bou van die siklotronsaal en met die vervaardiging van die onderdele van die siklotron self. In September 1952 is daar met die aanmeekaarsit van die siklotron begin.



Hier word aangetoon hoedat die juk van die siklotronmagneet in die fabriek aanmeekaar gesit word. Die deursnee van die poolvlakke, wat parallel is tot met 0.001 duim, is 45 duim.

The yoke of the cyclotron magnet, shown assembled at the factory. The diameter of the pole faces, which are parallel to within 0.001 in., is 45 in.

### Standards and specialized testing

Physics is essentially a science of measurement. For its own purposes the laboratory must develop intensively its measuring techniques. In so doing it becomes the natural home for the fundamental physical standards of the nation. Its second important function is therefore to supply standardizing and specialized testing facilities to science and industry.

### Applied physics

This aspect of the work is described under two main headings: specialized analytical techniques and instrumentation.

## BASIC RESEARCH

### Nuclear physics

Some four years ago this laboratory embarked on a programme for establishing a national centre for nuclear research. It was decided that a cyclotron should be built to supply the basic radioactive materials for this research. A physicist and an engineer, sent overseas to study the application and design of such an instrument, completed the basic design of the cyclotron as well as of the buildings required to house it. Progress has been made in building the cyclotron hall and in manufacturing the components of the cyclotron. Assembling operations began in September, 1952.

Aandag is ook bestee aan die apparaat wat nodig is vir die bestudering van die produkte van die siklotron. 'n Permanente magneet-betaspektrometer is bykans voltooi in die werksplase maar dit sal nog geruime tyd duur voordat dit in gebruik geneem sal word. Die tegniek van sintillasielapparate is bestudeer en toerusting waarin hierdie beginsel gebruik word, is gebou. Dit is reeds in 'n paar voorlopige studies gebruik maar verdere apparaat en toebehore is nodig voordat hierdie telapparate voltooi sal wees.

### Spektrografie

Die bestudering van spektra gedurende die afgelope vyftig jaar het reeds die meeste vrae i.v.m. die struktuur van atome en molekules beantwoord. Party vrae moet eger nog beantwoord word.

In hierdie laboratorium word daar gesoek na metodes waardeur die emissiespektra van die molekules  $Be_2$ ,  $Sb_2$ ,  $Bi_2$  en  $Si_2$  geopenbaar sal word. In 'n reeks ongeslaagde pogings om die spektra op te wek is die holkatodeboog, hoë-drukboë in gekontroleerde atmosfeer, en aktiewe stikstof gebruik. Geen verdere werk kan op hierdie gebied onderneem word tot dat die opwekkingsproses opgelos is nie. Gedurende pogings om die  $Be_2$  spektrum te vind is 'n reeks van vier onbekende bandespektra met buitengewone struktuur waargeneem. Geen bevredigende verklaring van hierdie bande kon gegee word nie en die uitsender is nog nie met sekerheid bepaal nie.

Die uitwerking van oplosmiddels op die Raman-spektra van organiese mengsels is ondersoek met die doel om te bepaal of die intramolekulêre kragte wat in oplossings voorkom spektroskopies waargeneem kan word, en, indien wel, om hierdie kragte kwantitatief te bestudeer.

Daar is begin met die bestudering van die  $AlF$  molekule en 'n doeltreffende metode vir die opwekking van hierdie spektrum is ontwikkel.

Aandag is ook bestee aan die ontwerp en bou van 'n absorpsiebuis met 'n optiese padlengte van tot een kilometer vir die studie van absorpsie spektra van meeratomige molekules. Hierdie toerusting kan eger nie geïnstalleer word voordat die nuwe gebou voltooi is nie.

In die spektrochemiese afdeling duur fundamentele studies van die eienskappe van vonke voort. Hierdie studies is belangrik vir die kwantitatiewe bepaling waarvoor die spektra van vonke gebruik word.

### X-straaldiffraksie

Metodes van X-straaldiffraksie is gebruik om die interne struktuur van 'n aantal kristalle te bepaal. Sekere ondersoeke is voorgestel deur die Leernywerheidsnavorsingsinstituut in Grahamstad en die doelstelling daarvan was om die struktuur van 'n aantal chroomkomplekse te bepaal ten einde hul funksies te verstaan en sodoende 'n beter insig te kry van hul chemiese aard.

Attention has also been given to the apparatus required for studying the products of the cyclotron. A permanent magnet beta spectrometer is nearing completion in the workshops, but it will be some time before it can be put into use. The technique of scintillation counters has been studied and equipment using this principle built. It has already been used in some preliminary studies but additions of further apparatus will be needed before it is complete.

### Spectrography

The study of spectra during the last half century has given an answer to many questions on atomic and molecular structure. Some answers are however still outstanding.

In this laboratory an intensive search is being made for methods of disclosing the emission spectra of the molecules  $Be_2$ ,  $Sb_2$ ,  $Bi_2$ , and  $Si_2$ . Attempts at excitation by means of the hollow cathode, vacuum arc, high pressure arcs in controlled atmospheres, and by means of active nitrogen, have been unsuccessful. In the search for the  $Be_2$  spectrum a series of 4 unknown bands of very unusual structure was observed. No satisfactory explanation of these bands has yet been found, nor has the emitter been identified with any measure of certainty.

The effect of solvents on Raman spectra of organic compounds has been investigated with a view to determining whether the intermolecular forces which occur in solutions can be spectroscopically observed, and if so, to study these forces quantitatively.

A beginning has been made on the study of the  $AlF$  molecule and a suitable method of exciting its spectrum has been developed.

Attention is being given to the design and building of an absorption tube with an optical path-length of up to one kilometre for the study of absorption spectra of polyatomic molecules. Installation of this equipment would have to await completion of new buildings.

In the spectrochemistry section fundamental studies on the characteristics of sparks are being continued. These are important in the quantitative determinations for which the spectra of sparks are used.

### X-ray diffraction

X-ray diffraction methods were used to determine the internal structure of a number of crystals. Certain investigations were suggested by the Leather Industries Research Institute, Grahamstown, and their aim was to determine the structure of a number of chrome complexes in order to understand their functions and in this way to get a clear picture of their chemical nature.



Die struktuur van kalium, ammonium en rubidium-trioxalato-chromiaat is heeltemaal vasgestel en die struktuurverhoudings beskryf.

Voordat daar met hierdie ondersoek begin kon word was dit nodig om metodes te ontwikkel waardeur die absolute intensiteit van X-strale wat deur klein enkelkristalle verstrooi word met 'n Geigerteller-X-straal-spektrometer gemeet kon word.

#### Bestudering van metaal met die elektronmikroskoop

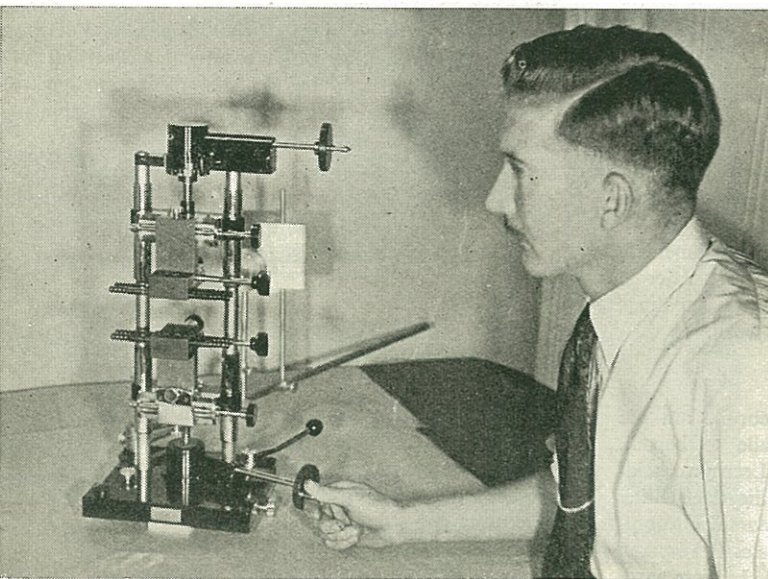
Ten einde 'n verklaring te vind vir die verskynsel van plastiese deformatsie in metale is omvattende ondersoek uitgevoer op enkelkristalle sowel as op veelkristallyne monsters van superrein aluminium. Ingevolge die resultate wat so verkry is, is 'n teorie m.b.t. die formasie van afskuiwingsbande voorgestel. Hierdie werk is in 'n aantal verhandelings gepubliseer.

#### Radiobiologie

'n Elektronversneller word tans gebou en sal gebruik word vir noukeurige eksperimente na die uitwerking van straling op ensieme en virusse.

#### Hittevloei in die aardkors

Voledige kennis van al die faktore wat betrokke is by die vloei van hitte in die aardkors kan van heelwat belang wees vir mynwerkzaamhede. Die hitteafdeling van hierdie laboratorium werk saam met liggame soos die Bernard Price-Instituut vir Geofisiese Navorsing en die Geologiese Opname om inligting oor hierdie onderwerp te versamel. Gedurende die afgelope jaar is die termiese geleidendheid gemeet van sowat 30 monsters wat geneem is uit die kern van 'n boorgat waarin temperatuurmetings uitgevoer is.



Hierdie universele vonk-booghouer vir die Spektrochemiese Afdeling is slegs een van die veel gespesialiseerde items toerusting wat deur die Sentrale Werkspase vervaardig is.

This universal spark-arc stand for the Spectrochemical Section is one of many specialized items of equipment made by the Central Work-shops.

The structures of potassiumammonium and rubidium-trioxalato-chromiate have been completely determined and their structural relations described.

As a preliminary to these investigations it was necessary to develop methods of using a Geiger-counter spectrometer to measure the absolute intensity of X-rays scattered from small single crystals.

#### Metal studies with electron microscope

With a view to finding a satisfactory explanation of the phenomenon of plastic deformation in metals, extensive investigations were carried out on single crystals as well as on polycrystalline specimens of high purity aluminium. On the basis of the results obtained, a theory of the formation of slip bands has been put forward. This work has been published in a number of papers.

#### Radiobiology

An electron accelerator is under construction which will be used for precision experiments designed to study the effects of radiation on enzymes and viruses.

#### Heat flow in earth's crust

A complete knowledge of all the factors involved in the flow of heat through the earth's crust is of some importance in mining operations. The heat section of this laboratory is co-operating with other bodies such as the Bernard Price Institute for Geophysical Research and the Geological Survey in collecting information on this subject. During the past year it has measured the thermal conductivity of some 30 samples taken from the core of a borehole in which temperature measurements have been made.

#### Magnetisering van rotse

Die onderafdeling vir toegepaste geofisika van hierdie laboratorium het begin met die bestudering van die onreëlmatige magnetisering wat in sekere gange aangetref word.

#### Geologiese ouderdom

'n Navorsingsbeampte is tans oorsee waar hy die tegniek van massaspektrometrie bestudeer—veral met betrekking tot die aanwending van hierdie tegniek tot die bepaling van die ouderdom van sekere rotse deur die hoeveelheid van die verskillende loodisotope daarin te meet. Voordat hy oorsee is het hierdie navorsings-beampte 'n massaspektrometer voltooi wat kan onderskei tussen ione met 'n „massa-tot-ladings-verhouding” tussen 12 en 460. Die oplosvermoë van hierdie apparaat moet egter nog verbeter word.

Hierbenewens word 'n metode vir die bepaling van isotoopverhoudings, deur gebruik van optiese emissiespektra en fotometrieë meettegnieke, ontwikkel.

#### STANDARDISERING EN TOETSING

##### Standaarde van massa en lengte

Die ontwikkeling van besonder noukeurige metings van massa en lengte word vertraag deur die gebrek aan ruimte in die huidige laboratoria. Die proto-tipe kilogramgewig en die vier kopieë daarvan wat vir hierdie laboratorium bestel is word tans by die B.I.P.M. getoets voordat hulle na Suid-Afrika gestuur word. Die spesiale kilogrambalans is reeds weggestuur. Die golflengte komparator vir die standardisering van ingenieursmeetblokke is nog nie tot bevrediging van die Britse Nasionale Fisiese Laboratorium voltooi nie. Hierdie toerusting sal nie doeltreffend gebruik kan word nie totdat ruimte daarvoor in die nuwe gebou beskikbaar is nie.

Gedurende die jaar onder behandeling is ongeveer 500 gewigte en stibehangerbakkie-eenhede vir die essaieer van goud getoets en is sertifikate daarvoor uitgereik.

##### ELEKTRIESE STANDAARDE

##### Elektromotiewe krag

Die verwysingstandaard vir elektromotiewe krag, bestaande uit 22 normale Westonselle wat spesiaal vir hul stabiliteit gekies is, word deur gereelde tussenvergeliking in noukeurig gekontroleerde temperatuur instand gehou.

Bestudering van die eienskappe van selle waarvan die ontwerp gewysig is, duur voort.

##### Weerstand

Gereelde tussenvergeliking van die 7 weerstande van die Thomas-tipe waaruit die laboratorium se verwysingstandaard van weerstand bestaan, dui daarop dat hul

#### Magnetization of rocks

A programme of study of the anomalous magnetization found in certain dykes has been begun in the applied geophysics section of this laboratory.

#### Geological age

A research officer is at present overseas studying the techniques of mass-spectrometry with particular attention to their use in determining the age of certain rocks by measuring abundances of the isotopes of lead present in them. Before leaving on his tour this officer completed the construction of a mass spectrometer which is able to separate ions of "mass to charge" ratios as low as 12 and as high as 460. The resolving power of this instrument still has to be improved.

In addition, a method for determining isotope ratios using optical emission spectra and photometric measuring techniques is being developed.

#### STANDARDIZATION AND TESTING

##### Mass and length standards

Present lack of space in our laboratories seriously handicaps the development of high precision measurements of mass and length. The prototype kilogramme weight and its four copies ordered for this laboratory are at present being verified at the B.I.P.M. before dispatch to this country. The special kilogramme balance has already been dispatched. The wavelength comparator for standardizing engineering end gauges has not yet been completed to the satisfaction of the British National Physical Laboratory. We shall not be able to use any of this equipment effectively until space for this purpose becomes available in the new buildings.

During the year about 500 weights and riders for assaying gold were tested and given certificates.

##### ELECTRICAL STANDARDS

##### Electromotive force

The reference standard of electromotive force consisting of 22 Weston Normal Cells specially selected for their stability is being maintained by regular inter-comparison at an accurately controlled temperature.

A study of characteristics of cells of modified design continues.

##### Resistance

Regular inter-comparisons of the 7 Thomas Type resistors constituting our reference standard of resistance indicate that their stability justifies an effort to increase

stabiliteit die poging om die juistheid van ons tussenvergelijking tot 1 deel in  $10^7$  uit te brei, regverdig; dit word derhalwe uitgevoer.

'n Groot aantal standaardsele is volgens ons ver wysingstandaarde geyk. Besondere aandag is bestee aan die toets van lae weerstande by hoë strome. 'n Stroomregulator wat daartoe instaat is om strome tot by 600 ampere te kontroleer is gebou.

#### Oordragapparaat

Die bou van die nuwe wisselstroom/gelykstroom oordragapparaat wat deur hierdie laboratorium ontwerp is, is voltooi en onder verskillende toestande getoets. 'n Verhandeling oor die ontwerp en werkverrigting van hierdie apparaat is persklaar gemaak. Dit het die voordeel bo ander instrumente wat voorheen gebruik is dat dit vry is van nulpuntverskuiwing en daarby nog veel sydig en gerieflik is. 'n Groot aantal instrumente is geyk.

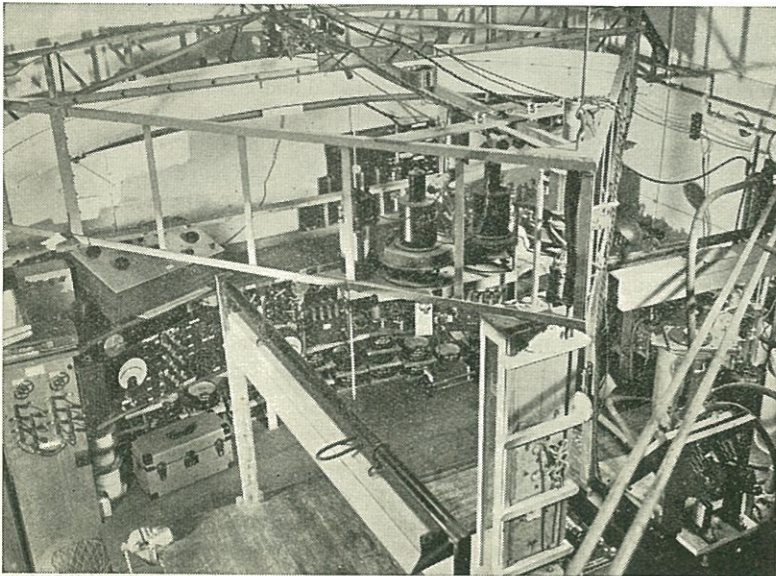
#### Magnetiese eienskappe

'n Permeameter vir die meet van magnetiese eienskappe van materiale word tans gebou.

#### Frekwensie

Verdere toebehore is vir die kristalossilator wat die frekwensiestandaard van hierdie laboratorium uitmaak, gebou—hierdeur word die reeks van frekwensies waarmee dit vergelyk kan word, uitgebrei. 'n 65 Watt versterker is ontwerp en gebou vir die verspreiding van 'n standaard 50 hertz frekwensie deur die laboratorium vir noukeurige tydmetings. Ringtellers vir gerieflike metings van tydsvlakke is ontwikkel en gebou.

Verskillende ossilators en tydvlakmeters is geyk.



Oordragstandaard vir die yking van wisselstroom instrumente. Hierdie reflekerende dinamometer-instrumente kan afgelees word tot 1 deel in 10,000 van 'n volle skaaluitwyking op 'n skaal wat 10 voet lank is en waarvan die radius 2 meter is. Die skaal en instrumente is gemonteer op 'n verplaasbare raamwerk wat mettertyd na die permanente geboue vervoer sal word.

Transfer standard for calibrating alternating current instruments. These reflecting dynamometer instruments can be read to 1 part in 10,000 of full scale deflection on a scale which is 10 ft. long and has a radius of 2 metres. Scale and instruments are mounted on a portable frame for eventual removal to permanent buildings.

the precision of our intercomparisons to 1 part in  $10^7$ ; this is accordingly being done.

A large number of standard cells have been calibrated against our reference standards. Special attention has been given to the testing of low resistance at high currents. A current regulator capable of controlling currents up to 600 amperes was constructed.

#### Transfer instrument

The construction of the new AC/DC transfer instrument designed in this laboratory has been completed and tested under a variety of conditions and a paper on its design and performance has been prepared. It has advantages over the instruments previously used in freedom from zero drift, frequency response, versatility and convenience in use. A large number of instruments have been calibrated.

#### Magnetic characteristics

A permeameter for measuring the magnetic characteristics of materials is under construction.

#### Frequency

Additional auxiliaries have been constructed for the crystal oscillator providing the frequency standard of this laboratory which will extend the range of frequencies with which it can be compared. A 65 watt amplifier has been designed and constructed for the distribution of a standard 50 cycle frequency throughout the laboratory for purposes of accurate timing. Ring counters for easy measurement of time intervals have been developed and built.

Various oscillators and time interval meters have been calibrated.

#### Kapasitansie en induktansie

Vir noukeurige brugmeting van kapasitansie en induktansie is 'n universele aardsluitingsinstrument van die Wagner-tipe vir audiefrekwensies ontwerp en gebou. 'n Frekwensie-selektiewe detektorversterker is ook gebou.

Aandag word ook bestee aan metings van die magnetiese draaimomente van die proton tot 'n hoë noukeurighedsgraad.

Aangesien dit 'n „natuurlike” konstant is, kan dit ook gebruik word om ons verwysingstandaarde te toets op dieselfde manier as wat die golflengte van 'n gekose spektraalyn gebruik kan word om die lengtestandaard te toets.

#### HITTESTANDAARDE

#### Internasionale temperatuurskaal

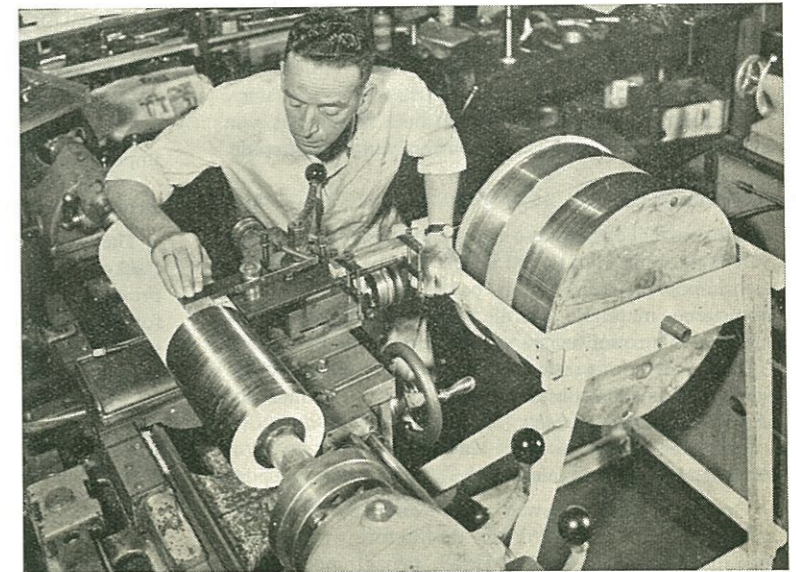
Daar is gevind dat twee van die platina-weerstande wat gebruik word vir die instandhouding van die laboratorium se internasionale temperatuurskaal foutief is. Hulle is nou reggestel en by drie fundamentele punte nagegaan. Na vergelyking met vorige ykings, is daar gevind dat hulle besonder goed daarmee ooreenstem.

Die volgende instrumente is vir buite-liggame en onderafdelings van die W.N.N.R. geyk:

200 termometers, 9 termokoppels, 2 optiese piro-meters, 1 termokoppelpirometer.

#### Emmissiwiteit

Die emissiwiteit van sinkplaat is met gebruik van 'n nuwe metode wat spesiaal vir hierdie doel ontwikkel is ten behoeve van die Nasionale Bounavorsingsinstituut gemeet.



Winding a coil of copper wire on to a cylinder of marble in the construction of a standard inductance, designed to give an accuracy of 20 parts in a million.

'n Koperdraad word op 'n marmervormer gedraai in die konstruksie van 'n standaard induktans wat ontwerp is om 'n akkuraatheid van 20 dele per miljoen te gee.

#### Capacitance and inductance

For the purpose of precision bridge measurement of capacitance and inductance a universal Wagner earthing device for audio frequencies has been designed and built. A frequency selective detector amplifier has also been built.

Attention is being given to the measurement of the gyromagnetic ratio of the proton to high precision. Since this is a “natural” constant it could be used as a check on our reference standards in the same way as the wavelength of a selected spectral line can be used to check the standard of length.

#### HEAT STANDARDS

#### International temperature scale

Two of the platinum resistors used for maintaining the international temperature scale in our laboratory proved to be faulty. They have now been repaired and checked at three fundamental points. The agreement obtained with a previous calibration is excellent.

The following instruments have been calibrated for outside concerns and sections of the C.S.I.R.:

200 thermometers, 9 thermocouples, 2 optical pyrometers, 1 thermocouple pyrometer.

#### Emissivity

The emissivity of galvanized iron has been measured for the National Building Research Institute using a newly developed method for this purpose.

### Termiese geleidendheid

Die apparaat vir die meet van die termiese geleidendheid van dun blokke word herbou. Meeste van die onderdele is ontvang en sodra die nodige loodgieterswerk voltooi is, sal dit geïnstalleer word.

#### FOTOMETRIESE EN STRALINGSTANDAARDE

### Fotometriese toetsing

'n Fotometriese toetsstasie is voltooi. Die binneoppervlakte van 'n integrerende sfeer is gevef en 'n reeks omvattende toetse om nie-selektiewe refleksie te bewerkstellig, is uitgevoer. Die elektriese skakelbord is nou voltooi en geïnstalleer en werk duur voort op die daarstelling van die verskillende fotometriese standaarde.

### Spektroradiometer

'n Universele spektroradiometer is ontwerp en die nodige aanvoortoele uitgevoer. Dit sal moontlik wees om die meeste spektraalstralingsvraagstukke soos bv. spektrofotometrie, spektroradiometrie en spektraalstudies van stralingsmetings ens., deur gebruik van hierdie apparaat oor 'n groot golflengtereeks te ondersoek. Daar is reeds 'n groot aanvraag vir metings wat met hierdie apparaat uitgevoer sal kan word.

Die ontwerp van 'n lineariteitstoetsapparaat vir fotoelektriese buise en verveelvoudigers is voltooi en goeie vordering is gemaak met die bou daarvan.

#### AKOESTIESE METINGS

### Yk van elektro-akoestiese toerusting

'n Aantal elektro-akoestiese magnetiese energieomsetters, grammofoon-klankarms, ontvangtoestelle en luidsprekers is vir ons eie gebruik sowel as vir buite-lyggame geëyk.

### Klankabsorpsie

Deur gebruik van 'n impedansbuis is metings van klankabsorpsie uitgevoer op monsters van boumateriale.

### Akoestiese impedans

Die soortelike akoestiese weerstand per sentimeter dikte van 'n akoestiese materiaal is een van die fundamentele eienskappe daarvan. Dit is bewys dat vir die meeste homogene materiale hierdie eienskap noukeurig genoeg deur stroomweerstandsmetings bepaal kan word. 'n Nuwe metode is ontwikkel vir die meet van die vloeiveerstand in akoestiese materiale. Toerusting hiervoor is gebou en word getoets.

### Artikulasie en verstaanbaarheid

Omdat spraak verreweg die belangrikste omgangsmiddel is, is dit belangrik dat die faktore wat die verstaanbaarheid daarvan beïnvloed, bepaal moet word.

### Thermal conductivity

The apparatus for measuring thermal conductivity of thin slabs is being rebuilt. Most of the components have arrived and the installation will be completed as soon as the necessary plumbing has been done.

#### PHOTOMETRIC AND RADIATION STANDARDS

### Photometric testing

A photometric testing station has been completed. Extensive tests were conducted on the painting of the inside of the integrating sphere to obtain non-selective reflection. The electrical control panel has now been completed and installed and work is continuing for establishing the different photometric standards, and providing the necessary facilities.

### Spectroradiometer

A universal spectroradiometer was designed and the required preliminary tests conducted. The construction of the instrument is nearing completion. The instrument is intended to be adaptable to most spectral radiation problems, such as spectrophotometry, spectroradiometry, spectral studies on radiation measuring elements, etc., over a wide wavelength range. A considerable demand for these measurements already awaits the completion of this instrument.

The design of a linearity tester for photoelectric tubes and multipliers is completed and construction is progressing.

#### ACOUSTIC MEASUREMENTS

### Calibration of electro-acoustic equipment

A number of electro-acoustic transducers, gramophone pick-ups, receivers and loud speakers have been calibrated for our use as well as for outside organizations.

### Sound absorption

Measurements of sound absorption have been carried out on many samples of building materials using an impedance tube.

### Acoustic impedance

The specific acoustic impedance per centimetre thickness of an acoustic material is one of its basic properties. It has been shown that this property can, for most homogeneous materials, be determined with sufficient accuracy from flow resistance measurements. A new method for measuring flow resistance in acoustic materials has been developed. Equipment has been built and is being tested.

### Articulation and intelligibility

Speech being by far the most important medium for communication it is important to determine the factors which influence its intelligibility. It is therefore neces-

sary to set up standards for testing articulation and intelligibility. These standards consist of certain word lists representative of the language as ordinarily spoken. Such word lists are being set up both for English and Afrikaans, and will be used as a basis for testing halls and sound equipment of all kinds for their effectiveness in conveying speech.

#### RADIOACTIVITY STANDARDS

The purpose of this work is to provide absolute and relative standards for any radio-isotope in any quantity. It is also intended to provide facilities for measuring neutron intensities.

Routine measurements on radio-isotopes have been made throughout the year using the air-wall ionisation chamber.

The coincidence set-up for absolute standardization of isotopes with simple disintegration schemes is working well and it has been possible to check within 2% standardizations carried out at Harwell.

Experience has been gained in the use of the 4II counter with which it should ultimately be possible to standardize the activity of any isotope regardless of the complexity of its disintegration scheme. This goal has not been reached.

#### X-RAY DOSIMETRY STANDARDIZATION AND FILM-BADGE SERVICE

X-ray therapy equipment has been calibrated for four outside bodies. Radiation surveys have been carried out for the X-ray departments of six hospitals and recommendations have been made to improve the protection against radiation exposure.

The number of film badges used has been: 2,196 by outside bodies; 716 in the National Physical Laboratory. The total number used has remained practically constant; 32 institutions have made use of the service, 9 of which have done so for the first time this year.

#### SCIENTIFIC AND INDUSTRIAL APPLICATIONS

#### ANALISE

### Spektrochemie

Die Afdeling Spektrochemie van die Nasionale Fisiese Laboratorium is tans reeds welbekend aan sekere industrieë waarvoor dit 'n aansienlike hoeveelheid roetiene-analises uitvoer. Analises van drukkermetale, sinklegerings en ertsmonsters word nog steeds gereeld onderneem en 500 monsters is gedurende die afgelope jaar geanaliseer.

'n Kwantitatiewe spektrochemiese analiseermetode is uitgewerk vir die analise van lood en sinkertse.

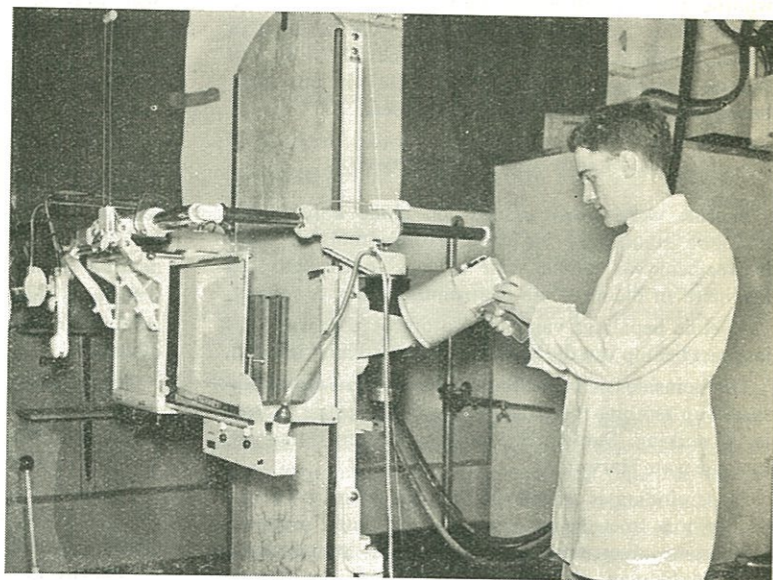
#### ANALYSIS

### Spectrochemistry

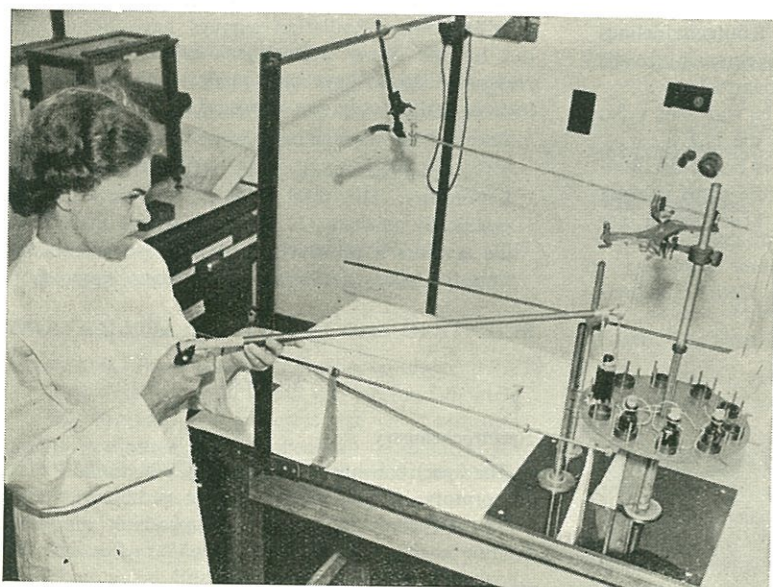
The Spectrochemistry Section of the National Physical Laboratory is now well known in certain sections of Industry for which it does an appreciable amount of routine analysis. Analyses of printer's metals, zinc base alloys and of ore samples are still being undertaken regularly and 500 different samples were analyzed during the past year.

A quantitative spectrochemical method has been worked out for the analysis of lead and zinc ores.

Bo: 'n Meter word gebruik om die verspreiding van straling rondom X-straal apparaat wat vir diagnose gebruik word, te bepaal.



Onder: Radio-fosfor en radiojodium, wat by die groot maat ingevoer word, word in dosisse opgemaak. Personeel bly op 'n veilige afstand deur gebruik te maak van hierdie afstandsbeheertegniek.



Above: A survey-meter being used to determine the distribution of radiation around diagnostic X-ray equipment.

Below: Radio-phosphorous and radio-iodine, imported in bulk, are dispensed into doses. Staff keep at a safe distance by using this remote control device.

'n Spektrochemiese apparaat is vir 'n nywerheid-sonderneming gebou en reggestel. Hierdie apparaat word gebruik vir produksiebeheer en lewer bevredigende resultate.

Verdere aanvoerwerk is vir die Komitee insake Navorsing op Spoorelemente in Suid-Afrika onderneem. Een navorsingsbeampte van die Tabak-Navorsingstasie was vir drie weke in die laboratorium werksaam om ondervinding op te doen i.v.m. die spektrochemiese metodes wat betrokke is by die analise van plantmateriaal. Tans bestudeer twee beamptes van die Afdeling Tuinbou spektrochemiese metodes in die laboratorium.

Die infrarooi-spektrometer wat bestel is, is gedurende die jaar afgelewer. Hierdie apparaat word tans getoets en sal 'n groot hulp wees by die oplossing van die fundamentele struktuur van organiese stowwe wat ekonomies van belang is vir Suid-Afrika. Dit sal ook gebruik word om infrarooi spektra van minerale olies en van olies wat vir verf gebruik word, te bestudeer.

Die ontwikkeling van 'n direktelesende apparaat vir die middelslag Hilgerspektrograaf is voltooi en word in die werksplase gebou. Die elektroniese ontwikkeling van hierdie apparaat word vertraag deur tekort aan personeel in die afdeling elektronika. Hierdie apparaat sal van groot nut wees in spektrochemiese analises aangesien dit die juistheid waarmee analise uitgevoer word sal verbeter. Fundamentele vonk-studies sal ook met hierdie instrumente uitgevoer kan word.

#### Mikrogolf spektroskopie

'n Mikrogolf spektroskoop word in die afdeling elektronika gebou vir chemiese analise en om inligting te verstrek oor die struktuur van die meer gekompliseerde molekules.

#### X-straaldiffraksie

Daar is gevind dat die diffraksieopnames van groot nut is vir die bestudering van die ontbinding van dolomiet. (Sien bl. 21).

Gedurende hierdie navorsingsprojek is 'n nuwe metode vir die meet van kristallietgroottes deur gebruik van X-strale, ontwikkel, en is die spoed, juistheid en nut van hierdie metode in 'n verhandeling beskrywe.

Dergelike tegnieke is toegepas tot 'n bestudering van sintetiese wolprodukte wat in samewerking met die Nasionale Chemiese Navorsingslaboratorium onderneem is, en het daartoe gelei dat die aard van 'n groot aantal koolwaterstofmengsels wat uit wololies vervaardig word, uitgekien is. 'n Metode om die grondvlak-refleksies te beklemtoon en te meet is gebruik en die resultate wat verkry is, het dit moontlik gemaak dat die aantal koolstofatome in hierdie langkettingkoolwaterstofmengsels noukeurig bepaal kon word.

A spectrochemical unit was set up and adjusted for an industrial undertaking. This unit is being used for production control and is functioning satisfactorily.

Further development work was undertaken for the Committee for Trace Element Research in South Africa. One officer of the Tobacco Research Station worked in the laboratory for three weeks to gain experience in spectrochemical methods of analysing plant materials. At present two officers of the Horticultural Division are studying spectrochemical methods in this section.

The infra-red spectrometer which had been ordered was received during the past year. The instrument is at present being tested and will be a great aid in solving fundamental structure of organic substances of economic importance in South Africa. It will also be used to study infra-red spectra of mineral oils and of oils used in paints.

The development of a direct reading attachment for the medium Hilger spectrograph was completed and is at present being manufactured in the workshop. The electronic development for this instrument is being held up by a shortage of staff in the electronics section. This instrument will be a valuable asset for spectrochemical analysis as it will improve the accuracy with which analyses can be performed. Fundamental spark studies will also be made with this instrument.

#### Micro-wave spectroscopy

A micro-wave spectroscope is being built in the electronics section. When complete the spectrograph will be used as an aid to chemical analysis and to supply information on the structure of the more complicated molecules.

#### X-ray diffraction

X-ray diffraction patterns were found invaluable in a study on the decomposition of dolomite. (See p. 21.)

During this research project a new method of measuring crystallite sizes by X-ray methods was developed and the speed, accuracy and usefulness of this method have been described.

Similar techniques were applied in a study of synthetic wool products undertaken in conjunction with the National Chemical Research Laboratory and several to identify the nature of a large number of hydrocarbon compounds prepared from wool fats. A method of accentuating and measuring the "basal reflections" was used, and the results obtained enabled us to specify accurately the number of carbon atoms in these long-chain hydrocarbon compounds.

'n Studie van Transvaalse chroomertse is onderneem ten einde resultate wat met chemiese en X-straaltegnieke verkry is, te korreleer. Noukeurige kristalwerk bepaling is uitgevoer op 'n groot aantal monsters afkomstig van verskillende plekke. Deur die wet van Vegard toe te pas tot die X-straal gegewens en tot die resultate van die chemiese analises, was dit moontlik om die samestelling van hierdie spinelle in vaste oplossing te bepaal. 'n Verslag van hierdie werk is gepubliseer.

'n Metode is ontwikkel waardeur die persentasie vrye kwarts in stofmonsters afkomstig van myne en fabriek vinnig en sekuur bepaal kan word. Die resultate wat verkry is van hierdie bepaling word gebruik in verband met navorsing op myntering. Die kwantitatiewe X-straal analiseermetode is ook dikwels toegepas tot nywerheidsprobleme; 'n kwantitatiewe bepaling van  $\text{Ca(OH)}_2$  in afval-kalkhope is byvoorbeeld uitgevoer ten behoeve van 'n firma wat vuurstene vervaardig.

X-straaldiffraksiemetodes is gebruik in 'n ondersoek na die struktuur van metale en legerings wat uitgevoer is in samewerking met die afdeling fisika van materiale van die Staatsmetallurgielaboratorium. Noukeurige kristalwerk-parametermetings is van etlike legerings gemaak en die struktuur van 'n aantal sinteties-voorbereide spinelle is bepaal. Werk op monsters tungsten-karbid wat vir verskillende nywerheidsfirmas onderneem is, is tans onder hande.

Hierdie werk word gedoen ten einde die korellasie tussen X-straal-gegewens—korrelgroottes, samestelling en tekstuur—en die fisiese eienskappe wat gedurende werking deur die monsters getoon is, te vind.

Veel tyd is bestee aan roetiene uitkenning van die mengsels wat in materiale soos stoomketelslak, korrosie-produkte van metale, ens. teenwoordig is. By die uitkenning van die mengsels is die nut van X-straaltegnieke weereens geopenbaar. 'n Omvattende liaseersisteen word tans opgerig vir diffraksiegegewens.

#### Elektronmikroskoop

Die elektronmikroskoop is gebruik vir die bestudering van biologiese vraagstukke in samewerking met Onderstepoort en etlike patologie-laboratoriums. Bakterieë en virusse wat na vermoed word sekere dieriesiektes veroorsaak, is ondersoek ten einde hul grootte en struktuur te bepaal.

Talle kleimonsters is met die elektronmikroskoop ondersoek vir die bepaling van hul grootte, vorm en struktuur. Die inligting wat op hierdie manier verkry is, het aansienlik bygedra tot ons kennis van die samestelling van Suid-Afrikaanse klei-neerslae.

'n Elektronmikroskopiese bestudering van wolvesels is ook onder hande.

Heelwat tyd is bestee aan die ontwikkeling van nuwe tegnieke vir die voorbereiding van monsters en aan

In a study of Transvaal chrome ores the aim was to correlate chemical and X-ray evidence on the composition of this important mineral. Accurate lattice determinations on a large number of samples from various localities were carried out. By applying Vegard's rule to the X-ray data and the results of chemical analysis, it was possible to determine the composition of these spinels in solid solution. An account of this work has been published.

A method has been developed to determine accurately and quickly by X-ray methods the percentage "free quartz" in airborne dust samples from mines and factories. The results of these determinations are being used extensively in connection with research on silicosis. The quantitative X-ray method of analysis is also frequently applied to problems of an industrial nature; for example a quantitative determination of  $\text{Ca(OH)}_2$  in waste lime dumps was carried out for a firm manufacturing firebricks.

X-ray diffraction methods were applied in an investigation carried out in collaboration with the metal physics section and the Government Metallurgical Laboratories on the structure of metals and alloys. Accurate lattice parameter measurements were made on several alloys, and the structures of a number of synthetically prepared spinels were determined. Work on tungsten carbide samples which was undertaken for various manufacturing firms is now in progress. The aim of this work is to try to find correlation between the observed X-ray data such as grain size, composition and texture, and the physical properties exhibited by the specimens during operation.

Much time was devoted to routine identification of compounds present in materials such as boiler slags, corrosion products from metals, etc. In this particular field of identifying compounds X-ray methods have proved their extreme usefulness. An extensive filing system of diffraction data is being compiled.

#### Electron microscope

The electron microscope has been used to study biological problems in co-operation with Onderstepoort and several pathological laboratories. Bacteria and viruses thought to be responsible for certain diseases amongst animals were examined in order to get information on the size and structure of these bodies.

Numerous samples of clay minerals were examined with the electron microscope to determine size, shape and structure of the clay particles. The information so gained has added considerably to our knowledge of the composition of South African clay deposits.

An electron microscopical study of wool fibres is also in progress.

Considerable time was devoted to the development of new techniques of specimen preparation and metal

metaal-beskaduweeingstegniek ten einde die oplosvermoë van elektronmikroskoopopnames te verbeter. Die elektronmikroskoop is ook toegerus met 'n vakuümplaatkamera wat in hierdie laboratorium ontwerp en in ons werksplase gebou is. Hierdie kamera blyk bevredigend te wees en dra aansienlik by tot die bruikbaarheid en nuttigheid van die Philips-elektronmikroskoop.

#### Massaspektrometrie

Die tegnieke van massaspektrometrie is toegepas in 'n „uitruilingstudie” wat uitgevoer is in samewerking met die Nasionale Chemiese Navorsingslaboratorium. Hierdie studie is onderneem ten einde die mate tot waarin uitruiling van bestanddele plaasvind tussen 'n soliede mengsel en die omringende atmosfeer te bepaal.

#### Radioisotope

Radioisotope is vir mediese gebruik ingevoer en nuwe metodes is ontwikkel vir die roetiene-uitdeling van hierdie isotope en vir metings van die inname daarvan deur pasiente. Ingevolge reëlins wat getref is met die Afdeling Burgerlike Lugvaart sal die regulasies m.b.t. die vlerkpuntskema so gewysig word dat groter hoeveelhede van party van die radioisotope ingevoer sal kan word.

Altesaam 6,587 millicuries radioaktiewe materiaal is gedurende die afgelope jaar mee gehandel, vergeleke met 5,297 millicuries gedurende vorige jaar; 513 dosisse radio-jodium is opgemaak en metings is op 301 pasiente uitgevoer.

'n Navorsingsassistent van die Mediese Skool van die Universiteit van die Witwatersrand is tans in die laboratorium werksaam op ystermetabolisme.

Die tegniek van sintillasiemeters is bestudeer en apparaat is ontwerp en gebou met die doel om dit toe te pas tot biologiese werk waar radioisotope gebruik word. Eksperimente word ook uitgevoer met vloeibare sintillasiemateriaal. Indien hierdie proewe slaag, word dit verwag dat die resultate tot in groot mate op mediese gebied toegepas sal kan word.

Advies is verleen aan 'n groot aantal buite-liggame i.v.m. die moontlike toepassings van radioisotope. Drie persone is opgelei in die hantering van radioaktiewe stowwe.

#### INSTRUMENTASIE

##### Ontwerp van optiese instrumente

Heelwat aandag is bestee aan verdere ontwikkeling van toetsmetodes vir mikroskope; vier mikroskope is ondersoek.

Die metode vir die bepaling van koma en oplosvermoë d.m.v. 'n model optiese bank is ontwikkel.

shadowcasting in order to improve on the resolution of electron micrographs. The electron microscope has been provided with a vacuum plate camera designed in this laboratory and constructed in our workshops. This camera has proved to be most satisfactory during use and adds considerably to the flexibility and usefulness of the Philips electron microscope.

#### Mass spectrometry

Mass spectrometry techniques were applied in an "exchange" study carried out in co-operation with the National Chemical Research Laboratory. The purpose of this study was to determine the extent to which exchange of constituents takes place between a solid compound and its surrounding atmosphere.

#### Radio-isotopes

Radio-isotopes have been imported for medical use and new methods have been developed for routine dispensing of this material and for uptake measurements on patients. Arrangements have been completed with the Division of Civil Aviation to modify the regulations on the wingtip scheme so that larger quantities of some radio-isotopes may be flown out.

A total of 6,587 millicuries of radioactive material has been handled during the year as compared with 5,297 millicuries during the previous year; 513 doses of radio-iodine were dispensed and measurements were made on 301 patients.

A Research Assistant of the Medical School of the University of the Witwatersrand is given facilities for work on iron metabolism.

Scintillation counter techniques are being studied and apparatus has been built with a view to application to biological radio-isotope work. Experiments are also being carried out with liquid scintillating materials. If successful, it is believed there should be a wide medical application.

Advice has been given to a large number of outside institutions on the possible applications of radio isotopes. Three persons have been trained in the handling of radio-active material.

#### INSTRUMENTATION

##### Optical instrument design

Considerable attention was given to the further development of our test methods on microscopes; four microscopes were tested.

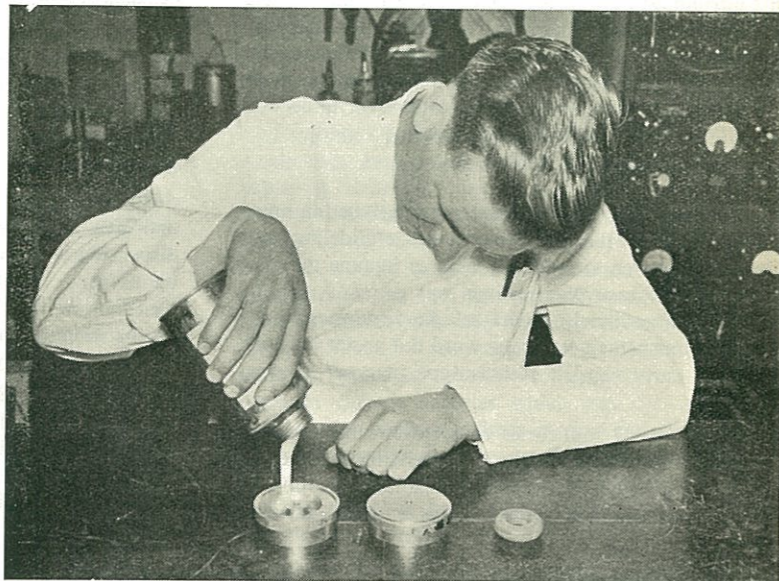
The method for determining coma and resolving power, using a model slide bench, was developed.

## Radiografie

Sekere radioisotope bied 'n eenvoudige en goedkoop plaasvervanger vir X-strale waar dit vir radiografiese doeleindes gebruik word. Toetse is uitgevoer ten einde die optimum toestande vir die maak van radiografiese opnames vir die opsporing van foute in verskillende metale van verskillende diktes, te vind. Hierdie metode is besonder nuttig gevind vir die ondersoek van die gietsel wat vir die vakuümkamer van die siklotron gebruik sal word voordat enige masjienwerk daaraan

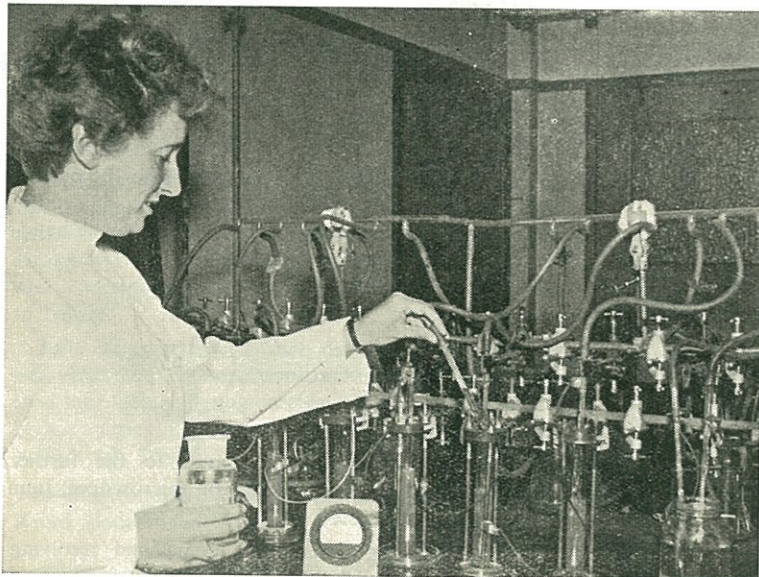
## Radiography

For radiography certain radio-isotopes offer a simple and inexpensive substitute for X-rays. Tests have been carried out to determine the optimum conditions for making radiographic surveys to determine faults in different metals and for various thicknesses. The method proved very useful in examining the casting to be used for the vacuum chamber of the cyclotron for possible faults before any machining was done. This method has also been accepted by a local firm for the regular



Regs: 'n Buigbare plastiese ring wat radio-kobaltdraad bevat word vervaardig vir die behandeling van kanker van die baarmoedernek.

Onder: 'n Navorsingsassistent van die Mediese Skool, Universiteit van die Witwatersrand, wat yster-metabolisme in die W.N.N.R. laboratoriums bestudeer, is hier besig om 'n elektrolitiese metode te gebruik vir die bepaling van radio-yster in bloedmonsters.



Above: Making a pliable plastic ring containing radio-cobalt wire for treatment of carcinoma of the cervix.

Below: A research assistant of the Medical School, University of the Witwatersrand, working on iron metabolism in the C.S.I.R. laboratories, is seen here using an electrolytic method for determining radio-iron in blood samples.

gedoen word. Hierdie metode is ook deur 'n plaaslike firma aanvaar vir die gereelde ondersoek van bauksiet blokke voordat hulle ingebou word in die glas-hoogoond. Hierdeur word heelwat geld gespaar.

## Seismiese instrumente

Die kort-afstand seismiese instrument wat deur die afdeling toegepaste geofisika van hierdie laboratorium ontwikkel is, is met groot welslae gebruik vir die ondersoek van ondergrondse struktuur by die W.N.N.R. se nuwe bouplek.

## Fotoelastisiteit

Fotoelastisiteitstechniek is toegepas tot die bestudering van vervormingskragte in muurseksies onder verskillende ladings. In die loop van hierdie ondersoeke is twee belangrike verbeterings tot die tegniek gemaak; daar is gevind dat die vervormingskragte wat plaasvind wanneer die catalinmodelle gesny word, vir 'n hele paar dae vertraag kan word deur die model tot  $-10^{\circ}$  C. te verkoel; hierbenewens is 'n eenvoudige kompenseerder waarmee die tekens van die vervormingskragte bepaal kan word, ontwerp.

'n Apparaat waarmee die elastiese eienskappe van monsters vinnig d.m.v. 'n vibrasiemethode bepaal kan word, is vir die Nasionale Bounavorsingsinstituut gebou.

## Meet van windstote op lugroetes

'n Aantal vliegtuie van die S.A.L.M. is toegerus met apparaat wat die versnelling van vliegtuie gedurende windstote, outomaties registreer. Een van hierdie apparate word tans gereeld gedurende vlugte gebruik om gegewens te versamel. In die geval van party van die instrumente is die demping van die veer-beheerde slinger verbeter deur viskositeit i.p.v. wrywing te gebruik.

## Magnetiese versterkers

Die ontwikkeling van nuwe soorte magnetiese materiale vir magnetiese versterkers of voorafversadigde reageerders bied 'n nuwe gebied vir die toepassing van instrumentasie. Die eienskappe van die nuutste soorte materiale is bestudeer in die afdeling elektronika. 'n Magnetiese versterker is ontwikkel vir die meet van die temperatuur van die ionbron in die massapektrometer en voorlopige ondersoek is gemaak na die moontlike toepassing daarvan in die siklotron en op spektrochemiese gebied.

## Bou van vakuümbuis

Alhoewel daar 'n groot verskeidenheid vakuümbuise kommersiël beskikbaar is, word besondere tipes soms vir navorsingsdoeleindes benodig. 'n Eenvoudige apparaat vir die vervaardiging van vakuümbuise is derhalwe ontwerp. Standaard onderdele sal vir sover moontlik hiervoor gebruik word.

examination of bauxite blocks before building them into a glass-melting furnace, thus effecting important economies.

## Seismic instrument

The short range seismic instrument which was developed in the applied geophysics section of this laboratory has been used with great success for exploring foundation conditions on the new building site of the C.S.I.R.

## Photoelasticity

Photoelasticity methods have been applied to the study of stresses in wall sections under various loading conditions. In the course of these investigations two important improvements in techniques were made: it was found that the distorting strains which occur when the catalin models are cut can be delayed for several days by cooling the model to  $-10^{\circ}$  C; in addition a simple compensator for determining the signs of stresses was devised.

An instrument for rapidly determining the elastic properties of samples by a vibration method was built for the National Building Research Institute.

## Gust measurement on air routes

Instruments for recording the accelerations experienced by aircraft under gust conditions have been installed in a number of aircraft of the S.A.A.F. One of these instruments is now in regular use collecting data during flights. In the case of some of the instruments the damping of the spring controlled pendulum was improved by using viscosity instead of friction.

## Transducers (magnetic amplifiers)

The development of new types of magnetic materials for transducers (also known as magnetic amplifiers or presaturated reactors) has opened a new field of application in instrumentation. Properties of the latest types of materials have been studied in our electronics section. A magnetic amplifier has been developed for measuring the temperature of the ion source in the mass spectrometer and preliminary investigations have been made on the possibility of its application in the cyclotron and in spectrochemistry.

## Vacuum tube construction

In spite of the large number of vacuum tube types available on the market, special types are sometimes still required in research. A simple type of apparatus for making vacuum tubes has been designed. Standard parts will be used, as far as possible, for making up the tubes.

### Eienskappe van ontvangbuis

'n Vakuümbuis karakteristieke-vertoneenheid is voltooi. Hierdie apparaat vertoon volledige reekse van dinamiese karakteristiek krommes van die vakuümbuis vir bepaalde parameters. Dit is derhalwe moontlik om ontvangbuiskonstantes onder verskillende operasionele toestande te bepaal. Deur die eienskappe van twee buise gelyktydig ten toon te stel is dit dus moontlik om buise wat bymekaar pas te kies en ook om foute in 'n buis na te spoor.

### Analoog rekenmasjien

As deel van 'n omvattende navorsingsprogram i.v.m. die ontwerp van analoog rekenmasjiene word die spesifieke probleem van 'n neutron spektrometer aangepak. Die doel hiervan is om outomaties en onmiddellik die energie van neutrone wat afgegee word deur die disintegrasie van 'n radioaktiewe isotoop, te bereken.

### Integrerende fotometer

Werk duur voort op die integrerende fotometer en mikro-fotometer waarvan daar in ons laaste jaarverslag melding gemaak is. Hierdie apparate sal die analise van lig, waargeneem van sterre, vergemaklik.

### Stimulus-opwekker

In fisiologiese navorsing is dit van belang om spiere d.m.v. kort elektriese impulse waarvan die reaksiespoed bekend is, te stimuleer. Op versoek van die Afdeling Dierkunde van die Universiteit van Kaapstad is 'n stimulus-opwekker ontwerp en gebou. Hierdie instrument lewer reghoekige pulsering van wisselbare frekwensie, kruinwaarde en impulswydte. Daar is gevind dat die instrument aan alle eise voldoen en 'n verslag waarin 'n beskrywing daarvan gegee word is persklaar gemaak.

### Spierpotensiaal

'n Verdere voorbeeld van die hulp wat deur 'n fisikus aan fisiologiese studies verleen kan word, kan gevind word in ko-operatiewe navorsing wat deur 'n navorsingsbeampte van hierdie laboratorium en die Professor van Verloskunde en Ginekologie aan die Universiteit van die Witwatersrand i.v.m. die meganiese werking van die baarmoeder, onderneem is. Hierdie werk is daarop gerig om die meganiese beginsels waarvolgens die baarmoeder gedurende 'n bevalling werk te bepaal en om sodoende die abnormaliteite wat soms gedurende 'n bevalling voorkom, te verstaan. 'n Verhandeling waarin die werk wat tot einde 1951 gedoen is, beskryf word, is gepubliseer. Werk duur egter voort.

### Beeldradio

Ten einde die wetenskaplike en industriële moontlikhede van beeldradio te demonstreer, is 'n geslote-kring televisieapparaat in hierdie laboratorium gebou. Die

### Valve characteristics

A compact valve characteristic display unit has been completed. This instrument displays complete families of the dynamic characteristic curves of vacuum tubes under pre-set conditions. It is thus possible to determine tube constants under varying operational conditions. By displaying the characteristics of two tubes simultaneously it is now possible to select matched tubes as well as to detect faulty operation in a single tube.

### Analogue computer

As part of a broad programme of analogue computer design, the specific problem of a neutron spectrometer is being tackled. The object is to compute automatically and instantaneously the energy of neutrons freed during the disintegration of a radioactive isotope.

### Integrating photometer

Work on the integrating photometer and micro-photometer mentioned in our last annual report and intended for facilitating the analysis of light observed from stars in astronomy, is being continued.

### Stimulus generator

In physiological research it is of interest to be able to stimulate muscle by means of short electrical pulses of known duration and frequency of occurrence. At the request of the Zoological Department of the University of Cape Town, a stimulus generator was designed and constructed. The instrument produces rectangular pulses of variable frequency, amplitude and pulse width. The instrument was found to satisfy all requirements and an account of its design has been prepared for publication.

### Muscle potentials

A further example of the assistance which can be given by a physicist in physiological studies, is afforded by a co-operative research undertaken jointly by a research officer of this laboratory and the Professor of Obstetrics and Gynaecology of the University of the Witwatersrand, on the mechanical action of the uterus. This work is directed to discovering the mechanical principles upon which the uterus works during labour and so to understanding the abnormalities which sometimes occur during childbirth. A paper describing the work up to the end of 1951 has been published. Work has continued throughout the year.

### Television

In order to demonstrate the industrial and scientific possibilities of television, a wired television unit, has been constructed in this laboratory. The display unit is

vertoneenheid is aan die kamera gekoppel deur 'n kabel; laasgenoemde kan dus op enige afstand van die vertoneenheid geplaas word. Dit is derhalwe moontlik om 'n werking op 'n afstand waar te neem waar dit omrede gevaar of onpraktiesheid andersins nie moontlik is om dit direk waar te neem nie.

### Servomechanismes

Ten einde die studie van beheervraagstukke te vergemaklik, is 'n aantal hulpapparate deur die afdeling elektronika gebou. 'n Sine-golfmodulator is ontwikkel tesame met die bygaande modulatore, demodulatore, integreerders ens. Wanneer hierdie reeks apparate voltooi is, sal dit moontlik wees om analise en sintese van outomatiese beheertoerusting volgens die frekwensie-beheermetode toe te pas.

Toerusting wat gebruik word om die ertshoogte in 'n 80-ton drom binne bepaalde perke te hou deur die snelheid van die vervoerband wat die materiaal verwyder te beheer, is ontwerp en gebou in die afdeling elektronika op versoek van 'n Randse mynmaatskappy. Werk word gedoen vir die afdeling spektrochemie op 'n apparaat wat daartoe in staat is om die grootte van swaar gelykgerigte strome noukeurig te beheer.

### Gehoer en gesig

Hierdie laboratorium tree op as raadgever i.v.m. akoestiek by die ontwerp van nuwe ateljees vir die S.A.U.K. Vir hierdie ateljees het ons, onder andere, nuwe akoestiese materiaal, klankdigte deure, akoestiese filters en spesiale vloermonterings ontwikkel.

Vir die Nasionale Instituut vir Personeelnavorsing is planne opgetrek vir die omskepping van bestaande kamers tot 'n reeks kamers vir een-dimensionele waarneming. Akoestiese toetse is vóór en ná die veranderings gemaak.

Advies is ook verleen i.v.m. die akoestiese ontwerp van nuwe geboue vir die Skool vir Doves in Pretoria.

Die laboratorium het ook onderneem om die Departement van Justisie te adviseer oor die wenslikheid van en koste verbonde aan die installering van outomatiese toerusting vir die opname van hofverrigtinge.

Advies is ook verleen i.v.m. die ontwerp van nuwe geboue en die herontwerp van bestaande geboue vir akoestiese eienskappe—veral m.b.t. sale en raadsale.

Die Afdeling Optika werk saam met ander liggame aan 'n omvattende projek i.v.m. die bepaling van die kleurgehalte van daglig in Suid-Afrika.

coupled to the camera by cable; the latter can thus be placed any required distance away from the display or viewing unit. It is thus possible to monitor or watch an operation at a distance where for reasons either of danger or impracticability direct viewing is not possible.

### Servo-mechanisms

In order to facilitate the study of control problems a number of auxiliaries have been constructed in the Electronics Section. A Sine-source modulator has been developed together with its associated modulators, demodulators, integrators, etc. When this range of instruments is completed they will allow analysis and synthesis of automatic control equipment on the basis of the frequency response method.

Equipment to maintain the level of the ore in an 80 ton bin between fixed limits by controlling the speed in the conveyor belt removing the ore, has been designed and constructed in the Electronics Section at the request of a Rand mining company.

Work is being done for the Spectrochemical Section on a device capable of controlling the value of large rectified currents to close limits.

### Hearing and vision

This laboratory is acting as consultant in acoustic matters on the design of new studios for the S.A. Broadcasting Corporation. For these studios we have amongst other things, developed new acoustic materials soundproof doors, acoustic filters and special floor mountings.

Plans were drawn up for the National Institute for Personnel Research for adapting existing rooms into a suite of rooms for one-directional observation. Acoustic tests were made before and after the changes.

Advice has been given on the acoustical design of new buildings for the new School for the Deaf in Pretoria.

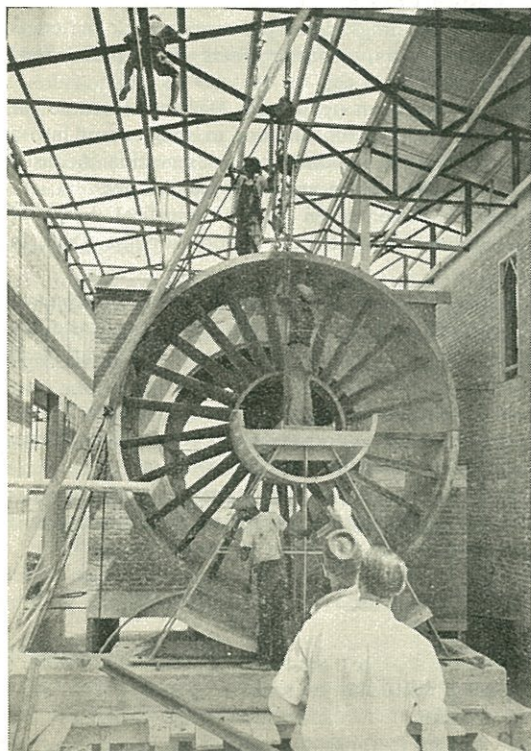
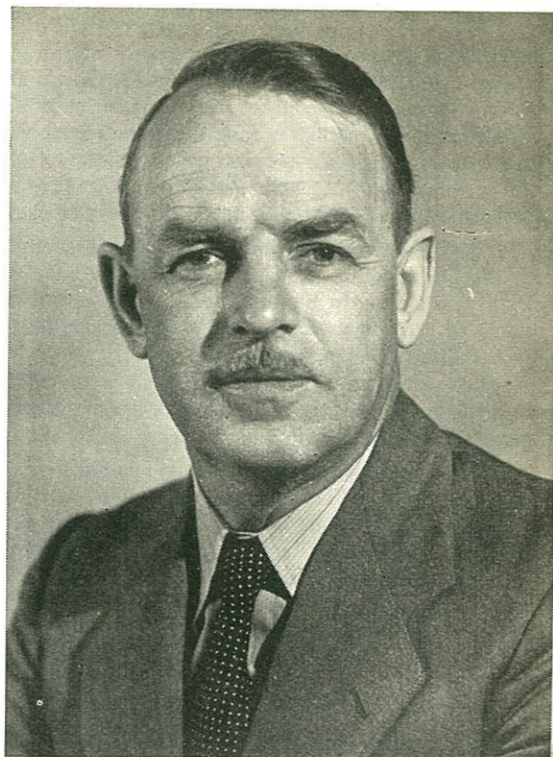
The laboratory has undertaken to advise the Department of Justice on the desirability and cost of installing automatic recording equipment to replace stenographers in Courts of Justice.

Advice has also been given on proper design, before building, or acoustic correction in completed buildings, of a number of halls and board rooms.

The Optical Section is co-operating with other bodies on a comprehensive project for the determination of the colour quality of daylight in South Africa.

Voorsitter van die Advieskomitees van die Nasionale Fisiese Laboratorium en van die Navorsingseenheid vir Werktuigkundige Ingenieurswese, dr. S. M. Naudé, Vice-President van die W.N.N.R.

Chairman of the Advisory Committees on the National Physical Laboratory and on the Mechanical Engineering Research Unit, Dr. S. M. Naudé, Vice-President of the C.S.I.R.



Installation of the 10 ft. low-velocity windtunnel: guide vanes in the outlet section.

Oprigting van die 10 vt. laagspoed windtonnel: geleidingslemme in die uitlaat-seksie.

## Navorsingseenheid vir Werktuigkundige Ingenieurswese

### INLEIDING

Hoewel die besluit van die Raad om 'n Navorsingseenheid vir Werktuigkundige Ingenieurswese te stig reeds in April 1951 geneem is, was dit nie voor die begin van 1952 dat die omstandighede in verband met personeel, akkommodasie en uitrusting sodanig verbeter het dat dit moontlik was om met die werklike navorsingswerk te begin nie.

Die eerste belangrike taak was om die samewerking van die nywerheid te verkry, wat so noodsaaklik is om die ingenieursprobleme waarmee die toekomstige ontwikkeling van die nywerheid te kampe sal hê, te definieer, te ondersoek en op te los.

Byna die hele onderneming was dus gekonsentreer op die probleme wat deur die nywerheid voorgelê is, ongeag of dit korttermyn- of langtermynondersoeke, ontwikkelingswerk, daaglikse probleme van die nywerheid of fundamentele navorsing was, mits die werk binne die algemene gebied van die W.N.N.R. val.

Met die oog op die baie verpligtings ten opsigte van kontrakwerk was dit nog nie moontlik om enige navorsing te doen oor fundamentele probleme wat ontstaan as gevolg van toestande in Suid-Afrika of wat van besondere belang vir Suid-Afrika is nie. Oorweging word egter verleen aan metodes waarvolgens dit gedurende die volgende jaar gedoen kan word.

### Akkommodasie

Onvoldoende akkommodasie, wat een van die vernameste probleme was, is uit die weg geruim toe die eenheid die nuwe windtonnelgebou en 'n paar garages, wat uindelik die voertuie van die W.N.N.R. sal huisves, betrek het. Twee windtonnels saam met verwante meetuitrusting wat aan die Nasionale Bounavorsingsinstituut behoort het en uitrusting wat deur die Nasionale Fisiese Laboratorium aangekoop is vir metaalfisika is oorgeplaas na die Navorsingseenheid vir Werktuigkundige Ingenieurswese. Die een tonnel het 'n deursnee van 10 voet en is 'n windtonnel vir lae snelhede wat spesiaal ontwerp is vir navorsing in verband met ventilators en ventilasie-studies in modelle van geboue. Die ander is 'n agthoekige windtonnel vir medium snelhede met 'n deursnee van 2 voet vir die yking van instrumente vir lugvloei-metings.

Behalwe hierdie uitrusting is slegs 'n paar klein items aangekoop. As gevolg van die geweldige gebied wat deur die wetenskap van werktuigkundige ingenieurswese gedek word, is dit raadsaam geag om liever die beperkte

## Mechanical Engineering Research Unit

### INTRODUCTION

Although the decision of Council to establish a Mechanical Engineering Research Unit was reached in April, 1951, it was not until the beginning of 1952 that the position regarding staff, accommodation and equipment improved sufficiently to enable a start to be made with actual research work.

The first major task has been to secure the collaboration of industry which is so necessary in defining, investigating and solving the engineering problems with which the future development of industry is confronted.

Thus almost the entire effort has been concentrated on problems submitted by industry, independent of whether these were short or long term investigations, development work, day-to-day problems of industry or fundamental research, provided the work fell within the general sphere of activity of the C.S.I.R.

In view of the heavy commitments in contract work it has not yet been possible to do any research into fundamental problems which arise by virtue of conditions in South Africa or which are of special interest to South Africa. Consideration is however being given to ways of doing this during the next year.

### Accommodation

Inadequate accommodation, which was one of the main problems, has been overcome by occupation of the new wind tunnel building and some of the garages which will ultimately house the C.S.I.R. vehicles. Two wind tunnels together with associated measuring equipment which belonged to the National Building Research Institute and equipment purchased by the National Physical Laboratory for metal physics have been transferred to the Mechanical Engineering Research Unit. The one tunnel is a 10 ft. diameter low velocity wind tunnel specially designed for research on ventilators and ventilation studies on model buildings. The other is a medium speed tunnel with a 2 ft. octagonal shaped working section designed primarily for the calibration of air flow instruments.

Apart from this equipment a few small items only have been purchased. Because of the vast field covered by the mechanical engineering science, it was considered advisable to spend the limited capital funds available



kapitaalfondse wat beskikbaar is te bestee aan uitrusting vir spesifieke ondernemings wat aangepak moet word, as om te probeer om die basiese uitrusting in al die verskillende takke te voorsien.

#### Nasionale Advieskomitee vir Navorsing in Verband met Werktuigkundige Ingenieurswese

Die komitee het twee keer gedurende die jaar vergader en het waardevolle advies in verband met die ontwikkeling van die werk gelewer. Die ywerigheid en hulp van die lede het grootliks bygedra tot die bevredigende werking van die Eenheid.

#### Bedrywighede

Ongeveer veertig navrae, wat 'n groot verskeidenheid van onderwerpe dek, is afgehandel.

In die volgende verklaring oor die vordering wat gemaak is, word die ondernemings behandel onder die drie afdelings waaronder die navorsingsbedrywighede georganiseer is.

#### INGENIEURSMATERIAAL, MEGANIEKA VAN VASTE STOWWE EN ALGEMENE INGENIEURSONTWERP

Die onderwerpe van hierdie afdeling verteenwoordig die mees fundamentele tak van die wetenskap van werktuigkundige ingenieurswese. Hoewel versoeke van verskeie nywerhede ontvang is vir hulp met probleme in hierdie gebied was die gebruik van toetsapparate wat nie beskikbaar is nie nodig vir die meeste van die voorgename ondersoekte en kon die werk dus nie aangepak word nie. Die pogings van hierdie afdelings is gevolglik gewy aan die ontwikkeling van sommige van die uitrusting wat dit nodig het en aan algemene probleme in verband met ingenieursontwerpe wat van 'n gespesialiseerde aard is. Die volgende onderneming is 'n tipiese voorbeeld.

#### Die ontwerp van 'n radar-antenne

Die ontwerp van die antenne word uitgevoer namens die Telekommunikasie-navorsingslaboratorium en maak deel uit van 'n onderneming wat die Wetenskaplike en Nywerheidsnavorsingsraad ingevolge 'n kontrak vir die Departement van Verdediging onderneem het.

Al die probleme in verband met die ontwerp is opgelos en die oplossing dra die goedkeuring van die Telekommunikasie-navorsingslaboratorium weg. Die finale planne en volledige spesifikasies behoort voor Junie 1953 gereed te wees.

#### HITTEVOORTPLANTING EN TOEGEPASTE TERMODINAMIKA

##### 'n Studie van vlieskoëffisiënte vir boumateriaal

Hierdie probleem word namens die Nasionale Bounavorsingsinstituut ondersoek en die doel daarvan is die vasstelling van betroubare waardes van vlieskoëffi-

on equipment for specific projects which have to be undertaken, rather than to attempt to provide basic equipment in all the various branches.

#### National Advisory Committee for Mechanical Engineering Research

The committee met twice during the year and provided valuable advice on the development of the work. The keenness and assistance of members have contributed greatly to the satisfactory functioning of the Unit.

#### Activities

About forty inquiries dealt with covered a wide range of topics. In the following statement of progress, projects are dealt with under the headings of the three sections in which the research activities are organized.

#### ENGINEERING MATERIALS, MECHANICS OF SOLIDS AND GENERAL ENGINEERING DESIGN

The subjects of this section represent the most fundamental branch of the mechanical engineering science and, although requests have been received from various industries for assistance on problems in this field, most of the proposed investigations involved the use of testing machines which were not available and the work could not be undertaken. The efforts of this section have therefore been devoted to the development of some of the equipment that it needs and to general engineering design problems which are of a specialized nature. The following project is a typical example.

#### Design of a radar aerial

The design of an aerial is being carried out on behalf of the Telecommunications Research Laboratory and forms part of a project which the Council for Scientific and Industrial Research has undertaken for the Department of Defence under contract.

All the problems in design have been solved to the satisfaction of the Telecommunications Research Laboratory and the final drawings and complete specifications should be completed before June, 1953.

#### HEAT TRANSFER AND APPLIED THERMODYNAMICS

##### Study of film coefficients for building materials

This problem is being investigated on behalf of the National Building Research Institute and aims at the establishment of reliable values of film coefficients

siënte wat gebruik sal word in die berekenings van hittevoortplanting deur die boumateriale onder plaaslike klimaatstoestand. Hierdie inligting is van fundamentele belang vir die funksionele ontwerp van geboue sonder lugreëling en in die berekening van verhittings- en/verkoelingsladings in die geval van geboue met lugreëling.

Dit het geblyk uit 'n opname van die literatuur dat die twee aspekte van die probleem wat verdere ondersoek verg die gekombineerde effek van natuurlike en geforseerde konveksie op hittevoortplanting en die effek van die rofheid van oppervlaktes op vlies- en oppervlakte-koëffisiënte raak. Geskikte apparaat om hierdie aspekte te bestudeer is ontwikkel en sal dit moontlik maak om ondersoekte te doen wat oor 'n wye gebied van Reynold se getal onder toestande van geforseerde konveksie en van Grashof se getal vir natuurlike konveksie strek. Daarbenewens is 'n verhandeling opgestel wat die beskikbare inligting oor vlies- en oppervlakte-koëffisiënte opsom en wat 'n verslag gee van die uitrusting wat vir die voorgename ondersoekte ontwikkel is.

#### Ontwerp, toesig gedurende oprigting en yking van 'n klimaatkamer

Dit is 'n ondersteunde onderneming en die doel van die klimaatkamer is om dit moontlik te maak om enige stel van omgewingstoestand in 'n toetskamer gou te kan reproduseer. Die kamer sal gebruik word vir 'n stelselmatige studie van fisiologiese effek op werkers as hulle blootgestel word aan omgewingstoestand wat soortgelyk is aan dié in hul werkplekke en om op hierdie manier die toestande te bepaal wat vir die gesondheid en doeltreffendheid van die werkers bereik moet word.

Vir hierdie doel moet daar voorsiening gemaak word vir die onafhanklike beheer van elk van die fisiese faktore wat daarby betrokke is, die grense waarvan soos volg is:

- (i) Droëbol-temperatuur van die lug moet wissel tussen 40 en 130° F.
- (ii) Die humiditeit oor die grootste moontlike gedeelte van die omvang van die droëbol-temperatuur moet wissel tussen 10 en 100%
- (iii) Die gemiddelde uitstralingstemperatuur van die omgewing en van elk van die grensoppervlaktes moet onafhanklik wissel van 30° F. bokant tot 30° F. onderkant die droëbol-temperatuur oor die grootste moontlike gedeelte van die omvang van die droëbol-temperatuur
- (iv) Lugsnelheid moet beheer word tot enige waarde van 0 tot 1,000 voet per minuut in 'n horisontale rigting en van 0 tot 300 voet per minuut in 'n vertikale rigting.

Hierdie toestande moet geskep word in 'n toetskamer van nagenoeg 10 voet kubus en as gevolg van die vereistes in verband met lugsbeweging moet die kamer die toetsafdeling van 'n windtonnel wees.

which are to be used in calculations of heat transfer through the elements of building under local climatic conditions. This information is of fundamental importance in the functional design of unconditioned buildings and in calculations of heating and/or cooling loads in the case of conditioned buildings.

From a survey of the literature it has been established that the two aspects of the problem which need further investigation concern the combined effect of natural and forced convection on heat transfer and the effect of surface roughness on film and surface coefficients. Suitable apparatus to study these aspects has been developed and will enable investigations to be made extending over a wide range of Reynold's number under conditions of forced convection and of Grashof's number for natural convection. In addition, a paper has been prepared which summarizes the available information on film and surface coefficients and gives an account of the equipment which has been developed for the proposed investigations.

#### Design, supervision during erection, and calibration of a climatic chamber

This is a sponsored project, and the purpose of the climatic chamber is to enable any particular set of environmental conditions to be reproduced rapidly in an experimental room. The chamber will be used for a systematic study of the physiological effect on workers when subjected to environmental conditions which are similar to those in places of work and, in that way to determine the conditions which should be achieved for health and efficiency.

For this purpose provision has to be made for the independent control of each of the physical factors involved, the limits being as follows:

- (i) Dry bulb temperature of the air to be varied between 40 and 130° F.
- (ii) The humidity over the largest possible portion of the dry bulb temperature range to be varied between 10 and 100%
- (iii) The mean radiant temperature of the environment and of each of the bounding surfaces independently, to be varied from 30° F. above to 30° F. below the dry bulb temperature over the largest possible portion of the dry bulb temperature range.
- (iv) Air velocity to be controlled to any value in the range from 0 to 1,000 ft. per minute in a horizontal direction and from 0 to 300 ft. per minute in a vertical direction.

These conditions have to be obtained in a test chamber about 10 ft. cube and because of the requirements regarding air movement, the chamber has to form the test section of a wind tunnel.

As gevolg van die uiterste toestande wat weergegee moet word en die wye omvang waarin elk van die fisiese faktore onafhanklik beheer moet word is die werk van 'n baie gespesialiseerde aard en is die ontwerp daarvan baie anders as die van meeste klimaatskamers wat in ander lande ontwikkel is. Om hierdie redes moes eksperimentele werk uitgevoer word om te verseker dat die voorgestelde ontwerp uniforme snelheid en temperatuurverspreiding in die toetsafdeling sal verseker en dat die graad van onstuimigheid laag sal wees. Die waardes van die hittevoortplantingskoëffisiënte moes vasgestel word om noukeurige berekening van die grootte van die apparaat moontlik te maak en om die geskikste stelsel van kontrole te kan uitsoek.

Die eksperimentele werk is voltooi en meeste van die probleme in verband met ontwerpe is opgelos en die ontwerp en spesifikasies, wat die eerste gedeelte van die werk verteenwoordig, behoort dus soos beplan in Junie 1953 klaar te wees.

#### Die ontwerp en konstruksie van 'n menslike kaloriemeter

'n Menslike kaloriemeter word ook benodig vir fisiologiese studies waarvoor die klimaatskamer ontwikkel word.

Die kaloriemeter sal gebruik word om die verskil te meet in die hitte-inhoud van die menslike liggaam tussen die twee „temperatuur“-grense, een waarvan konstant gehou word in die kaloriemeter en die ander wat gekontroleer kan word tot enige voorafbepaalde waarde in die klimaatskamer. Die instrument moet akkuraat wees en moet gou reageer en dit moet in staat wees om 'n onmiddellike, volledige en onafgebroke rekord van menslike hitteverlies te registreer en vir die afskorting van hittewisseling.

Met die oog op die ontwikkeling van menslike kaloriemeting in die V.S.A. in die afgelope paar jaar het die hoof van hierdie eenheid in die loop van 'n buitelandse besoek van Augustus tot Oktober 1951 vier weke in die Verenigde State deurgebring.

#### MEGANIKA VAN VLOEISTOWWE, INSLUITENDE HIDROULIESE MASJENERIE

##### Studies van dakventilators

Die eerste stap in hierdie ondersoek, wat die werkverrigting van bestaande soorte van dakventilators insluit, moes wag vir die voltooiing van die groot windtunnel. Die tunnel is nou opgerig en sal binnekort in werking wees. Die tunnel sal eers geëyk moet word voordat daar begin kan word met die eksperimentele werk.

Because of the extreme conditions which have to be produced and the wide range between which each of the physical factors have to be controlled independently, the work is of a very specialized nature and the design is vastly different from that of most climatic chambers developed in other countries. For these reasons, experimental work had to be conducted to ensure that the proposed design will give a uniform velocity and temperature distribution in the test section and that the degree of turbulence will be low. The values of the heat transfer coefficients had to be determined for accurate calculation of the size of the plant and for selecting the most suitable control systems.

The experimental work has been completed and most of the design difficulties have been solved so that the design and specifications, which represent the first phase of the work, should be completed in June, 1953.

#### Design and construction of a human calorimeter

A human calorimeter is also required for the physiological studies for which the climatic chamber is being developed.

The calorimeter is to be used to measure the difference in the heat content of the human body between two "temperature" levels, one of which is kept constant in the calorimeter and the other which can be controlled to any predetermined value in the climatic chamber. The instrument must be accurate and rapidly responding and must lend itself to immediate, complete and continuous recording of human heat loss and for partitioning the heat exchange.

In view of developments on human calorimetry in the U.S.A. during recent years, the Officer-in-Charge of this unit spent four weeks in the United States in the course of an overseas visit during August to October of 1951.

#### FLUID MECHANICS, INCLUDING HYDRAULIC MACHINERY

##### Studies of roof ventilators

The first stage of this investigation involving performance tests on existing types of roof ventilators had to await the completion of the large wind tunnel. The tunnel has now been erected and should be in operation shortly. The tunnel will have to be calibrated before a start can be made with the experimental work.

## Telekommunikasie-Navorsingslaboratorium

#### Algemeen

Die laboratorium is nou in twee afdelings ingedeel; radio en verdedigingsradar met gemeenskaplike werksplaasfasiliteite.

Die werksaamhede van die radio-afdeling staan onder leiding van die Advieskomitee vir Telekommunikasies waarop belangstellende Regeringsdepartemente en ander liggame verteenwoordiging geniet.

Die vernaamste doelwit van hierdie afdeling was weereens die bestudering van die voortplanting van radiogolwe en atmosferiese geraaspeile; die ontwikkeling van metodes vir kristalbeheer en die bestudering van radartegniek.

Die afdeling vir verdedigingsradar wy hom uitsluitlik aan werk wat onder kontrak vir die Departement van Verdediging onderneem word. Die werksaamhede van hierdie afdeling staan onder beheer van die Direkteur van die Korps van Wetenskaplikus U.V.M., wat ook optree as Krygswetenskapsadviseur tot die W.N.N.R.

#### Die ionosfeer en frekwensie-voorspellingsdiens

Die doelwit van hierdie bestudering van die ionosfeer is hoofsaaklik om kort-golf radiovoortplanting so voordelig moontlik te benut. Voortdurende metings word by verskillende plekke in Suid-Afrika onderneem en, deur gebruik te maak van die resultate hiervan, tesame met dié wat van oorsee ontvang is, is voorspellings vir die toestande van hoog-frekwente radiovoortplanting vir Suidelike Afrika gereeld gepubliseer.

Gedurende die afgelope jaar is die laboratorium se werksaamhede toegespits op die uitbreiding van die gebied wat deur hierdie metings gedek word.

Benewens die ionosfeerregistreerders wat reeds vir 'n aantal jare in Johannesburg en Kaapstad in werking is, is 'n registreerder gebou en aan die Oos Afrikaanse Weerkundige Departement geleen. Hierdie registreerder is tans in werking in Nairobi. Hulp is ook verleen aan die Belgiese Kongo wat tans besig is om 'n registreerstasie te Leopoldville op te rig. 'n Vakkundige is na die Telekommunikasie Navorsingslaboratorium in Johannesburg gestuur om aldaar onder toesig 'n registreerapparaat vir die stasie in Leopoldville te bou.

#### Radio-geraaspeile

Die gereelde meet van radio-geraaspeile by 100 kilohertz is onderneem ten einde die uitwerking van atmosferiese radio-geraas op verskillende radiohulpmiddels vir rigtingspeilingsisteme te bereken.

Metings in die Unie is gestaak aangesien daar gemeen word dat genoeg inligting nou beskikbaar is om hierdie berekenings uit te voer. Pogings is aangewend

## Telecommunications Research Laboratory

#### General

This laboratory is now divided into two sections, radio and defence radar, with common workshop facilities.

The activities of the radio section are guided by the Telecommunications Advisory Committee on which interested Government Departments and other organizations are represented.

The work of this section has been primarily in the field of radio wave propagation and atmospheric noise levels, the development of methods of crystal control and the study of lightning by radar methods.

The defence radar section is concerned entirely with work for the Department of Defence on a contract basis and its activities are under the control of the Director of the Corps of Scientists, U.D.F., who is also Defence Research Adviser to the C.S.I.R.

#### The ionosphere and frequency prediction service

The object of these ionospheric studies is primarily to enable the best possible use to be made of short-wave radio propagation. Continuous measurements are made at various places in Southern Africa and, using these results combined with those received from overseas, predictions of high frequency radio propagation conditions for Southern Africa have been published regularly.

During the past year activities have been directed at extending the field covered by these measurements.

In addition to the ionosphere recorders that have been in operation in Johannesburg and Cape Town for several years, a recorder has been built and loaned to the East African Meteorological Department. This recorder is now in operation in Nairobi. Assistance was also given to the Belgian Congo which is establishing a recording station in Leopoldville, using a recorder built in this laboratory by a technician sent for the purpose.

#### Radio-noise levels

The regular measurement of radio-noise levels at 100 Kc/sec. was undertaken with a view to assessing the effect of atmospheric radio-noise on various radio aids to Navigation.

Measurements in the Union have now ceased as it is considered that sufficient information is available for this assessment. Efforts have been made to obtain

om dergelike resultate in Noord-Rhodesië en Oos-Afrika te verkry maar heelwat moeilikheid is ondervind met die instandhouding van registreerders in daardie gebiede.

Die bestudering van die uitwerking van atmosferiese geraas op laag-frekwente rigtingpeilingsisteme duur voort. Toetse is met die Laag-Frekwente Loran-sisteme, deur gebruik van ontvangtoestelle van deur die Lugmag van die Verenigde State beskikbaar gestel is, uitgevoer; en, onder kontrak aan die Decca Rigtingspeilingsmaatskappy met 'n Decca-Rigtingpeilingstoestel.

Die bestudering van neerslagsteurings en kransontladingsteurings in vliegtuie duur voort en die volledige toerusting is gedurende vlugte getoets. Geen gereelde metings kan egter voor volgende somer onderneem word nie.

Die Raad is dank verskuldig aan die Afdeling Burgerlike Lugvaart en die Lugvervoerraad vir Suidelike Afrika vir die ondersteuning wat hulle aan hierdie werk gegee het.

Die algemene bestudering van atmosferiese geraas is vir die afgelope jaar reeds hangende aangesien die navorsingsbeampte wat op hierdie gebied spesialiseer, in die Cavendish-laboratorium in Cambridge was vir verdere studie. 'n Eksperimentele multifrekwensie MF-HF geraasregistreerder is egter gedurende die jaar getoets.

#### Opname van aard-konstantes

Hierdie opname is onderneem ten einde die uitwerking van Suid-Afrikaanse grondsoorte en terrein op die voorplanting van laag-frekwente golf lengtes te bepaal.

Die veldwerk is voltooi met uitsondering van Suidwes-Afrika. Metings in hierdie gebied is vertraag ingevolge moeilikheid wat ondervind is by die instandhouding van sekere verafgeleë radiobakens.

Die voorbereiding van die resultate in die vorm van 'n algemene landkaart van die Unie nader voltooiing; vir sekere gebiede sal die resultate in meer besonderhede in tabelvorm aangegee word.

Die Raad is weereens dank verskuldig aan die Unie Verdedigingsmag en die Afdeling Burgerlike Lugvaart vir hulle hulp met hierdie opname.

#### Nuwe metodes vir kristalbeheer

Die metodes vir kristalbeheer wat in die laboratorium ontwikkel is verskaf doeltreffende kristalstabiliteit en akkuraatheid wat tog buigsaam is—slegs een kristal word gebruik. Dit kan toegepas word tot ontvangtoestelle, sender-beheer, sein-generators, toerusting vir die meet van frekwensies en dergelike toerusting.

Die ontwikkeling van 'n ontvangtoestel waarin hierdie beginsels toegepas word is eerste onderneem, nou word ses proefmodelle volgens die laboratorium se ontwerp

similar results in Northern Rhodesia and East Africa but considerable trouble has been experienced in the maintenance of the recorders in these territories.

The study of the effect of atmospheric noise on low frequency navigation systems has continued. Tests have been carried out on the Low Frequency Loran system, using receivers made available by the United States Air Force; and on a new Decca navigation receiver under contract with the Decca Navigator Company.

The study of the recurrence of precipitation static and corona in aircraft is proceeding and the complete equipment has been tested in flight. No regular measurements can, however, be undertaken before next summer.

The Council is indebted to the Division of Civil Aviation and the Southern Africa Air Transport Council for their support in this work.

The general study of atmospheric noise has been in abeyance over the past year as the officer specializing in this field has been on overseas study in the Cavendish Laboratory, Cambridge. An experimental multi-frequency MF-HF noise recorder has, however, been under test for the greater part of the year.

#### Ground constants survey

The object of this survey is to determine the effect of South African soil and terrain on the propagation of low frequency waves.

The field work has been completed with the exception of South West Africa. Measurements in this area have been delayed owing to difficulty in monitoring certain unattended radio beacons.

The preparation of the results in the form of a general map of the Union, and in more detailed tabulated form in certain areas, is nearing completion.

The Council is indebted to the Union Defence Force and the Division of Civil Aviation for assistance in this survey.

#### New methods of crystal control

The method of crystal control developed in this laboratory provides effectively crystal stability and accuracy and complete flexibility, using only one crystal. It is applicable to receivers, transmitter control, signal generators, frequency measuring equipment and similar devices.

The development of a receiver using these principles was undertaken first and six trial models for the Union Defence Force are being produced by a South African

Voorsitter van die Komitee van Advies insake Telekommunikasieavorsing Professor G. R. Bozzoli, Professor van Elektriese Ingenieurswese, Universiteit van die Witwatersrand.



Chairman of the Telecommunications Research Advisory Committee, Professor G. R. Bozzoli, Professor of Electrical Engineering, University of the Witwatersrand.

deur 'n Suid-Afrikaanse vervaardiger vir die Unie Verdedigingsmag gebou. Die eerste twee toestelle is reeds gelewer en word tans uitgetoets.

Daar is begin met werk op die toepassing van hierdie beginsels tot sender-beheer en vir toerusting vir die meet van frekwensies.

#### Ondersoek van weerlig met radar

Die feit dat radar-eggo's van die weerligstraal self ontvang kan word, bied 'n nuwe metode vir die ondersoek van weerligstrale.

Toerusting vir hierdie werk is in samewerking met die Bernard Price-Instituut in werking gestel vir etlike maande aan die einde van die somer-seisoen in werking, en eggo's is 'n aantal kere geregistreer hoewel geen fotografiese rekords verkry is nie. Uit ondervinding wat opgedoen is, is 'n nuwe soort radarapparaat vir die volgende somer-seisoen voorberei.

#### Afdeling verdedigingsradar

Werk wat onder kontrak onderneem is vir die wysiging van verouderde radartoerusting ten einde die werkverrigting daarvan te verbeter, nader voltooiing. Voordat hierdie werk onderneem kon word moes daar egter 'n nuwe laboratorium voor opgerig word.

'n Tweede, meer omvattende projek vir die ontwikkeling van besondere toerusting is tans onderweg.

manufacturer to the laboratory's design. The first two of these receivers have been delivered and are now under test.

Work has commenced on the application of these principles to transmitter control and to frequency measuring equipment.

#### Investigation of lightning by radar

The fact that radar echoes can be received from the actual lightning column opens up a new method of investigating the mechanism of lightning strokes.

Equipment for the purpose was operated in conjunction with the Bernard Price Institute for several months towards the end of the summer season and echoes were seen on a number of occasions but no photographic records were obtained. As a result of the experience gained, a new type of radar equipment is in preparation for the next summer season.

#### Defence radar section

The first contract for the development of modifications to an obsolescent type of radar equipment to improve its performance is nearing completion. To enable this work to be undertaken it was necessary to set up a new laboratory. The equipping of this laboratory is proceeding.

The second and larger project for the development of specific equipment is now in progress.

## Nasionale Bounavorsings- instituut

Gedurende die afgelope jaar is die aandag van alle afdelings veral toegespits op navorsing i.v.m. Naturelle-behuising. Fondse wat deur die Nasionale Behuising en Beplanningskommissie beskikbaar gestel is, is gebruik om 'n eenheid vir navorsing na die koste van Naturellebehuising in die lewe te roep en ook om dié afdelings wat op dringende algemene behuisingvraagstukke werksaam is, te sterk.

### Advieskomitee vir Bounavorsing

Hierdie komitee het weereens waardevolle dienste aan die W.N.N.R. gelewer en 'n besonder geslaagde vergadering gedurende Februarie het die vorm aange- neem van 'n besoek aan die Vrystaatse goudvelde waar veldwerk ter plaatse ondersoek is. Ons wens weereens die voorsitter, mnr. E. W. Dohse, en die voorsitter van die onder-komitee insake die Koste van Naturelle-behuising, mnr. T. H. Louw, te bedank vir hul hulp.

'n Belangrike stap voorentoe was die instelling in Kaapstad van 'n Streeks-Advieskomitee vir Bounavorsing. Hierdie onderkomitee, wat onder voorsitterskap is van mnr. R. Kantorowich, bedien die Instituut van advies oor dié bounavorsingsprobleme wat eie is aan die Kaapse Skiereiland.

Die Advieskomitee vir Bounavorsing het die volgende onderkomitees:

- (a) Komitee vir Navorsing insake Behuising
- (b) Streekskomitee vir Bounavorsing—Kaapse Skiereiland
- (c) Navorsingskomitee vir Landgoedsbeplanning
- (d) Reëlingskomitee insake Oorblywende Druk in Grondsoorte
- (e) Reëlingskomitee insake die Verwering van Betonrioolpype
- (f) Komitee insake Koste van Naturellebehuising
  - (i) Onderkomitee insake die Doeltreffendheid van Arbeid
  - (ii) Onderkomitee vir Gebou-elemente
  - (iii) Onderkomitee vir Boumateriale
  - (iv) Onderkomitee vir Bedryfskoste en Winste
  - (v) Onderkomitee vir Onorthodokse Boumetodes.

### Beurse

Die volgende beurse is tans in werking:

- (a) Vereniging van Munisipale Ingenieurs—beurse vir die bestudering van die verwering van betonrioolpype; drie beursohouers is aangestel, een waarvan

## National Building Research Institute

The year has been marked by increased attention to research on Native housing by all divisions. Funds from the National Housing and Planning Commission have provided the staff for a most successful "Costs of Native Housing" Unit and have also made it possible to strengthen those sections working on urgent problems affecting general housing.

### Building Research Advisory Committee

This committee has given the C.S.I.R. another year of valuable service and a most successful meeting in February took the form of a visit to the O.F.S. Goldfields to inspect field work in progress. Thanks are again extended to the chairman, Mr. E. W. Dohse, and the chairman of the Sub-Committee on the Costs of Native Housing, Mr. T. H. Louw, for their great help.

An interesting development is the constitution of a Regional Research Advisory Sub-Committee in Cape Town, under the Chairmanship of Mr. R. Kantorowich, to advise on the particular local building research problems of the Cape Peninsula.

The Building Research Advisory Committee has the following sub-committees:

- (a) Housing Research Committee
- (b) Regional Building Research Sub-Committee—Cape Peninsula
- (c) Research Committee on Estate Planning
- (d) Steering Committee on Residual Pressures in Soils
- (e) Steering Committee on Corrosion of Concrete Sewer Pipes
- (f) Native Housing Cost Committee
  - (i) Sub-Committee on Efficiency of Labour
  - (ii) Sub-Committee on Elements in Building
  - (iii) Sub-Committee on Building Materials
  - (iv) Overheads and Profits Sub-Committee
  - (v) Sub-Committee on Unorthodox Methods of Construction.

### Fellowships

The following Fellowships are operating:

- (a) Institution of Municipal Engineers—Fellowships to Study the Corrosion of Concrete Sewers; three Fellows have been appointed, one in the National

in die Nasionale Chemiese Navorsingslaboratorium werksaam is. Die waarde van die beurse is £3,500 per jaar.

- (b) Nasionale Behuising en Beplanningskommissie—Beurse vir navorsing insake behuising. 15 Beursohouers van verskillende rang is op tydelike grondslag aangestel.

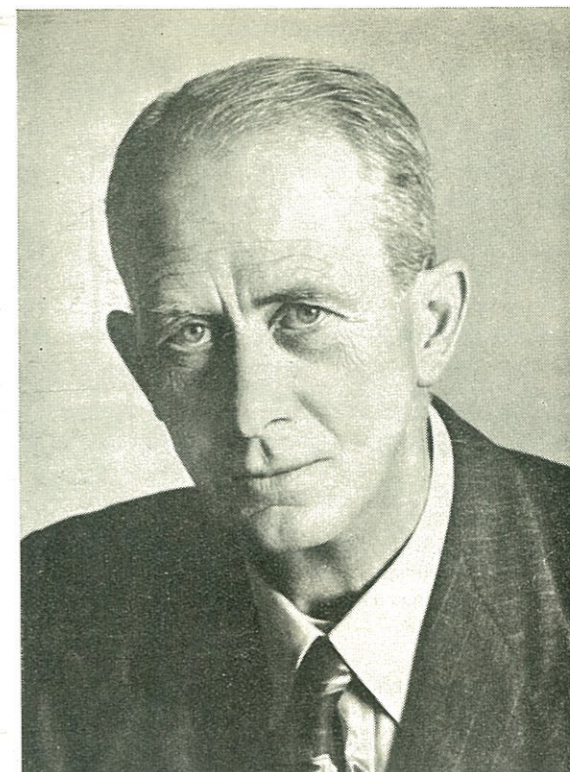
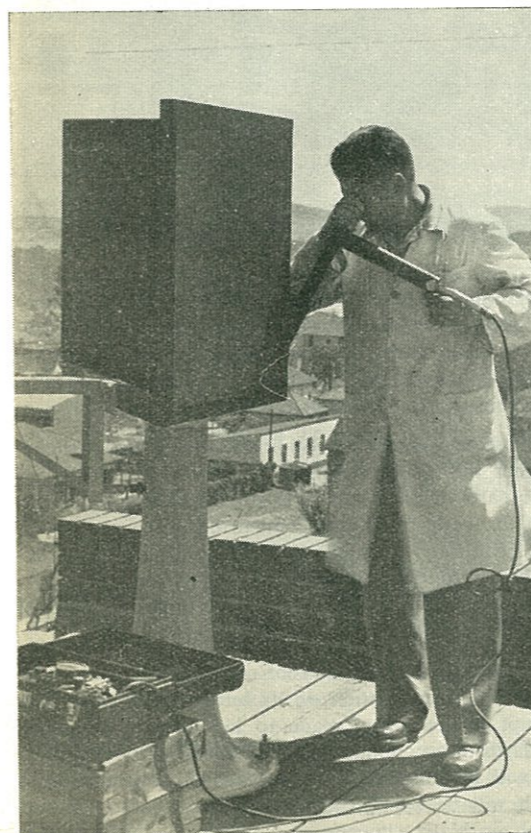
Hierbenewens het die Vereniging van Argitekte £500 geskenk vir navorsing i.v.m. Naturellebehuising. Die Raad vir Maatskaplike Navorsing het ook £1,600 beskikbaar gestel vir verdere maatskaplik-ekonomiese opnamens soos die wat by Springs uitgevoer is.

### Afdeling Argitektuur

Die tweede Naturelleproefedorp—Kwa Thema—by Springs, vorder goed. Die doelwit van hierdie proefdorpe is die vermindering van die koste van dienste, en besonder bevredigende resultate word verkry. Veel nuttige en bruikbare inligting is ook ingesamel i.v.m.

Regs: Voorsitter van die Advieskomitee vir Bounavorsing, mnr. E. W. Dohse, Hoof-Ingenieur, Departement van Publieke Werke.

Onder: Die verligting van 'n deel van die hemelruim word bepaal met 'n Macbeth-beligtingsmeter.



Above: Chairman of the Building Research Advisory Committee Mr. E. W. Dohse, Chief Engineer, Department of Public Works.

Left: Illumination from a portion of the sky being determined with a Macbeth illuminometer.

Chemical Research Laboratory. (Value of Fellowships £3,500 p.a.).

- (b) National Housing and Planning Commission—Fellowships for Housing Research. 15 Fellows of various grades have been appointed on a temporary basis.

In addition, the Institute of Architects has donated £500 to be used for Native housing research. The Council for Social Research has also made available £1,600 for further socio-economic surveys of the type undertaken at Springs.

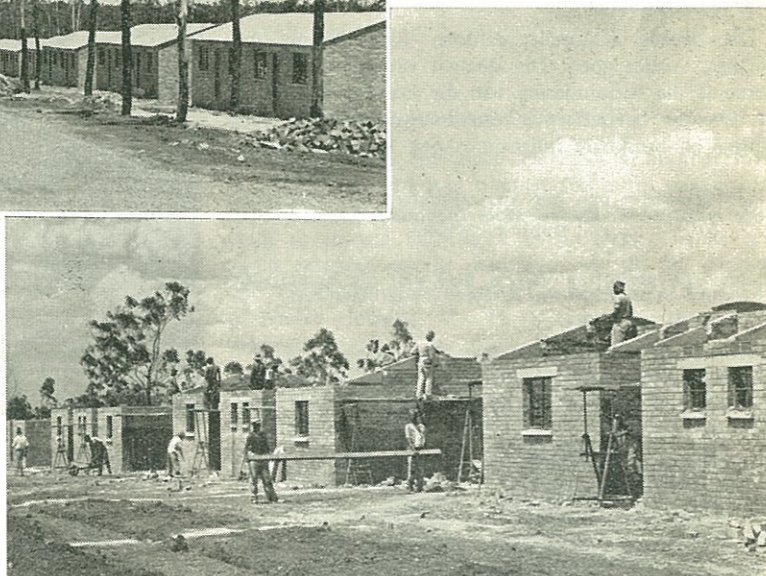
### Architectural Division

The second experimental Native township, Kwa-Thema, at Springs, is well under way. The primary object of these experimental towns is the reduction of costs of services, and very satisfactory results are being obtained. Much useful information is also being gained



Semi-detached, sub-economic (assisted rental) houses at the Kwa-Thema Township, Springs, planned by the Architectural Division for the Municipality of Springs, to accommodate 40,000 Natives.

Sub-ekonomiesse rywonings in die Kwa-Themadorp, Springs, is deur die Afdeling Argitektuur vir die Munsipaliteit van Springs ontwerp om 40,000 Naturelle te huisves.



die algemene verbetering van hierdie gemeenskappe. Kwa-Thema is die eerste dorp waar voorsiening gemaak is vir die drie ekonomiese groepe wat deur die maatskaplik-ekonomiese opname aan die lig gebring is, en die resultate word derhalwe noukeurig waargeneem.

Die tweede grootskaalse maatskaplik-ekonomiese opname om te bepaal of die resultate wat by Springs verkry is van toepassing is tot ander dele van die land, word tans in Port Elizabeth uitgevoer. Hierbenewens word gelyktydige opnames van voeding, gesondheid en tuberkulose ook deur die betrokke Staatsdepartemente uitgevoer en hierdie omvattende inligting oor dieselfde bevolkingsgroep behoort van groot nut te wees.

'n Navorsingsbeampte van die Afdeling werk saam met die Suid-Afrikaanse Nasionale Tuberkulose Vereniging aan laasgenoemde se nedersettingskema. 'n Poging is eers aangewend om vir hierdie nedersettings „minimum behuisingstandaarde” op te stel en dit sal gevolg word deur 'n program vir koste-vermindering. Hierdie koste-verminderingstelsel sal benader word op dieselfde wyse as navorsing op Naturellebehuising.

concerning the general improvement of these communities. Kwa-Thema is the first town to provide housing for the three economic groups recognized by the socio-economic survey and the results are being carefully observed.

The second large socio-economic survey to determine whether the results obtained at Springs are valid for other parts of the country, is at present in progress at Port Elizabeth. In addition, concurrent surveys of nutrition, health and tuberculosis are also being undertaken by the appropriate Government Departments and this comprehensive information on the same population sample should be of the greatest value.

One officer in this division is working with the S.A.N.T.A. organization on its settlement scheme. An attempt is first being made to lay down “minimum standards of accommodation” for these settlements and this will be followed by a cost-reduction programme which will be approached on similar lines to the research on Native housing.

#### Afdeling Funkionele Doeltreffendheid

Die funksionele doeltreffendheid van volskaalse proefgeboue wat ingevolge 'n toekening van die Nasionale Behuisings en Beplanningskommissie by Vereeniging en by Atteridgeville, Pretoria, gebou is, is noukeurig waargeneem. Verskillende konstruksiemetodes is gebruik en buitengewone ventilasiesisteme is in twee van die geboue uitgetoets.

Hierdie werk is onderneem, hoofsaaklik om die termiese eienskappe te bepaal van Naturellehuise wat volgens verskillende metodes gebou is. Hoewel daar reeds baie inligting versamel is, is daar 'n tekort aan inligting oor hoe die bewoners fisiologies reageer onder verskillende temperatuurstoestande. Pogings word aangewend om die mediese outoriteite te interesseer in die verband tussen die gesondheid van die bewoners en hulle termiese omgewing.

Werk duur voort op die analise volgens die teorie van periodieke hittevloei wat met behulp van die toetskamer vir hittevoortplanting opgestel is en daar word gehoop om hierdie resultate te gebruik in die berekening van die termiese omgewingsfaktore wat in die huise by Atteridgeville en Vereeniging gemeet is.

#### Afdeling Grondmeganika

Klem is weereens gelê op die vraagstuk van die ophang van fondamente, en dit is nou bewys dat teerpaaië ook deur ophang beïnvloed word.

Waarneming van temperatuur en voginhoud in die grond onder 'n gebou, dui daarop dat die voginhoud van die grond wat onder die middel van die gebou is, styg, maar dat daar min ooreenstemming is tussen hierdie styging en die isoterme van die grond. Dit blyk, derhalwe, dat die vloei van vog in grond onder termiese gradiënte nie die belangrikste faktor in die ophang van geboue is nie. 'n Interessante reeks laboratoriumeksperimente het aangedui dat onder termiese gradiënt die oordrag van vog in grond waarskynlik gedurende die dampfase en nie soos deur sommige navorsers geglo word gedurende die vliesfase, plaasvind nie. Dit wil ook voorkom asof die elektropotensiale wat gepaard gaan met die vloei van vog na die grond onder die middel van die gebou stromingspotensiale is en dat enige verwantskap tussen potensiale en termiese gradiënte bloot toevallig is.

Werk word tans gekonsentreer op die herdistribusie van vog in 'n uitgedroogde kleigrond wat met 'n ondeurdringbare vlies bedek is. Die aanvoerwerk vir hierdie navorsingsprojek is in Engeland gedoen en werk in Suid-Afrika sal hoofsaaklik toegespits word op grootskaalse veldproewe om te bepaal of hierdie teorieë in die praktyk toegepas kan word.

#### Afdeling Struktuuringenieurswese

Veel aandag is bestee aan metodes vir die voorkoming van krake in geboue wat op uitsettende grondsoorte gebou is. Etlieke versterkte baksteenmure is ge-

#### Functional Efficiency Division

Attention has been devoted to observing the behaviour of the full-scale experimental buildings at Vereeniging and at Atteridgeville, Pretoria, provided under the National Housing and Planning Commission grant. Construction of these buildings has varied from very heavy to very light and in two buildings special new ventilation procedures have been tried.

This work is designed principally to determine the thermal behaviour of Native houses of varying types of construction, and while considerable information has been collected, there is a serious lack of information on the physiological reactions of the occupants to temperature conditions. Attempts are being made to interest the medical authorities in this relationship between health of occupants and their thermal environment.

Work is still proceeding on the analysis of the heat transmission test room data according to a periodic heat flow theory and it is hoped to use this work for calculating the thermal environments measured in the houses at Atteridgeville and Vereeniging.

#### Soil Mechanics Division

Emphasis has again been laid on the problem of heaving foundations and it has now been shown that black top roads are also subject to heaving.

Full scale observations of temperature and moisture regimes in the soil under a building have shown that there is an increase of moisture under the centre of the building but that there is little correlation between this moisture increase and the isothermals in the soil. It appears, therefore, that flow of moisture in the soil under thermal gradient is not a primary factor in the heaving of buildings. An interesting series of laboratory experiments has indicated that, under a thermal gradient, the transfer of moisture in a soil probably takes place in the vapour phase and not in the film phase as suggested by some research workers in this field. It also appears that the electropotentials accompanying the flow of moisture towards the region under the centre of the building are streaming potentials and that any potentials accompanying thermal gradients are fortuitous.

Work is now being concentrated on the redistribution of moisture in a desiccated soil which has been covered with an impermeable membrane. The initial researches by this method have been carried out in England and work in South Africa will be devoted principally to full-scale experiments in the field to determine whether the theories apply in practice.

#### Structural Engineering Division

Attention has been paid to the problem of finding methods of preventing the cracking of buildings on heaving foundation soils. Many full-scale reinforced



Above: Experimental house built on three concrete pads — one at each back corner and one in front centre; it is hoped that this construction may overcome effects of expanding (heaving) clay foundations which cause severe wall cracks in many areas.

Below: Applying tests to determine the strength of houses built by unorthodox methods. This tensioning apparatus simulates wind-loads.



Bo: Proefhuis gebou op drie beton „kussings”, een by elk van die agterste hoeke en een in die middel voor; deur hierdie metode te gebruik word daar gehoop dat die uitwerking van die uitsit (oplig) van kleifondamente wat muurkrake veroorsaak in baie dele van die land, voorkom sal word.

Onder: Toepassing van toetse om die sterkte van huise wat volgens onortodokse metodes gebou is, te bepaal.

toets en die eerste versterkte baksteenhuise, wat soos 'n kas met afskortings ontwerp is en slegs by drie punte ondersteun word, is gebou.

'n Onderneming vir die toets van Naturellehuise wat volgens verskillende metodes gebou is, om vas te stel of hulle bestand is teen wind en ander elemente wat in die praktyk teengekom word, is uitgevoer as deel van die navorsingsprogram op Naturellebehuising. Hierdie werk was nodig om te bepaal of sekere van die nuwer en ligter geboue struktureel stabiel sou wees.

brick walls have been tested and the first reinforced brick house, designed as a partitioned box and supported only on three points, have been constructed.

A programme of testing full-scale Native houses of varying construction to determine whether they would be able to stand up to wind and other forces encountered in practice, has been carried out as part of the Native housing research programme. This work was necessary to determine whether certain newer and lighter types of construction would be structurally stable.

#### Afdeling Materiale

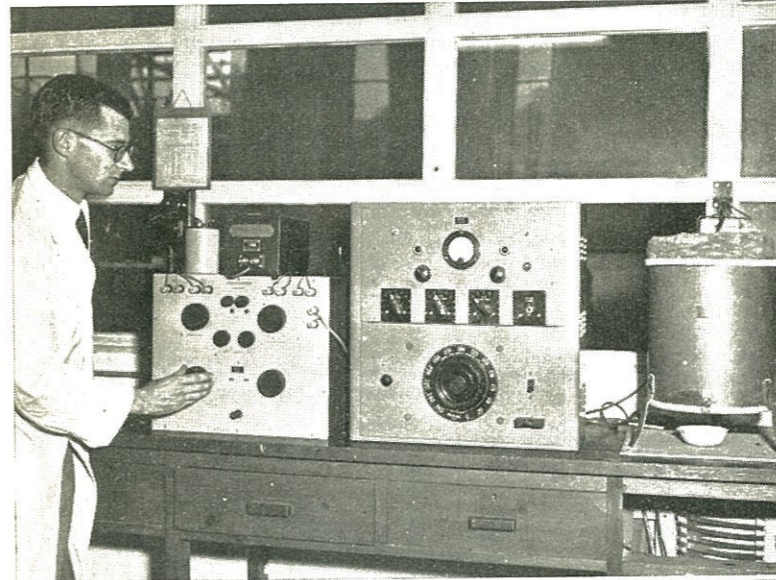
'n Peilaanleg vir die vervaardiging van eksperimentele klompes slaksement wat op vol skaal getoets moet word, is by Yskor opgerig. Hierdie volkskaalse toetse sal waarskynlik aan die einde van die jaar mee begin word en sal die bou van 'n klein dam en etlike huise insluit.

Die navorsingswerk op die uitsetting van kalkmortelle is feitlik voltooi. Klompes van ongeveer half-kubieke voet kalk is in 'n spesiale oond voorberei en eksperimentele baksteen pilare wat met hierdie kalksoorte gebou is het die gaafheid en ongaafheidskriteria wat deur laboratoriumproewe opgestel is, gestaaf.

#### Materials Division

A pilot plant for the production of experimental batches of slag cement for testing under full-scale conditions has been erected by Iscor. These full-scale tests will probably be started towards the end of this year and will include the construction of a small dam and several houses.

The programme on the expansion of lime mortars is nearly completed. Batches of about  $\frac{1}{2}$  cu. ft. of lime have been prepared in a special furnace and experimental brick piers built with these limes have confirmed the criteria of soundness and unsoundness found from laboratory experiments.

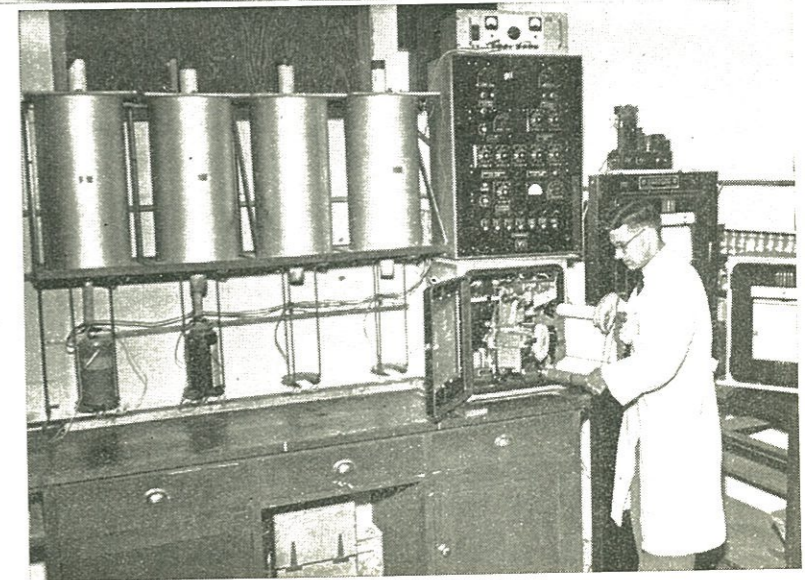


Above: A high-temperature quench furnace with controller and temperature measuring potentiometer, which has been used extensively in phase-equilibrium studies in evaluating the suitability of South African blast furnace slag for the manufacture of slag cement.

Below: Semi-automatic equipment for rapid qualitative and semi-quantitative determinations by the technique of differential thermal analysis, a method which has been found particularly useful in studies of dolomitic limes.

Bo: Hoë-temperatuurruim met kontrole en temperatuurmetingspotensiometer wat baie gebruik is in studies van fase-ewewig ten einde die geskiktheid van Suid-Afrikaanse hoogoonsslakke vir die vervaardiging van slaksement, te bepaal.

Onder: Semi-automatiese toerusting vir snelle kwantitatiewe en semi-kwalitatiewe bepalinge d.m.v. differensieëltermiese analise; hierdie tegniek is besonder geskik gevind vir die studie van dolomiet kalksoorte.

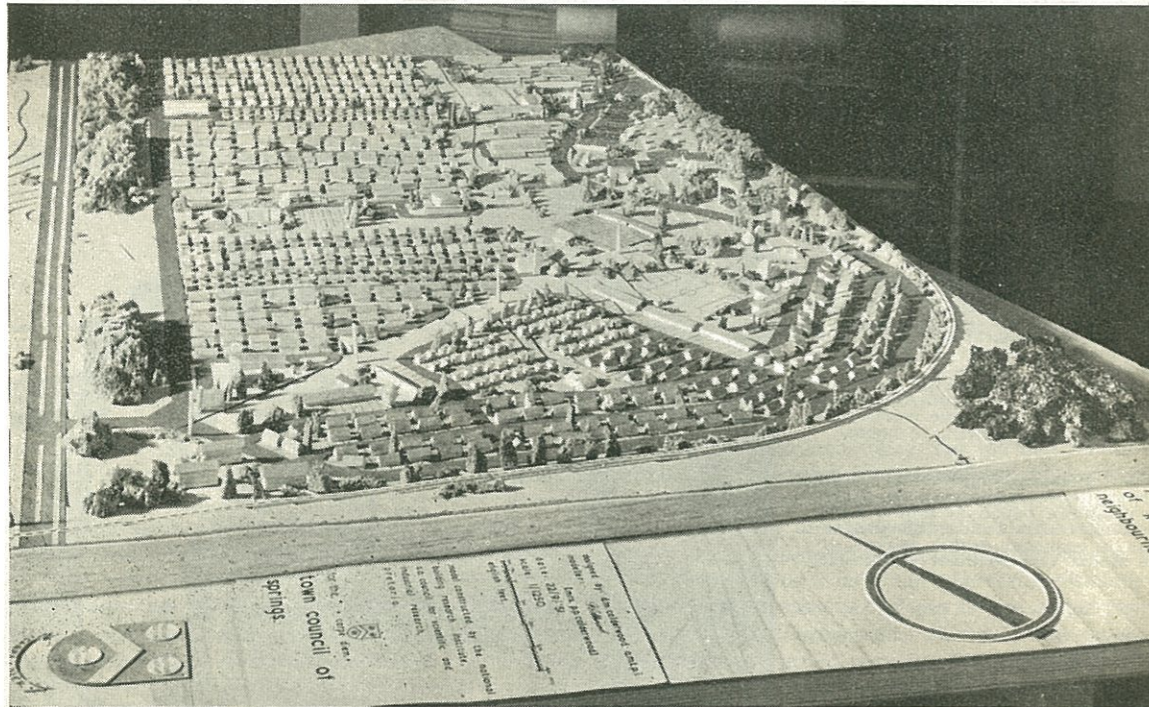


Die drievoudige benadering tot die probleem van die verwerking van rioolpype deur swaelsuur blyk reeds tentatiewe voorstelle vir die voorkoming van hierdie vraagstuk te lewer. Die veldbeampte ('n sivele ingenieur) wat verantwoordelik is vir die konstruksie en werkingsprosedures; die beton-tegnoloog ('n chemiese ingenieur) wat handel met betonfaktore, en die mikrobioloog wat met die suurvormende bakterieë werk, ontwikkel tans tot 'n besonder goeie navorsingspan.

#### Afdeling vir die Koste van Naturellebehuising (Tydelik)

Hierdie afdeling het die ontleding van bestaende onkosterekords en tydstudies op eksperimentele geboue onderneem, en sy werk mag van die vrugbaarste wees wat die instituut nog ooit onderneem het. Die werk oefen reeds 'n merkbare invloed uit op Naturellebehuising in Suid Afrika en die werk wat hulle gedoen het op kostenorms, verminderde kostenorms en die opleiding van naturellebouwerkers het reeds veel aandag getrek.

Model van die Kwa-Thema Naturelledorp, Springs, wat ontwerp is om die koste van dienste te verminder en om 'n bevredigende omgewing te verskaf vir drie ekonomiese groepe.



The triple approach to the problem of sewer deterioration by sulphuric acid attack appears already to be providing tentative suggestions for preventing some of the difficulties experienced in the field. The field officer (civil engineer), concerned with the construction and operating procedures, the concrete technologist (chemical engineer) working on the concrete factors, and the microbiologist, dealing with the acid producing bacteria, are developing into an excellent team.

#### Costs of Native Housing Division (Temporary)

This division has undertaken the analysis of existing cost records and time studies on experimental buildings, and its research may prove to be among the most fruitful yet undertaken by the institute. The work is already having a marked influence on Native housing in South Africa and their work on "cost norms", "reduced cost norms" and on the operative training of Native building workers is attracting attention.

Model of the Kwa-Thema Native Township, Springs, designed to reduce the costs of services and to provide a satisfactory environment for three economic groups.

## Nasionale Instituut vir Personeelnavorsing

### Nasionale Advieskomitee vir Personeelnavorsing

Die Raad is weereens dank verskuldig aan die lede van die Nasionale Advieskomitee vir Personeelnavorsing vir die belangstelling wat hul getoon het in die werk van die Instituut en vir hul praktiese advies m.b.t. baie van die navorsingsaktiwiteite en organisasie.

### Funksionele organisasie

Ondervinding van personeelnavorsing gedurende die afgelope paar jaar dui daarop dat die toepassing, op versoek van bestuur, van prosedures vir die beheer van afwesigheid of van ander metodes om doeltreffendheid te vermeerder, slegs onderneem moet word nadat die werksomstandighede as geheel bestudeer is sodat daar onder die heersende operasionele toestande vasgestel kan word of (a) die metode op wetenskaplike grond geldig is, (b) daar ander faktore is wat die doeltreffende werking daarvan mag verhinder (c) dit die beste oplossing is van die regte, in teenstelling met die veronderstelde, doeltreffendheidsvraagstuk waarmee die betrokke organisasie te kampe het.

In die Instituut se werksaamhede word die klem dus alhoemeer gelê op operasionele navorsing ten einde uit te vind watter probleme onder die heersende omstandighede ondersoek verg, en, om voorbereidings te tref vir wetenskaplik-gestaafde maatreëls.

Hierdie neiging het die onderskeid tussen veldwerk en werk wat in die laboratorium gedoen word, benadruk. Die veldnavorsingswerker diagnoseer personeelvraagstukke en pas die tegnieke en oplossings wat algemeen beskikbaar is toe tot spesifieke omstandighede. Die navorsingswerker in die laboratorium ondersoek fundamentele vraagstukke wat voorkom in die loop van veldnavorsingswerk, poog om algemene oplossings te vind wat tot alle gebiede toepasbaar is, en ondersoek teoretiese vraagstukke wat, hoewel hul slegs indirek verbonde is aan die praktiese vraagstukke van die veldwerk, uiteindelik mag lei tot die verbetering van toegepaste tegnieke en 'n beter begrip van operasionele vraagstukke.

Twee voorbeelde sal hierdie onderskeid verduidelik:

(1) Gedurende 'n aantal veldnavorsingsprojekte vir die verdedingsmag, staatsdiens, industrie en mynbedryf, het die vraagstuk van beroepsevaluasie voorgekom. Elke geval het karakteristieke eienskappe wat afhang van die aard van die werk, die interne organisasie, verdeling van arbeid, en die rang-hiërargie in elke arbeidsgroep. Die bestudering van hierdie vraagstukke is die werk van veldnavorsingswerkers wat deeglik vertrou is met plaaslike omstandighede. Daar is egter ook 'n gemeenskaplike probleem, naamlik die

## National Institute for Personnel Research

### National Advisory Committee on Personnel Research

The Council is once again greatly indebted to the members of the National Advisory Committee on Personnel Research for their interest in the Institute's work and for their practical advice on many aspects of its research activities and organization.

### Functional organization

Experience of personnel research during recent years has shown that the introduction, at the request of management, of specific measures such as a test selection or training programme, absentee control procedure or other device to increase efficiency, should be undertaken only after studying the work situation as a whole to determine under prevailing operational conditions whether (a) the device can be scientifically validated, (b) there are other factors which may prevent its effective operation, or (c) it is the proper answer to the real, as distinct from the supposed, efficiency problem with which the organization is concerned.

Emphasis in the work of the N.I.P.R. is, therefore, shifting more and more to "operational" research, to find out what kind of problem can become the subject of investigation under prevailing circumstances, and to clear the ground for the introduction of scientifically proved measures.

This trend has sharpened the distinction between field and laboratory research. The field research worker diagnoses personnel problems and applies techniques and solutions which are generally available, to specific circumstances. The laboratory research worker investigates basic problems arising in the course of field research, attempts to find general solutions, applicable in all fields, and pursues theoretical questions which, though only remotely connected with the practical problems of the field situation, may ultimately lead to an improvement in applied techniques and a deeper understanding of operational problems.

Two examples will make the distinction clearer:

(1) The problem of job evaluation has cropped up in a number of field research projects, in defence, public service, industry and mines. In each case, it has characteristic features depending on the nature of the work, the internal organization, division of labour, and rank hierarchy within each domain. Their study is the concern of field research workers, thoroughly familiar with local circumstances. But there is also a common problem, namely the manner in which the data obtained from job descriptions and analyses are to be handled to construct job evaluation and merit rating scales.



Bo: Voorsitter van die Nasionale Advieskomitee vir Personeelnavorsing mnr. J. E. Worsdale, President van die Geassosieerde Wetenskaplike en Tegniese Verenigings, Voorsitter en Besturende Direkteur van 'n Suid-Afrikaanse sementmaatskappy.

Regs: Elektroniese apparaat wat gebruik word om groot groepe papier-en-potloodtoetse na te sien.

wyse waarop die gegewens wat uit werksbeskrywings en analyses verkry is, behandel moet word ten einde beroepsevaluasie en prestasievermoeëskale op te stel. Bestaande metodes is onbevredigend en fundamentele psigometriese navorsing moet onderneem word ten einde hulle te verbeter. Nie alleen sou dit te veel tyd in beslag neem om hierdie studies toe te pas tot alle beroepsevaluasies wat deur veldwerkspanne onderneem word nie, maar dit is ook te betwyfel of navorsers in hierdie spanne die nodige gespesialiseerde kennis sou kan aanleer. Dit is derhalwe wenslik om 'n afdeling vir psigometrika in die lewe te roep tot wie hierdie gevorderde tegniese vraagstukke verwys kan word.

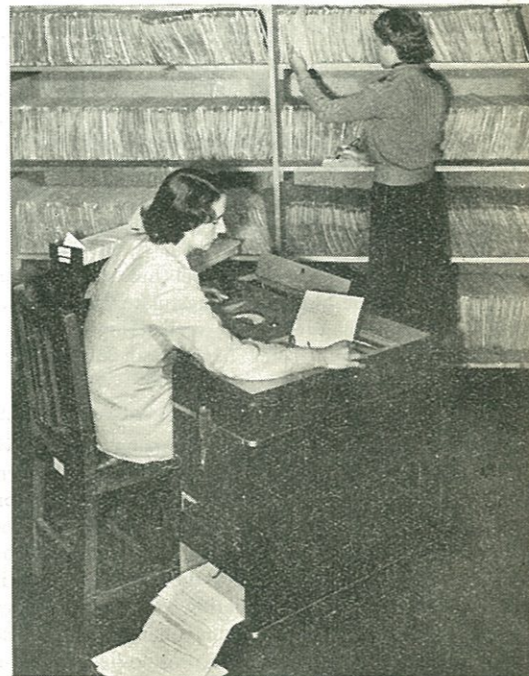
(2) In navorsing op personeelkeuring, industriële betrekkinge en beroepsaanpassing bied die raming van persoonlikheid heelwat moeilikheid. Beskikbare meetapparate is óf ontoereikend óf nie geskik vir gebruik buite die laboratorium nie. Een rede hiervoor is dat ons kennis van die aard en oorsprong van persoonlikheidsstruktuur nie volledig is nie. Indien ons dus 'n

Existing methods are unsatisfactory and basic psychometric research has to be undertaken to attempt to improve on them. Not only would it be wasteful to undertake this in all field research sections concerned with job evaluation, but it is also doubtful whether officers in such sections, in view of the diversity of their assignments, could acquire the necessary specialist knowledge. It is, therefore, desirable to have a psychometric division to which these advanced technical problems can be referred.

(2) In work on personnel selection, industrial relations and occupational adjustment, the assessment of personality make-up presents considerable difficulty. Available measuring devices are either inadequate or unsuitable for use outside the laboratory. One reason for this is that our knowledge of the nature and origin of personality make-up is far from complete. If we had a better understanding of its determinants, we might be able to devise more practicable and reliable methods of measurement. This requires theoretical studies which can only be carried out in a laboratory staffed by experimental psychologists with specialist knowledge of the subject. Hence a theoretical psychology division is a necessary part of the organization of a personnel

Left: Chairman of the National Advisory Committee on Personnel Research Mr. J. E. Worsdale, President of the Associated Scientific and Technical Societies, Chairman and Managing Director of a South African cement company.

Below: Electronic machine used in marking large groups of pencil and paper tests.



beter begrip van die determinante van persoonlikheidsstruktuur sou kan kry sou dit moontlik wees om meer doeltreffende en betroubare tegnieke vir die bepaling daarvan te ontwikkel. Hiervoor is teoretiese studies wat alleen in 'n laboratorium deur sielkundiges met 'n gespesialiseerde kennis van die onderwerp uitgevoer kan word, nodig. Gevolglik is 'n afdeling vir teoretiese sielkunde noodsaaklik by die organisasie van 'n personeelnavorsingsinstituut wat hom nie slegs tot die empiriese en *ad hoc* oplossing van personeelvraagstukke wil bepaal nie.

Hierdie oorwegings het daartoe gely dat daar perke gestel is aan die werk van die veldnavorsingspanne, ingevolge waarvan hulle meer gespesialiseerd is op gebied van beroepsveld en minder gespesialiseerd is op gebied van die oplossing van fundamentele tegniese vraagstukke.

Die belangrikste veldnavorsingsafdelings is tans dié vir die Verdedigingsmag, Staatsdiens, Industrieë en Myne. Navorsingsafdelings vir Handel, Onderwys en Landbou kan ook geskep word mits die aanvraag vir personeelnavorsing op hierdie gebiede groot genoeg is. Party van hierdie veldnavorsingspanne is ingedeel in 'n aantal spanne wat hulle veral toelê op die personeelvraagstukke van besondere organisasies. Ons vind dus dat daar binne die Navorsingsafdeling vir die Verdedigingsmag afsonderlike spanne is wat handel met die behoeftes van die Lug en Landmagte; binne die Afdeling vir Navorsing vir Industrieë is daar 'n span wat konsentreer op die yster en staal bedryf en 'n ander vir leerjongens in die ingenieursbedryf. 'n Ruk gelede was daar ook 'n derde span wat hom veral toegelê het op vraagstukke verbonde aan die klerebedryf. Aangesien hierdie spanne hêr-ingedeel word volgens aanvraag, is dit voornemens om die personeel vir sover dit moontlik is, permanent in elke veldnavorsingspan te hou sodat hulle 'n deeglike kennis van die agtergrond van die afdeling kan versamel en ook bedrewe raak in die oplos van besondere vraagstukke.

Die laboratoriumspanne sal aangevul word sodra diegene wat gespesialiseerde kennis aangeleer het in die veldnavorsingspanne vervang kan word of indien navorsingsbeamptes met die nodige tegniese bevoegdheid van elders verkry kan word.

Afdelings wat reeds bestaan is die volgende:

**Afdeling Wiskundige Statistiek.** Die funksies van hierdie afdeling is om alle ander afdelings van advies te bedien insake die ontwerp van eksperimente ten einde die statistiese ontleding van navorsingsgegewens wat later gedoen moet word te vergemaklik; om vraagstukke insake statistiek wat in die loop van hierdie ontleding voorkom op te los; om oorspronklike navorsing te onderneem na wiskundige statistiek, veral met betrekking, maar nie beperk, tot die vraagstukke wat gedurende personeelnavorsing teengekom word nie.

**Afdeling Psigometrika.** Hierdie afdeling handel met die vraagstukke verbonde aan sielkundige metings in

research institute, which does not wish to confine itself to empirical and *ad hoc* solutions of personnel problems.

These considerations have led to a narrowing of the scope of the field research teams, making them more specialist with regard to occupational fields, less specialist with regard to the solution of basic technical problems.

At the moment the major field research divisions are those concerned with Defence, Public Service, Industries and Mines. Others, such as Commerce, Education, Agriculture, etc., could be added should sufficient demand for personnel research in these fields arise. Within some of these field divisions, there are a number of teams specializing in the personnel problems of particular organizations. Thus within the Defence Research Division, separate teams deal with the requirements of the Air and Land Forces. Within the Industrial Division, one team concentrates on the iron and steel industry, another on engineering apprentices. Some time ago there was a third team which specialized in the problems of the clothing industry. Whereas such teams break up and re-form according to demand, it is intended to keep their personnel as far as possible permanently within each field division, in order that they may acquire a thorough knowledge of its background and become expert in the solution of its particular problems.

Additions to the laboratory divisions will take place as those who have acquired knowledge can be replaced in field research teams or as research officers with the necessary technical competence can be obtained from elsewhere.

Divisions already in existence are the following:

**Mathematical Statistics Division.** Its functions are to advise all other departments on experimental design in order to facilitate later statistical analysis of research data; to solve statistical problems arising in the course of this analysis; to undertake original research into mathematical statistics, with special reference, but not confined to the problems encountered in personnel research.

**Psychometric Division.** This division is concerned with the problems of psychological measurement generally, both in relation to the construction of tests, rating scales and questionnaires, and in the assessment of absenteeism, labour turnover, accidents and kindred phenomena.

**Theoretical Psychology Division.** There are two departments in this division at present:

- (a) The Personality Research Department, engaged on basic studies of the nature of temperament, personality and character.
- (b) The Psycho-physiological Research Department: investigates somatic aspects of behaviour, particularly in relation to temperament and perception. It contains an electroencephalography unit.



die algemeen, sowel met betrekking tot die opstel van toetse en vraelyste, as tot die raming van afwesigheid, arbeidsomset, ongelukke en dergelike verskynsels.

**Afdeling Teoretiese Sielkunde.** Hierdie Afdeling is tans ingedeel in twee departemente:

- (a) Die Departement vir Navorsing na Persoonlikheid, wat besig is met fundamentele studies na die aard van temperament, persoonlikheid en karakter.
- (b) Die Departement vir Psigofisiologiese navorsing wat die liggaamlike aspekte van gedrag, veral met betrekking tot temperament en waarneming ondersoek. Hierdie departement sluit ook 'n eenheid vir elektroensefalografie in.

Dit is voornemens om 'n derde departement te stig vir die bestudering van aanleg.

**Afdeling vir Naturellestudies.** Die ontwikkeling van die menslike naturelle hulpbronne is van groot belang vir die Unie en ander gebiede in Afrika. Derhalwe bestee die N.I.P.N. veel van sy tyd aan die bestudering van die beroepspotensialiteite van die Naturellebevolking. Die uitwerking van verskillende omgewings- en kultuurinvloede op die Naturellementaliteit en bekwaamhede sal besondere aandag verg. Hierdie studies is tot dusvêr deur die Mynnavorsingsafdeling onderneem as gevolg van hulle intieme kennis van die konstruksie en toepassing van keuringstoetse vir naturellemynwerkers; maar ingevolge bogenoemde beleid, en die aanvraag van ander rigtings is dit nou nodig om hierdie studies deur 'n afsonderlike span te laat onderneem.

Dit is voornemens om ander afdelings te stig waarvoor daar op die oomblik nog geen personeel is nie en wie se funksies tans versprei is oor die verskillende veldnavorsingspanne. Die volgende is die afdelings wat gestig sal word: 'n **Afdeling vir Industriële Betrekkinge en Industriële Aanpassing**, 'n **Afdeling vir die Keuring en Opleiding van Personeel**, en 'n **Afdeling vir Ergonomika**.

Benewens die gewone dienste (administrasie, biblioteek en uittrekseldiens, publikasies en werksplaas) is daar ook 'n gesamentlike rekenaarsafdeling waar roetiense statistiese berekenings vir alle navorsingsafdelings uitgevoer word. Hierdie afdeling is toegerus met rekenmasjiene van die Powerstipe en werk onder tegniese direksie van die Afdeling Wiskundige Statistiek en die administratiewe beheer van 'n komitee wat prioriteite toewys. Die instelling van 'n gesamentlike psigometrika afdeling is oorwoë ten einde te voorsien in die behoeftes van spanne wat die dienste van wetenskaplike assistente met opleiding in die gebruik van psigomotor en potlood-en-papierstoetse nodig het.

#### Navorsing vir Verdedigingsmagpersoneel

'n Genoegsame aantal leerlingloodse het die oorlogse opleidingskema voltooi om 'n hersiening van die keuringsprosedures wat gedurende die oorlog gebruik is, te regverdig. Hierdie toetsbattery wat tot 'n

A third department, to undertake the study of abilities, is contemplated.

**African Studies Division.** Because of the importance to the Union and other African territories, of the development of its native human resources, the N.I.P.R. is devoting much of its time to a study of the occupational potentialities of African peoples. The effects of various environmental and cultural influences on African mentality and abilities will receive particular attention. These studies have so far been done by the Mines Research Division because of their intimate connection with the construction and application of selection tests for native mine workers; but in terms of the policy enunciated above, and in view of the demand from other directions, it became necessary to refer African studies as such to a separate team.

Other divisions which are contemplated, but for which staff is not yet available and whose functions are at the moment spread over the various field research sections are an **Industrial Relations and Adjustment Division**, a **Personnel Selection and Training Division**, and an **Ergonomics Division**.

In addition to the usual service departments (administration, library and abstracting, publications and workshop) there is also a computers' pool to carry out routine statistical computations for all research divisions. It is equipped with Powers punch card machinery, works under the technical direction of the Mathematical Statistics Division and under administrative control of a priorities committee. The establishment of a psychometrists' pool is contemplated to meet the needs of teams which require the occasional services of scientific assistants trained in the use of psychomotor and pencil-and-paper tests.

#### Defence personnel research

A sufficient number of air pupils had passed through the post-war training scheme and obtained their wings to warrant a re-validation of the war-time selection tests. The battery, with some modification, has proved

mate gewysig is, blyk toepasbaar te wees tot vredestrydse opleidingstoestande; die verhouding van dié wat nie slaag nie is 2½ keer so groot onder dié wat nie aanbeveel is nie, as dié wat deur die toetse aanbeveel is. 'n Finale opvolgingstudie van rekrute vir die Staande Mag het daarop gedui dat die siftingsbattery wat tans gebruik word, 'n redelike voorspelling van sukses gedurende opleiding gee, veral waar die opleidingskursus die aanleer van tegniese vakke behels.

Navorsing word tans gedoen op 'n nuwe klassifiseringstoets vir die Landmagte, wat sal verseker dat die beskikbare rekrute so voordelig moontlik gebruik sal word.

'n Toetsprosedure is ook ontwikkel vir gebruik van kandidate in die Militêre Gimnasiums wat wil aansluit by die Staande Mag.

Die roetiense toets en versamel van opvolgingsgegevens verkry van vakleerlinge vir die S.A.L.M. duur voort.

Twee studies is voltooi i.v.m. die wanaanpassing van militêre personeel tot diensomstandighede.

'n Aantal verslae oor ander personeelaangeleenthede is aan die Verdedigingsoutoriteite voorgeleë.

#### Naturellemynwerkers

Verdere opvolgingstudies van die klassifikasie van Naturellemynwerkers is voltooi. Resultate wat vroeër verkry is in verband met die geldigheid van die toetse is gestaaf. 'n Prosedure is ook uitgewerk waar daar, deur gebruik te maak van 'n toetsbattery wat sifting voorafgaan, die kapasiteit van keuringsentra met 75% vermeerder kan word sonder verlies van doeltreffendheid van die toetse, en waarmee daar slegs 'n klein styging in koste gepaard gaan.

'n Keuringsbattery vir Naturelle-hystoestelbestuurders is voltooi en het 'n besonder hoë voorspellingswaarde. Daar is feitlik geen druipele onder leerlinge wat d.m.v. hierdie battery gekies is nie en leerlinge bereik ook 'n hoë mate van vaardigheid.

Navorsing na die opleidingsmetodes vir naturelleopsieners en 'n aantal operasionele probleme in verband daarmee, duur voort.

Daar is ook begin met die konstruksie van toetse om die liggaamlike krag en uithoevermoë van naturellemynwerkers te bepaal. Indien dit bewys word dat hierdie toetse geldig is, sal hul gekombineer word met siftingstoetse ten einde meer noukeurige klassifisering as wat met geestelike aanpassingstoetse verkry kan word, te bewerkstellig.

Die huidige toetsbattery wat rekrute in nie-meganiese, meganiese en toesighoudende groepe indeel, word tans as roetiense gebruik deur vyf myngroepe. Agt keuringsentra is reeds opgerig en 'n negende nader voltooiing. Tesame sal hulle sestien myne op die Witwatersrand en in die Vrystaat dien.

applicable to peace-time training conditions, the proportion of failures being 2½ times greater amongst those not recommended, than amongst those recommended by the tests. A final follow-up of recruits for the Permanent Force showed that the screening battery now in use gives a reasonable prediction of success in training, more particularly where the training course involves the mastering of technical subjects.

Research is now in progress on a new classification test for the Land Forces, which will ensure that best use will be made of all available recruits.

A test procedure was also developed for use with candidates in the Military Gymnasia, who wish to enter the Permanent Force.

The routine testing and collection of follow-up data on artisan apprentices for the S.A.A.F. was continued.

Two studies were completed on the maladjustment of military personnel to Service conditions.

A number of reports on other personnel matters was submitted to the Defence authorities.

#### Native mine labourers

Further follow-up studies were completed on the classification tests for Native mine workers. Earlier results on the validity of the tests were amply confirmed. A procedure was also worked out, involving the use of a pre-screening battery, whereby the capacity of selection centres could be increased by 75%, without any loss of efficiency on the part of the tests, and involving only a slight increase in operating costs.

A selection battery for Native winch drivers was completed which has a very high predictive capacity. There are virtually no training failures amongst trainees selected by means of this battery and trainees achieve a high level of competence.

Research into training methods for boss boys, and into a number of operational problems relating to their functions, is still in progress.

A start was made on the construction of tests to determine the physical strength and stamina of native mine labourers. If these tests are proved to be valid, they will be combined with the screening tests to give a finer classification than can be obtained by means of mental adaptability tests.

The present battery of tests, which classifies recruits into non-mechanical, mechanical and supervisory groups is now in routine use in five mining groups. Eight selection centres have been established and a ninth is in the course of construction. Together they will serve sixteen mines on the Witwatersrand and in the Free State.

### Keuring en opleiding van vakleerlinge

Die roetiene toepassing van keuringstoetse tot ambagskoolleerlinge en ambagsvakleerlinge vir die Unie Verdedigingsmag, verskillende myne, ingenieurswerkswerkplase en 'n paar kleiner liggame het voortgeduur.

Opvolgingstudies van die ambagskoolleerlinge het daarop gedui dat die toetse met 'n hoë noukeurighedsgraad die sukses van kandidate in teoretiese opleiding, kan voorspel. Dit was egter nie moontlik om die toetse volgens tegniese kollege eksamens te valideer nie aangesien meeste vakleerlinge dit nie die moeite werd ag om in die eksamens te slaag nie, en voormanne, opsigters en werkgewers dikwels onverskillig staan teenoor sukses met teorie en „boekwerk”—daar is dus geen aansporing vir 'n vakleerling om in die eksamens te slaag nie.

Die poging wat aangewend is om rekords te hou van die hoeveelheid en gehalte van werk wat verrig is, wat dan sou dien as maatstaf vir praktiese prestasie, het nie geslaag nie aangesien daar gevind is dat hierdie rekords nie objektief was nie.

Ambagstoetse is derhalwe ontwerp en blyk meer bevredigend te wees. Hierdie toetse is tans vir twee ambagte in drie verskillende organisasies voltooi en sal vir validasiedoeleindes gebruik word.

Daar is begin met werk i.v.m. die voorbereiding van 'n reeks toetse om leerling te kies vir die een-jaar kursus wat vakleerlingskap voorafgaan en wat volgende jaar by tegniese kolleges ingestel sal word.

### Beroepsevaluasie

'n Vraagstuk wat teengekom word in meeste liggame wat personeelnavorsing ondersteun, is die evaluasie van werkvereistes. Evaluasies van dié aard kan gebruik word om keuringstoetse en opleidingsprogramme te ontwerp; om bevorderings en bemanningsbeleide te ontwikkel; om lone te bepaal en om prestasievermoëskale op te stel. 'n Nuwe benadering tot die vraagstuk van beroepsevaluasie word tans deur die N.I.P.N. in 'n groot nywerheidsfirma uitgetoets. 'n Span wat hom toelê op die bestudering hiervan en wat bestaan uit werknemers van die betrokke firma wat onder leiding van die N.I.P.N. werk, is in die lewe geroep. Die metode waardeur die benodighede van elke besondere werk gereduseer word, is gedurende 'n voorlopige studie van 'n aantal tegniese betrekings uitgetoets en is bevredigend gevind. Werksbeskrywings sal nou verkry word van alle dagloners in die betrokke firma.

### Afwesigheid en arbeidsomset

Verdere verbeterings is aangebring aan die beheerkaart-apparaat wat vir die bestudering van afwesigheid ontwikkel is, en sal die roetiene-gebruik daarvan vergemaklik. Die apparaat is uitgetoets in ander departemente behalwe die een waarvoor dit oorspronklik ontwerp is, en daar is gevind dat dit algemeen toepasbaar is. Dit is ook bewys dat die gebruik daarvan nie beperk

### Selection and training of apprentices

Routine administration of selection tests to trade school students and to artisan apprentices for the Union Defence Force, various mines, engineering workshops and a few smaller organizations continued during the year.

Follow-up studies on the trade school pupils showed that the tests provide a good prediction of success in theoretical training. It has not been possible to validate them against technical college examinations for apprentices, as many do not trouble to pass these, and the attitudes of journeymen, supervisors and employers are often indifferent towards success in theory or "book-work", so that there is in fact little incentive for an apprentice to pass.

The attempt to use records of amount and quality of work done as a criterion of practical achievement did not succeed, as it was found that these records are not objective.

Trade tests were thereupon designed which appear to be more satisfactory. These have now been completed for two trades in three different organizations, and will be used for validation purposes.

Work has been started on the preparation of a battery of tests to select pupils for the one-year pre-apprenticeship training course which will be introduced at technical colleges next year.

### Job evaluation

A problem met with in most organizations sponsoring personnel research is the evaluation of job requirements. Such evaluations can be used to devise selection tests and training programmes, to develop promotion and manning policies, to set wages and to construct merit rating scales. A new approach to job evaluation is being tried out by the N.I.P.R. in a large industrial organization. A job-studies team has been set up consisting of employees of this organization, working under N.I.P.R. direction. The method of breaking down job requirements has been tried out in a pilot study on a number of technical jobs and has been found satisfactory. Job descriptions will now be obtained of all daily paid jobs in the organization.

### Absenteeism and labour turnover

Further improvements have been made in the control chart device developed for the study of absenteeism, which will facilitate its routine use. The device has been tried out in departments other than that for which it was originally constructed, and has been found generally applicable. It has been shown that its use is not confined to large organizations, and that it is equally

is tot groot organisasies nie, en dat dit tot klein homogene werkende groepe, van so min soos 50 persone, toegepas kan word. 'n Aantal hipotese betreffende die begrip van afwesigheidsgeneigtheid word eksperimenteel ondersoek.

Verdere werk is gedoen op die statistiek van arbeidsomset. Die voorbereiding van gegewens i.v.m. arbeidsomset vir wiskundige bestudering duur voort.

### Naturellestudies

Die eerste stadium in 'n studie van die Naturel se vermoë om handvaardigheid aan te leer, is voltooi. Die uitwerking wat vorige industriële ondervinding, toetssofisme, ras en persoonlikheid van die persoon wat die toets toedien, stam waartoe die naturel behoort en aansporing het op die aanleerspoed, is in 'n groep volwasse naturellemynwerkers bestudeer. Hoewel die resultate nog nie heeltemaal ontleed is nie, is dit duidelik dat vir hierdie besondere bevolkingsgroep geld 'n groter insentief is tot vordering as ander faktore.

Die ondersoek sal herhaal word op groepe wat verskil in ouderdom, geslag, mate van ontstamming, opvoeding en algemene intelligensie.

Werk is ook aan die gang om die uitwerking van ouderdom opvoeding, stamoorsprong, kontak met die westerse beskawing en voedingstoestand op die intelligensie en toetsprestasie te bepaal.

### Wechsler-Bellevuetoets

Dit was onmoontlik om vir die standardisering van hierdie toets 'n verteenwoordigende groep van die bevolking te kry deur om vrywilligers in die pers te vra of deur herstellende siekes in die hospitale te toets. Hoewel daar op die wyse 'n groot groep mense getoets is, was feitlik almal wat getoets is van gemiddelde of bo-gemiddelde intelligensie. Die Nasionale Raad vir Maatskaplike Navorsing het nou 20 beurse aangebied wat toegeken sal word aan na-graadse studente, waarvan daar van elkeen verwag sal word om 'n aantal persone, wat op voorafbepaalde wyse gekies is, te toets. Standardisering sal deur die N.I.P.N. uitgevoer word; maar, deur elke student toe te laat om toegang te hê tot die versamelde resultate vir hul eie gebruik in hul verhandelings, word daar gehoop om terselfdertyd 'n omvattende studie te voltooi van die toets se betroubaarheid, geldigheid en die waarde daarvan as diagnoseermiddel.

### Psigometriese studies

Die pas-gestigte Afdeling vir Psigometrika het 'n rekenkundige sub-toets wat ingesluit sal word in die her-standardisering van die Suid-Afrikaanse groepsverstandtoets, voltooi.

Die ondervinding het geleer dat die I.K., veral soos gemeet deur die S.A. Groepsverstandtoets blootstaan aan ernstige afwykings en dat dit ook her-standardiseer

applicable to small homogeneous working groups, down to about fifty cases. A number of hypotheses regarding the concept of absence proneness is being subjected to experimental verification.

Further work has been done on the statistics of labour turnover. The preparation of labour turnover data for mathematical study is proceeding.

### African studies

The first stage in a study of the African native's ability to acquire manual skill has been completed. The effect on speed of learning of previous industrial experience, test sophistication, race and personality of tester, tribal origin and incentive was studied in a group of adult native mine labourers. Though the results have not yet been fully analyzed, it is clear that for this particular population, the money incentive has a greater effect on the progress of learning than the other factors.

The investigation will be repeated on groups varying in age, sex, detribalization, education and general intelligence.

Work has also been started on determining the effects of age, education, tribal origin, contact with western civilization and nutritional condition on intelligence and aptitude test performance.

### Wechsler-Bellevue Test

It has been found impossible to standardize this test on a normal population sample, by appealing for volunteers through the press, or by testing volunteers among convalescent hospital patients. In a large sample obtained in this way, nearly all were of average or above average intelligence. The National Council for Social Research has now made 20 bursaries available, which will be awarded to post-graduate students, each of whom will be required to test a number of subjects, chosen in a predetermined manner. Standardization will be carried out by the N.I.P.R.; but by allowing each student to have access to the pooled results for dissertation purposes, it is hoped to complete at the same time a comprehensive study of the test's reliability, validity and diagnostic capacity.

### Psychometric studies

The newly formed Psychometric Division has completed an arithmetic sub-test, to be included in the re-standardization of the South African group intelligence test.

It has been shown that the I.Q., particularly as measured by the S.A. Group and Individual Intelligence Tests, is liable to a number of serious errors of measure-

moet word. Die negatiewe korrelasie tussen I.K. en familie-grootte wat elders waargeneem is, is vir Suid-Afrikaanse gegewens gestaaf. Dit is ook bewys dat Afrikaanssprekendes in die beantwoording van intelligensietoetse tot 'n mate deur omgewingsfaktore gestrem word. Om hierdie en ander redes, is dit voorgestel dat die konsep van die I.K. nie meer van waarde is nie en dat intelligensietoetse op dieselfde manier as aanlegtoetse gevalideer en gebruik moet word.

'n Studie van die uitwerking van die volgorde waarin die verskillende toetse gedoen word, op toetsprestasie, is voltooi.

Die standardisering van alle bestaande N.I.P.N. toetse word nagegaan, en klein afwykings, soos bv. verskille in die moeilikheidsgraad van alternatiewe toetse en skaalfoute word verwyder.

#### Navorsing na temperament

Die Afdeling Teoretiese Sielkunde het hom veral toegelê op die bestudering van temperament en die determinante daarvan. Die betroubaarheid van die waarneming wat gebruik word by die raming van temperament is ondersoek en die oorsake van verskillende soorte afwykings is nagespoor.

Die afdeling onderneem 'n groot hoeveelheid roetiene elektroensefalografiese ondersoekings vir hospitale, klinieke en privaat mediese praktisyns. Hierdie roetiene ondersoeke, tesame met eksperimentele werk wat op vrywilligers uitgevoer word, begin nou lig werp op die verhouding tussen sekere neuro-fisiologiese funksies en aspekte van temperament. Derhalwe is dit bewys dat alfafrekwenste verband hou met twee temperamentsveranderlikes wat die spoed, prikkelbaarheid, veranderlikheid en traagheidsvermoë van gedrag bepaal. (Alfafrekwenste is 'n kenmerkende ritme wat gewoonlik voorkom wanneer die oë gesluit is, maar wat deur visuele impulse of gesigsbeelde afgesluit word.) Fotiese stimulering, deur middel waarvan serebrale golfritmes opgewek kan word, lewer interessante reaksies waarvan dit gevind is dat hulle ooreenstem met die hipotese betreffende die temperamentsaanwysings van die E.E.G. Daar is ook op gewys dat adaptasiespoed in die elektrodermale-refleks definitief verband hou met alfafrekwenste. Hierdeur word die standpunt ondersteun dat hierdie verskynsels voortspruit uit die een of ander sentrale neurologiese prikkelingsfaktor—wat miskien een van die belangrikste determinante van temperament mag wees.

#### Wiskundige statistiek

Benewens die dienste wat dit lewer aan ander afdelings van die N.I.P.N. het die Afdeling Wiskundige Statistiek ook 'n aantal navorsingsprojekte van sy eie voltooi. 'n Metode is ontwikkel vir die doeltreffende berekening van die hoeveelheid individue wat 'n sekere afsnypunt in 'n vasgestelde statistiese bevolking oorskry. Heelwat

ment, and that the latter test is also in need of re-standardization. The negative correlation between I.Q. and size of family, observed elsewhere, was verified for South African data. It was also shown that Afrikaans speaking persons suffer a slight environmental handicap in the answering of intelligence tests. For these and other reasons, it was suggested that the concept of the I.Q. had outlived its usefulness and that intelligence tests should be validated and used after the manner of aptitude tests.

A study was completed of the effect on test performance of the order in which tests of various types are performed.

The standardization of all existing N.I.P.R. tests is being checked, and minor faults, such as differences in the difficulty of alternative forms and scaling errors are being removed.

#### Temperament research

The Theoretical Psychological Division has been predominantly concerned with the study of temperament and its determinants. The reliability of observational methods of temperament assessment has been investigated and the causes of various kinds of error have been traced.

This division carries out a good deal of routine electroencephalography for hospitals, clinics and private medical practitioners. These routine examinations, together with experimental work on volunteer subjects, are beginning to throw some light on the relationship between certain neuro-physiological functions and aspects of temperament. Thus alpha frequency has been shown to be connected with two temperament variables which determine the speed, stimulability, variability and inertia of behaviour. (Alpha frequency is a characteristic rhythm which generally emerges when the eyes are closed, but which is blocked by visual impulses or imagery). Photic stimulation, by means of which cerebral rhythms can be evoked, produces some interesting responses which have been found to be consistent with the hypothesis regarding the temperamental significance of the E.E.G. Adaption rate in the electrodermal reflex has also been found to be positively associated with alpha frequency, which further supports the view that these phenomena derive from some central neutral excitability factor, which may prove to be one of the major determinants of temperament.

#### Mathematical statistics

Apart from its services to other N.I.P.R. divisions, the Mathematical Statistics Division completed a number of research projects of its own. A method for the efficient estimation of the proportion of individuals exceeding a certain cut-off in a specified statistical population was developed. Extensive work has been

done on the estimation of the parameters in a new class of distributions obtained from some of the more uncommon infinite range frequency distributions, by restricting the range between two finite limits. A paper has also been completed on the estimation of the parameters of a log-normal distribution. A further study on the estimation of the correlation coefficient in the case of dichotomized populations has been completed. It was found that some of the results obtained in "probit analysis" could be used to find an "improved" G-coefficient and its sampling variance. Preliminary work has been carried out with the object of finding new ways in which to combine tests into batteries when it can be shown that the traditional procedures are only "most effective" when all variables are normal or in other special cases.

A critical survey of the literature on factor analysis has been completed.

#### Publikasies

Benewens talryke verslae aan ondersteuners, en in antwoord op navrae, het lede van die personeel ook 'n aantal verhandelings vir publikasiedoeleindes voltooi.

'n Boek, deur A. G. Arbous, Hoof van die Afdeling Industriële Navorsing, waarin die werk wat gedoen is op die keuring van administratiewe kwekelinge beskrywe word, is deur die Oxford University Press onder die opskrif *Selection for industrial leadership* gepubliseer.

'n Monografie oor 'n Reeks tabelle en grafieke vir die werkende eienskappe van keuringstoetsbatterye deur A. G. Arbous word gepubliseer en die manuskrip van 'n monografie *Nuwe tegnieke vir die ontleding van afwesigheidsgegewens* deur A. G. Arbous en H. S. Sichel is vir publikasie voorberei.

Vyftien artikels het gedurende die afgelope jaar in Suid-Afrikaanse en oorsese wetenskaplike en ander tydskrifte verkyn, en nog twaalf is vir publikasie aangeneem. Twee-en-twintig verhandelings deur lede van die personeel het in drie uitgawes van die *N.I.P.N. Bulletin* wat gedurende die jaar uitgegee is, verskyn.

Daar word soveel versoeke om die *N.I.P.N. Bulletin* ontvang dat dit oorwoë is om dit in gedrukte vorm teen 'n nominale inskrywingsfooi uit te gee. Reëlins vir uitruiling is met 'n aantal ander publikasies getref.

done on the estimation of the parameters in a new class of distributions obtained from some of the more uncommon infinite range frequency distributions, by restricting the range between two finite limits. A paper has also been completed on the estimation of the parameters of a log-normal distribution. A further study on the estimation of the correlation coefficient in the case of dichotomized populations has been completed. It was found that some of the results obtained in "probit analysis" could be used to find an "improved" G-coefficient and its sampling variance. Preliminary work has been carried out with the object of finding new ways in which to combine tests into batteries when it can be shown that the traditional procedures are only "most effective" when all variables are normal or in other special cases.

A critical survey of the literature on factor analysis has been completed.

#### Publications

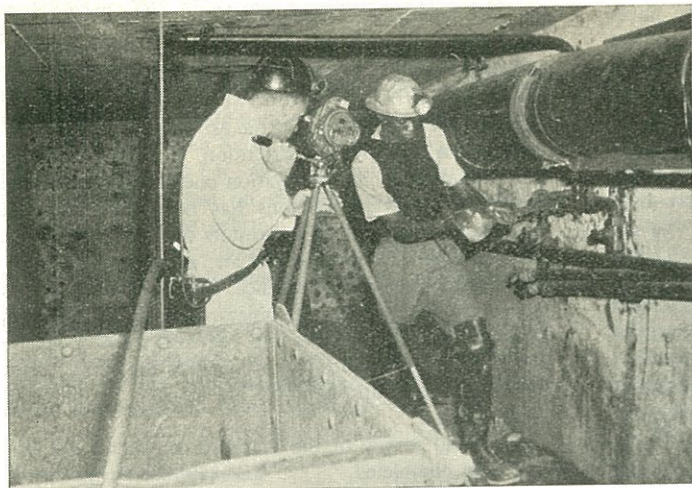
In addition to numerous reports to sponsors and in response to enquiries, staff members completed a number of manuscripts for publication.

A book, presenting the work done on the selection of administrative trainees by A. G. Arbous, head of the Industrial Research Division, is being published by the Oxford University Press under the title of *Selection for Industrial Leadership*.

A monograph on *A Set of Tables and Graphs for the Operating Characteristics of Aptitude Test Batteries* by A. G. Arbous is being published. The manuscript of another monograph, *New Techniques for the Analysis of Absenteeism Data* by A. G. Arbous and H. S. Sichel has been completed for publication as a C.S.I.R. monograph in 1953.

Fifteen articles appeared during the period under review in South African and overseas scientific and other journals, and a further twelve were accepted for publication. Twenty-two papers by staff members were published in three issues of the *N.I.P.R. Bulletin* which appeared during the year.

Many requests for the *N.I.P.R. Bulletin* are being received and consideration is being given to its publication in printed form and to a nominal subscription charge. Exchange arrangements have been made with a number of publications.

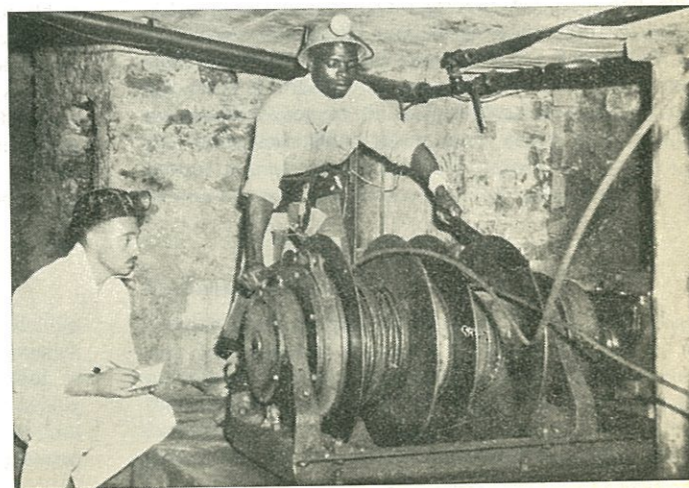
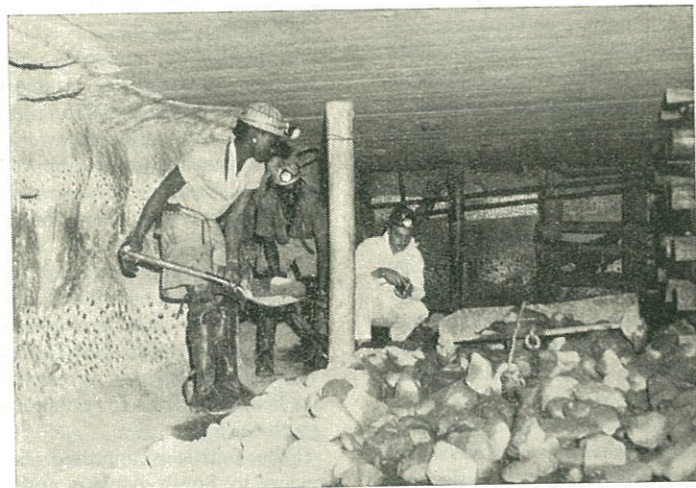


Analysis of work performance of Native Mineworkers in a mock-up stope.

Above: Cine-motionstudy of Native boy assembling waterblast pipes.

Centre: Studying motions of lashing boy.

Below: Job-analysis of winchdriver's duties.



Ontleding van die werkverrigting van naturelle-mynwerkers in 'n nagemaakte delfplek.

Bo: Rolprent-bewegingstudie van 'n natuurlejong besig om mynwatersproeiingspype aanmekeer te sit.

Middel: Bestudering van die bewegings van 'n naturellemynwerker wat klippe uit die delfplek wegruim.

Onder: Werksontleding van die taak van 'n hystoestelbestuurder.

## Mediese Navorsing

### Komitees

Die Mediese en Tandheelkundige Navorsingskomitee het eenkeer in Pretoria en eenkeer in Kaapstad vergader. Dr. G. W. Gale het afgetree van hierdie komitee en dr. E. H. Cluver se aanstelling het aan die einde van 1951 ten einde geloop en was hy ingevolge die bepaling van die konstitusie nie herkiesbaar nie. Die vakatures is onderskeidelik aangevul deur dr. J. J. du Prè le Roux, Sekretaris vir Gesondheid en prof. J. F. P. Erasmus van die Departement Chirurgie, Universiteit van Kaapstad. Dr. B. J. P. Becker van die Department Patologie van die Universiteit van die Witwatersrand het ingestem om op te tree as plaasvervangende lid van die komitee. Die Raad betuig sy dank aan lede van hierdie en ander advieskomitees vir hul hulp en advies.

Prof. S. F. Oosthuizen wat nog steeds optree as Ere-Sekretaris vir Mediese Navorsing het gedurende Julie en Augustus 1952 die Verenigde State van Amerika en die Verenigde Koninkryk besoek. Hy het gereeld alle mediese navorsingseenhede besoek en dit het baie daartoe bygedra dat die werksaamhede van al hierdie gedesentraliseerde eenhede so vlot verloop het.

Die Raad het met genoeg daarvan kennis geneem dat dr. G. M. Bull wat optree as Mediese Ere Skakelbeampte in die Verenigde Koninkryk benoem is tot Professor van Medisyne aan die Queen's Universiteit in Belfast, Ierland. Dr. Bull en dr. R. M. Kark, die Mediese Ere Skakelbeampte in die Verenigde State van Amerika, voorsien die Raad van inligting oor die jongste ontwikkelings op die gebied van mediese navorsing oorsee. Hierdie inligting wat aan ongeveer vyftig persone gestuur word, blyk van groot waarde te wees. Daar is in noue voeling gebly met mediese liggeme oorsee en sentraal Afrika.

### Skenkings

Die Raad erken met genoeg talryke skenkings, wat £128 14s. 6d. beloop, vir teringnavorsing. Hierdie fondse word uitsluitlik gebruik om die onkoste van die Tuberkulose Navorsingseenheid te dek.

### Mediese navorsingseenhede

Die Raad het 'n komitee in die lewe geroep om die organisasie en vooruitgang van die bestaande mediese navorsingseenhede krities in oënskou te neem en om te rapporteer oor enige ander sake wat dit nodig mag ag vir die bevordering van mediese navorsing.

Ingevolge die besoek van dr. C. H. Barlow, het die Unie Gesondheidsdepartement die aanbeveling van die Raad dat 'n mallakoloog aangestel moet word om die sistematiek, ekologie en biologie van slakke in hierdie land te bestudeer en wat in noue samewerking met die Raad se Bilharzia-Natuurgeskiedenis Navorsingseenheid sal werk, aanvaar. Hierdie pos is oral geadverteer.

## Medical Research

### Committees

The Medical and Dental Research Committee met once in Pretoria and once in Cape Town. Dr. G. W. Gale has retired from this committee and Dr. E. H. Cluver relinquished membership at the end of 1951 and in accordance with the constitution was not eligible for re-election for one year. Their respective places have been taken by Dr. J. J. du Prè le Roux, Secretary for Health and Prof. J. F. P. Erasmus of the Department of Surgery, University of Cape Town. Dr. B. J. P. Becker of the Department of Pathology, University of the Witwatersrand has agreed to act as an alternate member of the committee. The Council is most grateful to members of this and other advisory committees for their valuable help and advice.

Prof. S. F. Oosthuizen, who has continued as Honorary Secretary for Medical Research, visited the United States of America and the United Kingdom during July and August 1952. He visited all the medical research units periodically and this has done much to assist in the smooth administration of these decentralized units.

The Council was pleased to learn that Dr. G. M. Bull, who acts as Honorary Medical Liaison Officer in the United Kingdom, has been appointed to the Chair of Medicine at The Queen's University of Belfast. Dr. Bull and Dr. R. M. Kark, the Honorary Medical Liaison Officer in the United States of America, have continued to provide the Council with the latest information on medical research overseas. This information, which is distributed to about fifty persons, has proved to be of great value. Close contact has been maintained with medical institutions overseas and in central Africa.

### Donations

The Council has pleasure in acknowledging numerous donations, amounting to £128 14s. 6d., for tuberculosis research. These funds are used exclusively to defray expenses of the Tuberculosis Research Unit.

### Medical research units

The Council has appointed a committee to examine critically the organization and progress of the existing medical research units and to report on any other matters which it may consider desirable for the furtherance of medical research.

Following the visit of Dr. C. H. Barlow, the Union Health Department has accepted a recommendation by the Council for the appointment of a malacologist to study the systematics, ecology and biology of the snails of this country, working in close collaboration with the Council's Bilharzia Natural History Unit. This post has been widely advertised.

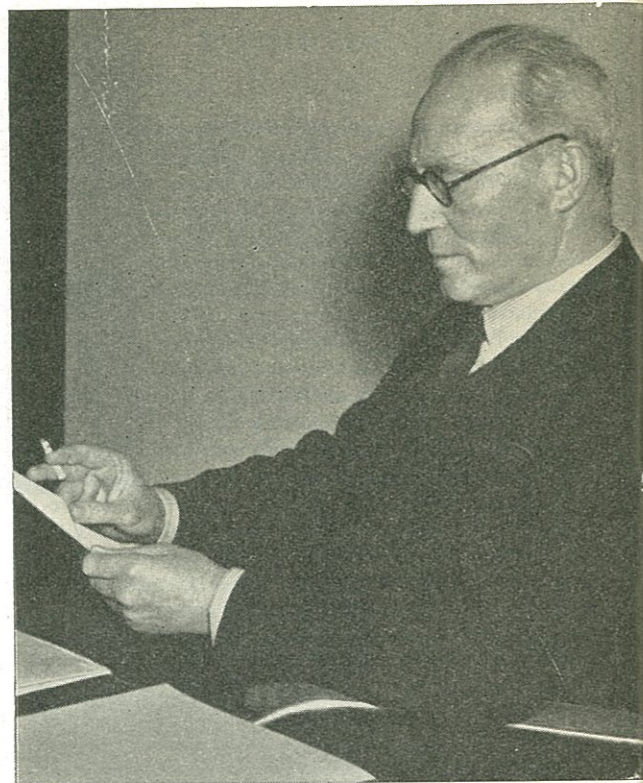
Dr. A. R. P. Walker, hoof van die voedingseenheid in die Nasionale Chemiese Navorsingslaboratorium het 'n aanstelling op die personeel van die Suid-Afrikaanse Mediese Navorsingsinstituut aanvaar, maar sal voortgaan met die direksie van die werk van die eenheid as 'n Navorsingseenheid vir Menslike Biochemie wat onder die Mediese en Tandheelkundige Navorsingskomitee ressorteer.

Die name van twee eenhede vir maatskaplike geneeskunde is verander ten einde die aard van hul werk binne die gebied van maatskaplike geneeskunde nader toe te lig. Die Durbanse eenheid is tans bekend as die Navorsingseenheid vir Gesinsgesondheid en die eenheid in Kaapstad as die Navorsingseenheid vir Kliniese Voeding.

Verslae van die hoofde van die eenhede word in die volgende afdelings gegee.

Right: Chairman of the Medical and Dental Research Committee, Dr. T. B. Davie, M.D., F.R.C.P., Principal and Vice Chancellor of the University of Cape Town.

Below: Honorary Secretary for Medical and Dental Research, Prof. S. F. Oosthuizen, M.D., D.Sc., F.R.C.P., F.F.R., President of the S.A. Mediese Raad, Professor of Radiology, University of Pretoria.



Bo: Voorsitter van die Mediese en Tandheelkundige Navorsingskomitee, dr. T. B. Davie, M.D., F.R.C.P., Prinsipaal en Vise-kanselier van die Universiteit Kaapstad.

Links: Ere-Sekretaris vir Mediese en Tandheelkundige Navorsing, prof. S. F. Oosthuizen, M.D., D.Sc., F.R.C.P., F.F.R., President van die S.A. Mediese Raad, Professor van Radiologie, Universiteit Pretoria.

Dr. A. R. P. Walker, head of a nutrition unit in the National Chemical Research Laboratory, has accepted an appointment on the staff of the South African Institute for Medical Research, but will continue to direct the work of the unit as a Human Biochemistry Research Unit under the Medical and Dental Research Committee.

The titles of two units on social medicine have been altered to indicate more clearly the nature of their work within the field of social medicine. The Durban unit is now the Family Health Research Unit and the Cape Town unit the Research Unit in Clinical Nutrition.

Reports by the heads of the units are given in succeeding sections.

## AMEBIASENAVORSINGSEENHEID, DURBAN

Erehoof van die Eenheid: Dr. R. Elsdon-Dew.

### Akkommodasie

Die King Edward VIII-hospitaal verskaf nog steeds akkommodasie en is ook verantwoordelik vir die verskaffing van meeste van die kliniese materiaal.

### Personeel

Ere-lede van die personeel:

Direkteur:	dr. R. Elsdon-Dew
Assistent-direkteur:	dr. T. G. Armstrong
Geneesheer:	dr. A. J. Wilmot

W.N.N.R. personeel:

Laboratoriumassistent:	mnr. M. I. van der Lingen
Sekretaresse:	mevr. S. I. Achurch.

Die Natalse Provinsiale Administrasie het ons tegevoetgekome deur toestemming te verleen aan sy personeel om ons met hierdie werk te help, veral moet melding gemaak word van die volgende laboratoriumpersoneel:

mnr. R. Horner
mnr. L. Friedman
mnr. D. A. Cameron
mevr. S. Maddison
mnr. A. Goodchild.

### Werkzaamhede

Die werkzaamhede kan weereens onder vier hoofde ingedeel word:

- Geneeskundige proewe
- Opnames
- Laboratorium-ondersoeke
- Lektuur en skakeldienste.

### Geneeskundige proewe

Daar is voortgegaan met die ondersoek van verskillende geneesmiddels en etlike verhandelings oor hierdie werk is gepubliseer. Ons het gevind dat sekere geneesmiddels waaraan aansienlike publisiteit gegee is ingevolge hul doeltreffendheid vir die behandeling van amebiasis, in die praktyk nie sulke goeie resultate lewer nie en dat behandeling met antibiotika sonder twyfel aangevul moet word deur behandeling met direkte ameba-dodende middele. Met hierdie doel voor oë is direkte ameba-dodende middele getoets en 'n verhandeling waarin die resultate beskryf word in die *Journal of Tropical Medicine and Hygiene* gepubliseer. Die doeltreffendheid van antibiotika by die behandeling van amebiasis hou direkte verband met die breedte van die anti-bakteriese spektrum. Dit was te verwagte aangesien dit bewys is dat die ameba deur baie verskillende bakterieë ondersteun word.

## AMOEBIAS RESEARCH UNIT, DURBAN

Honorary Head of Unit: Dr. R. Elsdon-Dew.

### Accommodation

King Edward VIII Hospital continues to provide accommodation and to supply the bulk of the clinical material.

### Personnel

Honorary:

Director:	Dr. R. Elsdon-Dew
Assistant Director:	Dr. T. G. Armstrong
Physician:	Dr. A. J. Wilmot

C.S.I.R.:

Laboratory Assistant:	Mr. M. I. van der Lingen
Secretary:	Mrs. S. I. Achurch.

The Natal Provincial Administration have been most generous in allowing its personnel to assist in this work, particularly the following laboratory staff:

Mr. R. Horner
Mr. L. Freedman
Mr. D. A. Cameron
Mrs. S. Maddison
Mr. A. Goodchild.

### Activities of the unit

As previously, activities may be classified into four headings:

- Therapeutic Trials
- Surveys
- Laboratory investigations
- Literature and liaison.

### Therapeutic trials

The Therapeutic Trials Unit has continued with trials of various drugs and there have been several publications in this respect. Certain drugs which have received a considerable amount of publicity as being of great value in the treatment of amoebiasis have not proved very valuable in our hands and there is no doubt that the antibiotic approach needs to be supplemented by a directly amoebicidal attack on the parasites. To this end drugs reputed to have a directly amoebicidal action were tested and a paper on these results has been published in the *Journal of Tropical Medicine and Hygiene*. The effectiveness of antibiotics in amoebiasis is related directly to the broadness of the anti-bacterial spectrum. This might have been anticipated from our finding that many different bacteria are able to support the amoebae.

## Opnames

Opnames duur voort maar die werk is vertraag deur gebrek aan sentrifugeerruimte. Aangesien ons Isospora van verskillende soorte in menslike feces aangetref het is 'n nie-omvattende opname gemaak van Durbanse honde, en is Isospora in party van hierdie diere aange-tref. Werk in hierdie rigting duur voort.

## Laboratorium-ondersoeke

Soos in die vorige verslag vermeld is, is die voor-bereiding van monobakteriese kweekbodems uiters moeilik en eksperimenteer ons tans volgens die beginsels van Rao en ander om 'n meer doeltreffende metode vir die kweek van hierdie kulture te vind. Meeste van die tegnieke het ten doel die sterilisering van die siste sonder dat hul daardeur vernietig word. Komplement-bindingsreaksies is op 'n groot aantal gevalle uitgevoer en hierdie resultate is met die kliniese bevindings ge-korrelleer. Hierdie resultate was besonder interessant. Kortliks kan hulle saamgevat word deur te konstateer dat in 'n hoë persentasie van gevalle waarvan dit bewys is dat hul aan amebiese disenterie ly, komplement-bindings-teenliggaampies nie gedemonstreer kan word nie maar dat daar 'n positiewe korrelasie bestaan tussen die duur van die siekte en die ouderdom van die pasient aan die een kant en die verskyning van positiewe resultate aan die anderkant. Gevalle wat waargeneem is het stygende titres getoon. Gevalle waarvan die lewer aangetas is toon meer positiewe reaksies en as 'n lewer-abses eers gevorm het, is die toets feitlik sonder uit-sondering positief. Dit wil dus voorkom asof die teenwoordigheid van teëliggaampies verband hou met die lewer-letsels en dat in party gevalle met amebiese disenterie daar 'n sub-kliniese leweraantasting bestaan. 'n Verhandeling oor hierdie onderwerp is tans ter perse. Ons het opgemerk dat die antigeniese faktor uit ons antigeen verwyder is deur filtrasie deur Seitz-filters en daar is begin met eksperimente om te sien of hierdie feit sal dien as leidraad tot die konsentrasie en reiniging van die antigeen volgens chromatografiese metodes.

Elektriese studies duur voort maar dit het ons tot dusvêr nog nie geluk nie om ware elektrotaksis in die ameba te verkry nie, hoewel dit keer op keer deur ons in ander parasiete gedemonstreer is. Dit is te wyte aan die feit dat die ameba 'n kruiper is en enige beweging wat dit mag maak is derhalwe nie dadelik waarneembaar nie. Ons het sekere stukke glasware ontwerp en gebou sodat die ameba oor 'n lang tydperk dopgehou kan word ten einde hierdie saak nader toe te lig. Verdere studies word gemaak van die oksiderings-reduksie-potensiaal van die eksudaat in amebiese disenterie en amebiese lewerabsesse. Hierdie proewe het tot dusvêr nog nie veel gevorder nie.

Navorsing na diagnoseermetodes duur voort. Onder-vinding wat deur ons opgedoen is m.b.t. die sink-sulfaat flotasië-tegniek is bekragtig, sowel deur opname

## Surveys

Survey work is continuing, but the progress has been slow because of the lack of centrifuge space. As we have been encountering Isospora of various types in human stools, we have carried out a small survey of Durban dogs and have located some of these Isospora in these animals. Work on this aspect is progressing.

## Laboratory investigations

As was pointed out in the last report, the preparation of monobacterial cultures is most difficult and we have been experimenting along the lines suggested by Rao and others to find a more effective method of obtaining such cultures. Most of these techniques are aimed at the sterilization of cysts without killing them.

Complement fixation reactions were carried out over a large series of cases and these have been correlated with the clinical findings. These results have proved most interesting. In brief, one may state that in a high proportion of cases of proved amoebic dysentery, complement fixing antibodies cannot be demonstrated, but there is a positive correlation between the length of the history or the age of the patient on the one hand and the appearance of positive results on the other. Cases under observation have been shown to have rising titres. Cases showing liver affection have higher degrees of positivity and when once a liver abscess has developed the test is almost universally positive. This rather suggests that the appearance of antibodies is probably to be related to liver infection, and that in some cases of amoebic dysentery there is a sub-clinical liver infection. A paper on this subject is in the press. We had noted that the antigenic factor was removed from our antigen by filtration through Seitz Filters and experiments have been started to see whether this fact will prove a clue to the concentration and purification of the antigen by chromatographic methods.

Electrical studies have continued, but as yet we have been unable to establish true electrotaxis in the amoeba, though this has been demonstrated repeatedly by us in other parasites. This is due to the fact that the amoeba is a crawler and any movement it may manifest is not immediately apparent. We have designed and constructed certain pieces of glassware with a view to allowing a long-term observation of the amoeba to prove or disprove this point. Further studies are being made of the oxidation-reduction potential of the exudates in amoebic dysentery and amoebic liver abscess. These experiments have not as yet proceeded very far.

Research into diagnostic methods is continuing. Our early experience of the value of the zinc sulphate flotation technique has been confirmed, both in the survey work, and in the finding of Isospora. A comparative trial of various types of flotation techniques is in hand at the moment. It seems probably that the use of detergents will be an improvement. Various aspects of

werk as deur die vind van Isospora. 'n Vergelykende proef van verskillende soorte flotasië-tegnieke is tans onderweg. Dit is moontlik dat die gebruik van reinigingsmiddels in hierdie proewe hul sal verbeter. Verskillende aspekte van kleuringstegnieke is ondersoek. Daar bestaan 'n groot behoefte vir 'n tegniek waardeur die interne struktuur van ameba van verskillende soorte sigbaar gemaak kan word. Die gebruiklike kleuringstegniek, volgens die metode van Heidenhain is omslagtig en het die verlies van parasiete ten gevolge.

## Erkennings

Ons bedank met genoeë die volgende liggame en persone:

Die Natalse Provinsiale Administrasie vir akkommodasie, personeel, fasiliteite en heelhartige same-werking

Die Departement Naturellesake en die Departement van Gesondheid van die Korporasie van die Stad Durban vir hul samewerking en vir die fasiliteite wat hul tot ons beskikking gestel het

Die lede van die Amebiase Navorsingskomitee wat altyd bereid was om hulp en advies te verleen

Die Personeelkomitee van die King Edward VIII-Hospitaal sonder wie se samewerking dit onmoontlik sou wees om kliniese materiaal te versamel.

## Publikasies

'n Lys van werk wat gepubliseer is verskyn onder Bylae IC. Die volgende verhandelings is vir publikasie voorgelê:

Antibiotics and amoebic dysentery

Amoebic complement fixation reaction

Terramycin in the treatment of amoebic dysentery.

## BILHARZIA-NATUURGESKIEDENIS-EENHEID, JOHANNESBURG

*Hoof van die Eenheid:* dr. B. de Meillon, S.A. Mediese Navorsingsinstituut.

## Personeel

Die eenheid het soos in die verlede gefunksioneer met mej. J. D. Tubbs en mnr. N. Stoffberg as wetenskaplike assistente. Soos in die laaste jaarverslag vermeld is, is navorsers van buite aangemoedig om gebruik te maak van die materiaal en fasiliteite wat deur die eenheid beskikbaar gestel is.

## Bloedverlies en hoeveelheid eiers in uriene-bilharzia

Die eenheid het saamgewerk met die Voedingseenheid van die Wetenskaplike en Nywerheidsnavorsingsraad wat verbonde is aan die Suid-Afrikaanse Mediese Navorsingsinstituut aan die probleem van bloedverlies by gevalle wat met *haematobium* besmet is. Terselfdertyd is die totale eier-produksie ook waargeneem. Hierdie werk is voltooi en vir publikasie voorberei.

staining techniques have been investigated. There is great need for a technique which will permit the visualization of the internal structure of amoebae of the various kinds. The standard technique of staining by Heidenhain's method is tedious and likely to result in loss of parasites.

## Acknowledgements

We have to place on record our thanks to the following bodies and individuals:

The Natal Administration for accommodation, staff, facilities and unstinted co-operation

The Native Affairs Department and Health Department of the Corporation of the City of Durban for co-operation and facilities

The Members of the Amoebiasis Research Committee who have always been prepared to give advice and help when asked

The Staff Committee of King Edward VIII Hospital, without whose co-operation it would be impossible to collect the clinical material we use.

## Publications

Published work is listed in Appendix IC. The following papers have been submitted for publication:

Antibiotics and amoebic dysentery.

Amoebic complement fixation reaction.

Terramycin in the treatment of amoebic dysentery.

## BILHARZIA NATURAL HISTORY UNIT, JOHANNESBURG

*Head of Unit:* Dr. B. de Meillon, South African Institute for Medical Research.

The unit has continued as before with Miss J. D. Tubbs and Mr. N. Stoffberg as scientific assistants. As noted in the last report, outside workers are encouraged to make use of the materials and facilities provided by the unit.

## Blood loss and egg load in urinary bilharziasis

The unit collaborated with the Nutrition Unit of the Council for Scientific and Industrial Research and the South African Institute for Medical Research on the question of blood loss in *haematobium* infections. At the same time observations on total egg production were made. This work has been completed and submitted for publication.

### Resultate van behandeling, ondersoek na 'n jaar

Naturellemynwerkers wat behandeling ontvang en wat dan na streke gestuur word waar bilharzia nie voorkom nie, is waargeneem. Hul word ongeveer een jaar later weer ondersoek.

Ongelukkig was daar nie tyd om al die besonderhede van behandeling te versamel nie en was die opgawes dus teleurstellend. Uit die 32 gevalle wat tot dusvêr weer ondersoek is, was ses gevalle nog besmet, d.w.s. lewende eiers is gevind by die ondersoek van 'n enkele urienemonster.

Dit is voordiehandliggend dat hierdie 'n enige geleentheid is om geneesmiddels uit te toets op mense by wie herinfeksie gedurende die proefperiode van een jaar uitgeskakel is. Hierbenewens stel die bobbejane wat vir die eenheid as proefdiere beskikbaar is die eenheid nog verder in staat om terapeutiese toetse uit te voer.

### Werk op bobbejane wat as proefdiere dien

Waarnemings is gemaak op 60 bobbejane wat vir proefdoeleindes besmet is. Meeste van hierdie werk is onderneem in verband met 'n kliniese bestudering van metodes vir vroeë diagnose.

Verdere resultate wat voorspruit uit hierdie werk en wat van belang mag wees, kan soos volg opgesom word:

### Eenslagtige infeksies

Deur slakke met 'n enkele *mansoni* miracidium te besmet, het ons eenslagtige cercariae geproduseer. Diere wat met cercariae van hierdie aard besmet is, lewer slegs eenslagtige wurms en, word eiers natuurlik nie in die feces gevind nie. Diere wat op dié manier besmet is, is deur ons gebruik in ons bestudering van metodes vir vroeë diagnose. Hierbenewens is materiaal vir histopatologiese bestudering ook versamel. Hoewel die studie nog nie voltooi is nie is dit reeds op hierdie stadium moontlik om te konstateer dat eenslagtige infeksies 'n bepaalde patalogie het en dat party van die idees wat algemeen aanvaar is gewysig sal moet word. Dit is veral interessant om te sien dat in teenstelling met die heersende opinie die eosinophilia soos deur ons in bobbejane wat vir die proewe gebruik is waargeneem is, nie die gevolg is van weefsels wat met eiers aangetas is nie, hoewel dit waargeneem word teen ongeveer dieselfde tyd wanneer die wurms normaalweg begin eiers lê in diere wat tweeslagtig besmet is.

### Die kleinste hoeveelheid cercariae wat 'n positiewe BCF uitlok

Ons was van mening dat dit belangrik is om te bepaal hoeveel cercariae nodig is om 'n positiewe komplementbindingsreaksie in besmette diere uit te lok. Hierdie werk is nog nie voltooi nie maar ons het gevind dat besmetting deur so min as tien cercariae 'n positiewe reaksie binne 3-4 weke nadat die gasheer besmet is

### Results of treatment assessed after one year

We are making observations on mine Natives who receive treatment and are then posted to areas free of bilharziasis. Approximately one year later they are re-examined.

Unfortunately there has not been time to get all the details of treatment and the returns are rather poor. Out of 32 cases so far re-examined six were shown to be still infected, i.e., passing viable ova on examination of a single urine specimen.

It is quite obvious that we have here a unique opportunity for testing out drugs in human beings where reinfection during the testing period of about one year is ruled out. This, in addition to the availability of monkeys as experimental animals, makes this unit a particularly suitable one for therapeutic tests.

### Work on experimental monkeys

Observations have been made on 60 experimentally infected monkeys. Most of this work was done in connexion with clinical studies on early diagnosis.

Other matters of interest arising out of this work may be summarized as follows:

### Unisexual infections

By infecting snails with a single *mansoni* miracidium we have produced cercariae of one sex only. Animals infected with such cercariae yield worms of one sex only and, of course, eggs are not passed in the faeces. Animals so infected have been used in our experiments on early diagnosis but in addition material has been collected for histopathological study. Although the study has not been completed it is possible to state at this stage that there is a definite pathology associated with unisexual infections and that some accepted ideas on the pathology of bilharziasis may have to be amended. It is of particular interest to note that, contrary to prevailing opinion, the eosinophilia, as observed by us in experimental monkeys, is not the result of tissue invasion by eggs although it appears at about the time that egg laying commences in bisexually infected animals.

### Least number of cercariae which will elicit a positive BCF

We have thought it important to find out what number of penetrating cercariae are required to elicit a positive complement fixation reaction in infected animals. This work is not completed but we have so far shown that penetration by as few as ten cercariae

lewer. Die resultate verkry van diere wat met kleiner hoeveelhede cercariae besmet is, is nog nie beskikbaar nie.

### Antigenes

Die moeilikheid wat ons ondervind het in die vervaardiging van voldoende cercarieële antigenes vir proefdoeleindes het daartoe gelei dat ons probeer het om volwasse wurms vir hierdie doel te gebruik. Skape wat vir proefdoeleindes besmet is, is eers gebruik vir die produksie van volwasse wurms maar die opbrengste was so teleurstellend dat ons uiteindelik bobbejane moes gebruik. Ongelukkig is daar gevind dat antigenes wat van volwasse wurms voorberei is nie spesifiek is nie en dat hul positiewe resultate lewer met in Wasserman-positiewe serum. Pogings word tans aangewend om die gemene faktor uit hierdie antigeen te verwyder.

### Slakke wat in die laboratorium besmet is

'n Interessante waarneming wat gemaak is, is dat dit bewys is dat *Planorbis*-slakke van Ngamiland vatbaar is vir laboratoriumbesmetting met *mansoni*. Die Ngamilandse vleie het 'n reusagtige slakbevolking maar daar is absoluut geen tekens van menslike bilharzia nie. Die feit dat 'n moontlike draer daar voorkom is natuurlik van die uiterste belang vir die Bechuanalandse Regering veral daar hierdie gebied bestem is vir verdere ontwikkeling en moontlik vir digter bewoning.

Die feit dat siektes nie voorkom nie hoewel moontlike draers in Suid-Afrika teenwoordig is, is 'n saak wat keer op keer reeds benadruk is. Dit word gewoonlik aangeneem dat siektes nie voorkom nie omdat dit nog nie ingevoer is nie. Dit is derhalwe nodig dat alle moontlike draers in Suidelike Afrika deeglik ondersoek moet word.

### Opname: Witkoppen

In samewerking met dr. J. A. Kieser en die Buitestedelike Gesondheidsraad sal 'n opname gemaak word van Naturellekinders wat in die Witkoppen omgewing woon. Hierdie omgewing is swaar besmet met *bovis*. Na byna twee jaar se waarneming het ons gevind dat gemiddeld 20% van *Physopsis* besmet is. Die hoogste graad van besmetting was 40% en die laagste 9%. Dit behoort 'n end te maak an die vraag of *bovis* vir die mens van belang is.

Indien *bovis* skadeloos vir die mens blyk te wees, is ons voornemens om miracidia van hierdie spesies te gebruik om *Physopsis* in sekere omgewings te beheer. Ons het gevind dat baie slakke doodgaan, veral die jongeres wanneer hul met slegs 'n enkele miracidium besmet is. Dit is moontlik dat *Physopsis* heeltemaal uitgeroei kan word in 'n dam wat herhaalde kere met *bovis*-eiers behandel is. Indien die poging slaag, sal hierdie metode in die praktyk toegepas kan word onder omstandighede waar gewone slakdodende middels nie gebruik kan word nie.

produces a positive result in 3-4 weeks after infection of the host. The results on animals infected with smaller numbers of cercariae are not yet to hand.

### Antigenes

Our difficulties in producing sufficient cercarial antigen for experimental purposes has led us to attempt the use of adult worms for this purpose. Experimentally infected sheep were first used for the production of adult worms but the yields were so disappointing that monkeys were finally substituted. Unfortunately we have found that antigens prepared from adult worms are not specific and give a positive with a Wasserman positive serum. Attempts are being made at the present moment to remove the common factor from this antigen.

### Laboratory infection of snails

One interesting observation is that *Planorbis* snails from Ngamiland have been proved to be susceptible to laboratory infection with *mansoni*. The Ngamiland swamps have a huge snail population but there is absolutely no evidence of human bilharziasis. The fact that a potential vector occurs there is naturally of very great importance to the Bechuanaland Government, especially since the area has been earmarked for development and possible closer settlement.

The absence of disease in the presence of a potential vector in Southern Africa is a matter to which we have repeatedly drawn attention. The usual assumption is that the absence of disease means that it cannot occur, whereas it may be absent because it has not yet been introduced. It seems essential that all potential vectors should be investigated in Southern Africa.

### Survey: Witkoppen

In collaboration with Dr. J. A. Kieser and the Peri-Urban Health Board, a survey is to be made of Native children living in the Witkoppen area. This area is very heavily infested with *bovis*. After nearly two years of observation we have found an over-all average of about 20% of *Physopsis* to be infected. The highest rate observed was 40% and the lowest 9%. This should settle the question as to whether *bovis* has any importance for man.

Should *bovis* appear to be harmless for man then we propose to use miracidia of this species for controlling *Physopsis* in a selected area. We have found that there is heavy mortality among snails, especially young ones, when infected with even a single miracidium. It is possible that *Physopsis* may be completely exterminated in a dam by repeated additions of *bovis* eggs. If successful, such a method might have a practical application in certain circumstances where ordinary molluscicides cannot be used.

#### Geneeskundige proewe op laboratorium-diere

Dr. J. A. Kieser se werk op hierdie onderwerp duur voort en hy maak tans 'n verhandeling daarvoor persklaar.

Kortliks kan gesê word dat geeneen van die geneesmiddels wat algemeen gebruik word witrotte wat met *bovis* of *mansoni* besmet is kan genees nie. Dit bevestig die werk wat ons op bobbejane uitgevoer het.

Gedurende werk wat verrig is op 'n probleem wat heeltemaal geen verband hou met hierdie werk nie, is dit opgemerk dat dicoumarol wat aan die gasheer mondeling toegedien is 'n duidelike uitwerking het op die volwasse schistosome. In een van die skape byvoorbeeld, was 'n groot hoeveelheid van die wurms wat na die dood van die skaap ondersoek is, almal reeds dood of op die punt daarvan om dood te gaan. Hierdie interessante waarneming word verder opgevolg.

#### Ekologiese opname

Dit was onmoontlik om veel werk in hierdie rigting te doen. Mnr. W. D. Oliff van die Pes-Navorsingslaboratorium het egter 'n paar noukeurige opnames gemaak van die waterskeiding noord van Johannesburg. Hy het gevind dat *Physopsis* slegs plek plek voorkom. Slakke mag in die een stroom of dam gevind word en nie in 'n ander in dieselfde omgewing nie. Dit is derhalwe duidelik dat omgewingsfaktore, gunstig of ongunstig, baie met die saak te doen het maar wat hul presies is, is vir ons heeltemaal onbekend.

'n Dergelike opname is 'n paar jaar gelede gemaak deur dr. R. L. Davidson van die Universiteit van die Witwatersrand en mnr. N. J. Mentz wat destyds in my departement was. Hierdie twee navorsers het die water chemies laat ontleed en het ook alle plantegroei wat gevind is uitgeken. Hul het uiteindelik tot die besluit geraak dat hul nie die faktore wat verantwoordelik is vir die onsamehangende verspreiding van slakke kon bepaal nie.

#### Vroeë diagnose van bilharzia

Heelwat werk is hierinverband gedoen en 'n verhandeling is persklaar gemaak.

#### Erkennings

Ons betuig met genoeë dank aan die Pes-Navorsingslaboratorium in Johannesburg en aan die Malaria-Navorsingstasie, Tzaneen, beide van die Unie Gesondheidsdepartement vir hul hulp en bystand.

#### KARDIO-PULMONALE NAVORSINGSHEID, JOHANNESBURG

*Hoof van die Eenheid:* Professor G. A. Elliott, Universiteit van die Witwatersrand.

Werk wat gedurende die jaar verrig is word gedeeltelik weerspieël in die volgende verhandelings wat persklaar gemaak word:

#### Therapeutic tests in laboratory animals

Dr. C. D. Kisner has continued his work on this subject and he is in the process of writing a report for publication.

Briefly it may be said that none of the accepted therapeutic drugs produce cure in white mice infected with *bovis* or *mansoni*. This is in complete agreement with our work on monkeys.

During the course of work on a quite unrelated question, it was noticed that dicoumarol when given to the host orally, had a marked effect on adult schistosomes. In one sheep for instance the large number of worms recovered at post mortem were all dead or moribund. This interesting observation is being followed up.

#### Ecological survey

Little work in this direction has been possible. Mr. W. D. Oliff of the Plague Research Laboratory, however, made some detailed observations in the watershed north of Johannesburg. He had found the distribution of *Physopsis* to be extremely patchy. Snails may be found in one stream or dam and not in another in the same vicinity. Obviously some environmental factors favourable and unfavourable are responsible but what these are is quite unknown to us.

A similar survey was made some years ago by Dr. R. L. Davidson of the Witwatersrand University and Mr. N. J. Mentz. These two workers had chemical analyses of waters made and identified all associated plants. They concluded finally that they could not determine the factors responsible for discontinuous snail distribution.

#### Early diagnosis in bilharziasis

A considerable amount of work has been done on this subject, and a paper has been prepared for publication.

#### Acknowledgements

It is a pleasure to record the help and assistance received from the Plague Research Laboratory, Johannesburg and the Malaria Research Station, Tzaneen—both of the Union Health Department.

#### CARDIO-PULMONARY RESEARCH UNIT, JOHANNESBURG

*Head of Unit:* Professor G. A. Elliott, University of the Witwatersrand.

#### Papers in preparation

Eisenmenger's Complex. Clinical and Cardiac Catheterization Findings in Six Cases.

Die Kompleks van Eisenmenger. Kliniese en harte-kateterasie-bevindings in ses gevalle.

Geïsoleerde longslagaarvernouing. Bevindings in agt gevalle.

Oop *ductus arteriosus*. 'n Verslag van 22 gevalle. Samepersing van die aorta.

Die asemhalingsverskille wat waargeneem word by Hoog-frekwente Ballistokardiogramme van normale persone. (Bestudering van 130 gevalle.)

'n Vergelyking van hartvermoeë soos bereken uit Hoog-frekwente en Laag-frekwente Ballistokardiogramme van dieselfde persone. (Bestudering van 80 gevalle.)

Die uitwerking van asemhaling op Hoog-frekwente Ballistokardiografiese patrone.

Die uitwerking van binne-spiersse toediening van C.5968 op die hart-bloedvatsisteem—uitgevoer op 'n reeks gevalle wat aan drukverhoging ly. (In samewerking met dr. B. Goldberg en dr. M. M. Zion.)

Pulmonêre-vaskulêre weerstandvermoeë in myter-aandoenings. 'n Fisiologie bestudering van 8 gevalle.

Die ontwikkeling van 'n formule vir die voorspelling van respiratoriese dooie ruimte (Gebaseer op 'n berekening van dooie ruimte in 100 gevalle).

Hierbenewens word die volgende kommentaar gelewer.

#### Ballistokardiografie

Die ballistokardiograaf geniet nog steeds die aandag van die mediese pers. Volgens ons mening, en ingevolge 'n resultaat wat verkry is van werk wat tans aan die gang is in die Eenheid vir Kardio-pulmonale Navorsing, word onjuiste gevolgtrekkings in die praktyk toegepas, en is dit derhalwe noodsaaklik dat die perke van hierdie metode van ondersoek deeglik ondersoek moet word. Die gebruik van hierdie ondersoekingsmetode van kardio-vaskulêre dinamika is van fundamentele belang. Werk wat tans aan die gang is, kan soos volg opgesom word:

#### (i) Kliniese Ballistokardiografie

Ballistokardiogramme, laag-frekwente sowel as hoog-frekwente word versamel vir alle soorte van kardio-vaskulêre kwale. Aandag is veral gegee aan die ballistokardiogram wat verkry word in kransslagaar-aandoenings insoverre 'n aantal onlangse verslae waarin die noodsaaklikheid daarvan beklemtoon is in oorseese publikasies verskyn het. 'n Verhandeling oor die gebruik van hoog-frekwente Ballistokardiografie vir die diagnose van kransslagaar-aandoenings is gelees gedurende die Hartkwaal-konferensie wat gedurende Mei 1952 deur die Studente Mediesevereniging gehou is.

Isolated Pulmonic Stenosis. Findings in Eight Cases. Patent Ductus Arteriosus. A Report of 22 Cases. Coarctation of the Aorta.

The Respiratory Variation in the High Frequency Ballistocardiograms of Normal Subjects. (Studies on 130 Cases.)

A Comparison of Cardiac Outputs Calculated from High Frequency and Low Frequency Ballistocardiograms on the same subjects. (Studies on 80 Cases.)

The Effects of Respiration on High Frequency Ballistocardiographic Patterns.

The Cardiovascular Effects of Intramuscular Administration of C.5968 in a Series of Hypertensive Cases. (In collaboration with Drs. B. Goldberg and M. M. Zion.)

Pulmonary Vascular Resistance in Mitral Disease. A Physiological Study in Eight Cases.

The Development of a Formula for the Prediction of Respiratory Dead Space (Based on estimation of Dead Space in 100 Subjects).

Work in progress is reflected partly in the heading of "papers in preparation". Additional to this, the following comments are made:

#### Ballistocardiography

The Ballistocardiograph continues to receive much attention in the medical press. In our opinion, and as a result of work in progress in the Cardio-Pulmonary Unit, false conclusions are being applied in practice, and it is important that the limitations of the methods of investigation should be thoroughly investigated. The use of this method of investigation of cardiovascular dynamics is of fundamental importance. Work in progress is summarized as follows:

#### (i) Clinical Ballistocardiography

B.C.G.'s both low-frequency and high-frequency are being collected in all varieties of cardiovascular cases. Special emphasis has been given to the ballistocardiogram in coronary artery disease, in that several recent reports stressing its value have appeared in the overseas literature. A paper on the use of the high-frequency B.C.G. in the diagnosis of coronary artery disease was read at the Cardiac Conference held by the Students' Medical Society in May, 1952.



(ii) Eksperimentele en diere-ballistokardiografie

- (a) 'n Klein Ballistokardiografiese tafel met 'n verstelbare frekwensie-beheerapparaat is in gebruik geneem vir die uitbreiding van eksperimentele werk op diere, bv. honde en bobbejane. In samewerking met die Departement Chirurgie is etlike honde tot dusvêr ondersoek. Die tegniek en standardisering word verbeter. Resultate verkry van werk wat tot dusvêr gedoen is, is bemoedigend en daar word gehoop dat die metodes wat gebruik is van waarde sal wees in die ontleding van die grondbeginsels van ballistokardiografie.
- (b) Elektroniese analise van snelheid, versnelling en massafaktore in die ballistokardiogram. Daar is begin met die aanvoerwerk wat die ontwikkeling van hierdie metode voorafgaan en ons fisikaadviseur werk tans aan voorlopige stroombane.
- (c) Die ballistokardiograaf en babas. Deur gebruik te maak van die klein tafel het ons in samewerking met die Kindergeneeskundige by die Baragwanathse Hospitaal die ballistokardiogramme van ondervoede kinders geregistreer. Ons is voornemens om hierdie tegniek in die algemeen te ontwikkel; tans word dit gebruik om die verandering in hartvermoeë wat plaasvind by hierdie babas gedurende behandeling te bereken.
- (d) Die ballistokardiograaf by die berekening van die werking van geneesmiddels. In samewerking met dr. M. Suzman is die ballistokardiograaf gebruik as deel van 'n ondersoek wat gedoen word op etlike gevalle wat aan drukverhoging ly om die werkverrigting van 'n nuwe geneesmiddel C.5968 te ondersoek.
- (e) Die respiratoriese wisseling in die hoog-frekwente ballistokardiogram. Tagtig gevalle wat op rekord was is ontleed met die oog op die sogenaamde „confused record”. Ons resultate dui daarop dat, in teenstelling met wat algemeen aangeneem word, hierdie „verwarring” direk toegeskryf mag word aan asemhalingsstote en nie aan kardiaal uitstotingsfaktore nie. Verdere eksperimente moet egter uitgevoer word ten einde die faktore wat respiratoriese wisseling veroorsaak te bepaal.

Respiratoriese funksie

Die russtroom-longvolumeapparaat is in gebruik geneem. Ykingskurves is uitgewerk sodat Funksionele Oorblywende Lug direk gelees kan word.

Spirometrie, metings van longvolume en uitruiling is volgens ons mening onvoldoende vir die roetiene berekening van pulmonale funksie nie. Drie addisionele toetse is derhalwe bygevoeg tot die roetiene toetsbattery:

(ii) Experimental and animal ballistocardiography

- (a) A small B.C.G. table with a variable frequency control has been put into use with an electronic pick-up for the development of experimental work on animals, e.g., dogs and monkeys. Several dogs have been done up to the present, working in conjunction with the Department of Surgery. The technique and standardization are being improved. As far as this work has gone, it is encouraging and it is hoped the methods will be of value in the analysis of the fundamentals of ballistocardiography.
- (b) Electronic analysis of velocity, acceleration and mass factors in the ballistocardiogram. The initial development of this method has been started and our physicist adviser is busy with preliminary circuits.
- (c) The ballistocardiograph in infants. Using the small table we have, in conjunction with the Paediatrician at Baragwanath Hospital, recorded the B.C.G.'s of malnourished infants. Our aim is to develop this technique in general; at present the method is being used to estimate the changes in cardiac output occurring in these infants under treatment.
- (d) The ballistocardiograph in the assessment of drug action. In co-operation with Dr. M. M. Suzman, the B.C.G. has been used as part of an investigation on several hypertensive cases in the assessment of a new antihypertensive drug C.5968.
- (e) The Respiratory variation in the high frequency ballistocardiogram. Eighty cases from the records have been analysed from the point of view of the so-called “confused record”—our results seem to show that the “confusion” may be primarily due to respiratory impacts directly and not, as is claimed by some investigators, due to cardiac ejection factors. Further experimental work is required in this field to establish what factors are operating in the respiratory variation.

Respiratory function

The closed circuit lung volume apparatus was put into commission. Calibration curves were worked out so that Functional Residual Air could be read off directly.

Spirometry, measurements of lung volume and mixing indices were thought to be inadequate for the routine assessment of pulmonary function so three additional tests were added to the routine battery use:

- (a) Toets van lugtoevoer gedurende stap.
- (b) Oksimetrie—bestudering van die uitwerking van oormatige lugtevoer, oefening en O<sub>2</sub> inademing op die rustende O<sub>2</sub>-versadiging.
- (c) In party gevalle, CO<sub>2</sub>-inhoud van slagare gedurende rus en na oefening, oormatige lugtoevoer en inademing van suiwer O<sub>2</sub>.

Daar is altesaam 136 gevalle bestudeer en sal in 'n besondere verslag saamgevat word.

VOEDINGSNAVORSINGSEENHEID,  
JOHANNESBURG

Hoof van die Eenheid: Prof. J. Gillman, Universiteit van die Witwatersrand.

Die Gesamentlike Voedingsnavorsingseenheid bestaan uit die volgende personeel:

- Professor J. Gillman  
Dr. T. Gillman  
Dr. C. Gilbert  
Dr. S. Cohen  
en die tegniese personeel:  
Mevr. I. Spence  
Mnr. R. Herman  
Mnr. J. Nach  
Mej. Michaelis (Tydelik)  
Mnr. Mcinga, en  
Mnr. Matsheka.

VOEDING

Die lewensloop met betrekking tot voeding

Ingevolge ons aanvoerwerk op die uitwerking van voeding op die lewensloop van die mens, wou dit voorkom dat die siektevoorkomssyfer in enige gemeenskap direkte verband hou met diëet. In 1948 is daar begin met 'n eksperiment van 'n lang-termyn aard ten einde die rol van diëet te bepaal in die wysiging van die siektevoorkomssyfer wat voorkom in 'n groep van ons Wistar-stam albino rotte. Die eerste fase van die eksperiment is voltooi en die gegewens persklaar gemaak.

Ons ontleding van die gegewens is gebaseer op post-mortem en histologiese bevindings in 'n groep van 200 rotte. Met uitgang van 1952 sal hierdie getal op ongeveer 500 te staan kom.

Ons rotte, soos die van die Amerikaanse navorsers, spruit voort uit die Wistar-stam. Met hierdie feit in gedagte is dit duidelik dat die verbasende verskil in die voorkomssyfer van tumore alleen toegeskryf kan word tot klimaats- en diëetkundige faktore. Ten einde te onderskei tussen die aandeel van diëet en klimaat, is twee groepe rotte (120 in elke groep) aan die begin van 1952 op twee heeltemal verskillende, dog heeltemal gebalanseerde diëte geplaas. Aan die einde van 1954 behoort die resultate van hierdie eksperimente die funksie van diëet in die beïnvloeding van die siekte-spektrum in ons stam rotte aan te dui.

- (a) Walking ventilation test.
- (b) Oximetry—studying the effect of hyperventilation, exercise and O<sub>2</sub> breathing on the resting O<sub>2</sub> saturation.
- (c) In some cases arterial CO<sub>2</sub> content at rest and following exercise, hyperventilation and pure O<sub>2</sub> breathing.

The actual number of cases studied is 136 which will be subject to a special report.

NUTRITION RESEARCH UNIT, JOHANNESBURG

Head of Unit: Professor J. Gillman, University of the Witwatersrand.

The Joint Nutrition Research Unit consists of the following personnel:

- Professor J. Gillman  
Dr. T. Gillman  
Dr. C. Gilbert  
Dr. S. Cohen  
and the technical staff:  
Mrs. I. Spence  
Mr. R. Herman  
Mr. J. Nach  
Miss Michaelis (Temporary)  
Mr. Mcinga, and  
Mr. Matsheka.

NUTRITION

The life track in relation to nutrition

Following on our preliminary studies on the effect of nutrition on the life track in man, it seemed that the spectrum of disease observed in any community was closely related to diet. In 1948, a long-term experiment was initiated to examine the rôle of diet in modifying the pattern of disease occurring in a population of our particular Wistar strain of albino rats. The first phase of the experiment has been concluded and the data prepared for publication.

Our present analysis is based on post-mortem and histological findings in a group of 200 rats. By the end of 1952 the numbers will be brought up to approximately 500.

Our rats, like those of the American workers, were derived from the Wistar strain. Bearing this in mind, it is apparent that the remarkable difference in the incidence of tumours can only be ascribed to climatological and dietary factors. In order to discriminate between the rôle of diet and of climate, two groups of rats (120 in each group) were placed on two totally different but balanced diets, at the beginning of 1952. By the end of 1954 the results of these experiments should disclose the rôle of diet in influencing the spectrum of disease in our strain of rats.

Die omvattende genealogiese gegewens wat versamel is sal ons in staat stel om die voorkomssyfer van verskillende soorte siektes in families te korreleer. Die versameling van hierdie gegewens is onontbeerlik vir die interpretasie van enige ander eksperimentele werk wat op rotte uitgevoer word.

#### Ekperimentele lewersiektes

- (a) *Lewernekrose*. Nadat daar vasgestel is dat brouersgis en voedselgis die voorkomssyfer van lewernekrose verskillend beïnvloed, is daar begin met 'n reeks ondersoeke ten einde die grondslag van hierdie verskil te bepaal. Ons eksperimente het afdoende bewys gelewer dat dit moontlik is om lewernekrose op verskillende en oënskynlik onverwante maniere te verwek. Die probleem van lewernekrose is dus veel meer ingewikkeld as wat deur werkers in ander dele van die wêreld aange- neem word.
- (b) *Lewerkarsinoom*. Deur die samewerking van dr. A. Soiero van Lourenco Marques word menselewers nog steeds aan ons vir ondersoek gestuur. Die hoë voorkomssyfer van primêre lewerkarsinoom is opmerkenswaardig. Uit hierdie lewers kon ons ten minste een moontlike gevolg in die patogeenese van lewerkarsinoom vasstel.
- (c) *Lewerfibrose*. Uit 'n reeks van 70 eksperimente wat gedurende 1951 uitgevoer is kon ons aantoon dat uitgebreide vernietiging van die lewer wat te wyte is aan diëetkundige faktore nie vanselfsprekend deur fibrose gevolg word nie.
- (d) *Nekrose en herstelling van die lewer*. Ons het bewys dat massiewe lewernekrose wat te wyte is aan diëetsfaktore nie noodwendig aanleiding gee tot lewernekrose nie. Algehele herstelling van die lewerstruktuur kan teweeggebring word deur geskikte diëet. Daarenbove mag die bindweefsel heeltemaal verdwyn selfs nadat lewerfibrose ontwikkel het. Die faktore wat die onverwagte tussenkoms van fibrose in 'n nekrotiese lewer beheer, is ondersoek.

#### Voeding en die long

Ingevolge sy besondere struktuur word dit algemeen aangeneem dat die longe uitsluitlik verantwoordelik is vir die vloeï van gase in die bloedsomloop. Volgens gegewens wat deur ons in die laboratorium versamel is, is dit duidelik dat dit moontlik is om deur voedingstegnieke 'n long buite werking te stel en om 'n long-abses te veroorsaak. Dr. S. Cohen het gewys dat, in teenstelling met wat algemeen aangeneem word, die long 'n uiters belangrike aandeel het in die vervaardiging van fibrinogeen. Resultate deur hom verkry dui daarop dat die fibrinogeen wat in omloop is heeltemaal elke veertien minute hernu word.

The massive genealogical records which have been accumulated will allow us to correlate the familial incidence of various types of diseases. The accumulation of these data is essential for the interpretation of any other experimental work on rats.

#### Experimental liver disease

- (a) *Necrosis of the liver*. Having established that brewer's yeast and food yeast do not promote the same incidence of hepatic necrosis, a series of investigations was launched to discover the basis for this difference. Our experiments have shown conclusively that it is possible to produce hepatic necrosis in a number of different and seemingly unrelated ways. The problem of liver necrosis, therefore, is much more complicated than is claimed by workers in other parts of the world.
- (b) *Carcinoma of the liver*. With the collaboration of Dr. A. Soiero of Lourenco Marques, human livers continue to be forwarded to us for examination. The high incidence of primary carcinoma of the liver is noteworthy. From these livers we have been able to reconstruct at least one likely sequence in the pathogenesis of hepatic carcinoma.
- (c) *Fibrosis of the liver*. From a series of 70 experiments conducted during 1951, we have shown that extensive destruction of the liver of dietary origin is not automatically followed by fibrosis.
- (d) *Necrosis and regeneration of the liver*. We have demonstrated that massive necrosis of the liver of dietary origin need not necessarily be followed by hepatic fibrosis. Complete restitution of liver structure can be promoted by suitable dietary measures. Moreover, even after fibrosis has developed in a liver, the fibrous tissue may disappear completely. The factors determining the supervention of fibrosis in a necrotic liver have been examined.

#### Nutrition and the lung

By virtue of its peculiar structure, the lung is believed to be concerned exclusively with promoting the flow of gases to and from the circulation. Evidence we have accumulated in the laboratory shows that it is possible, by nutritional techniques, to collapse the lung and to cause lung abscess. Dr. S. Cohen has shown that, contrary to established views, the lung plays a crucial role in the production of fibrinogen. His results also indicate that the fibrinogen in the circulation is completely renewed every fourteen minutes.

#### Die voedingswaarde van mielies

Hierdie vraagstuk word naartiglik ondersoek. In onlangse biologiese eksperimente het ons daarop gewys dat die verryking van mielies 'n besonder ingewikkelde probleem is. Hoewel mielies sonder twyfel ryk is aan kalorieë, nuttige proteïene, vette, soute en vitamïene, dui ons eksperimente daarop dat tensy die hoeveelheid mielies in die diëet tot minder as 60% verminder word, voedingsiekte in die een of ander vorm vroeg reeds in die lewe van die proefdier sal intree.

Ons eksperimente op rotte is tans uitgebrei tot bobbejane. Ons het tandbederf in 'n ernstige graad asook tandvleisletsels waargeneem in 'n hele klomp van die bobbejane wat op verskillende diëete is. Dit dui daarop dat die bobbejaan waarskynlik 'n uitstekende primaat-proefdier mag wees vir navorsing na die etiologie van tandheelkundige siektes.

Daar word gehoop dat van nou af bobbejane alhoem- meer gebruik sal word vir diëetkundige proewe.

#### VOORTPLANTINGSFISIOLOGIE

##### Diëet en die menstruele siklus

Deur die diëet op verskillende maniere te verander kon ons grondige steuringe in die menstruele siklus van bobbejaanwyfies teweegbring. Hierdie studies in die bobbejaan sal ons in staat stel om met groter noukeurigheid die aard van die grondoorsake van die metaboliese steuring wat tot verskillende menstruele abnormaliteite in ondervoedde Bantoe vroue lei, te verklaar.

##### Die skildklier en die groei van bobbejane

Metabolisme-steurings wat volg op skildklieruitsnyding in bobbejane word bestudeer. Skildklieruitsnyding in jong bobbejane lei tot kretinisme. Hoewel ander diere verpot raak na skildklieruitsnyding, is dit slegs bobbejane wat al die simptome van klassieke kretinisme toon en is hul dus in hierdie opsig uniek.

##### Die struktuur van steroid hormone en hul fisiologiese werking in bobbejaanwyfies

'n Korrelasie wat nuwe gesigspunte gee kan gevind word tussen die geswelsverminderende werking van steroïde mengsels op die boudnaat (perineum) van die bobbejaan, hul bevoegdheid om ontydige bloeding te veroorsaak en hul chemiese struktuur.

##### ACTH en die menstruele siklus

Ons het keer op keer reeds gemerk hoedat emosionele steurings of beserings in die wyfiebobbejaan gepaard gaan met ontydige bloeding en tydelike versteuring van die menstruele ritme. In terme van huidige konsepte word reaksies van hierdie aard toegeskryf aan die produksie van ACTH deur die harsingslymklier. Die

#### The nutritional value of maize

This problem is being actively pursued. From recent biological experiments, we have shown that the supplementation of maize is a very complicated problem. While maize does unquestionably afford a rich source of calories, some useful proteins, fats, salts and vitamins, our experiments reveal that unless maize constitutes less than 60% of the diet, nutritional disease of greater or lesser severity can be anticipated at an early stage in the life of the experimental animal.

Our experiments in rats have now been extended to baboons. We have observed severe caries and gum lesions in many of our baboons on various diets, indicating that the baboon may yet prove to be an excellent primate for research into the aetiology of dental disease.

It is hoped that henceforth an increasing number of baboons will be used for dietary experiments.

#### REPRODUCTIVE PHYSIOLOGY

##### Diet and the menstrual cycle

By various modifications of the diet, we have been able to produce profound disturbances in the menstrual cycle of female baboons. These studies in the baboon will allow us to interpret more precisely the nature of the underlying metabolic disorder promoting the various types of menstrual abnormalities we have previously noted in malnourished African women.

##### The thyroid gland and growth in the baboon

The disturbances in metabolism following thyroidectomy in the baboon, are under investigation.

Thyroidectomy in young baboons leads to the classical picture of cretinism. Although stunting after thyroidectomy has been described in a variety of animals, including monkeys, the other physical attributes of cretinism have not been observed. In this respect, therefore, the baboon is unique.

##### The structure of steroid hormones and their physiological action in female baboons

A suggestive correlation can be established between the deturgescent action of steroid compounds on the perineum of the baboon, their capacity to produce premature bleeding and their chemical structure.

##### ACTH and the menstrual cycle

We have repeatedly noticed that emotional disturbances or injury in female baboons are attended by premature onset of bleeding and temporary suppression of the menstrual rhythm. In terms of current concepts, such reactions are ascribed to the production of ACTH by

toediening van ACTH het egter geen invloed op die menstruele siklus nie. Dit dui daarop dat bees ACTH wat in kliniese geneeskunde gebruik word, nie daartoe in staat is om die menstruele siklus te beïnvloed nie of anderssins dat die meganisme waardeur pyn en emosie hul invloed op die menstruele siklus uitoefen, herondersoek moet word.

#### Biochemiese ondersoeke van die menstruele siklus

Die plasma-proteïene word nog steeds deur dr. S. Cohen ondersoek. Ander werkers gaan voort met ondersoeke van die elektroliete gedurende die menstruele siklus en die wisseling in bloed-lipides en proteïen-verbindinge jodium gedurende die menstruele siklus van bobbejane.

#### MAKROMOLEKULÊRE SINDROOM

##### Aangebore misvormings

Ons het 'n tweede verslag oor aangebore misvormings in die kleintjies van moeders wat vóór en gedurende swangerskap met tripanblou behandel is, voltooi. Uit 'n totaal van 1,347 kleintjies was die voorkomssyfer van misvormings 32.4%. Defekte van die brein, rugmurg, oog en oor het veral voorgekom.

Die patogene van die aangebore misvormings wat geproduseer is in embrios verwyder uit moeders wat met tripanblou behandel is, word tans ondersoek. Hierdie ondersoek sal lig werp op party van die faktore wat die normale groei en ontwikkeling beïnvloed.

##### Retikulose

Die patogene van die limfoma wat deur tripanblou geproduseer word, is volledig ondersoek. Die materiaal wat verkry is van alle rotte wat met tripanblou behandel is, is nou vir histologiese ondersoek versamel. Daar word gehoop dat gedurende 1952 en 1953 die beskrywende deel van hierdie werk voltooi sal wees.

##### Hematologiese reaksies tot makromolekules

As aanvoerwerk tot die ophelding van die grondige hematologiese veranderinge wat veroorsaak word deur herhaalde inspuitings van tripanblou, het ons die bloedtoestand van ongeveer 800 van ons voorraad onbehandelde rotte teen ouderdomme van 50 tot 900 dae, ondersoek. Studies is gemaak van die uitwerking van verskillende metodes vir die versameling van bloedmonsters op die tellings wat verkry is. Ons hoop dat wanneer daar verslag gegee word van ons ondersoeke, die resultate sal dien as standaard vir ander ondersoeke na die hematologie van rotte. Ons het vasgestel dat die selfonstaansyfer van leukemia in ons rotte ongeveer 0.4% is.

Ons het weer die uitwerking van herhaalde inspuitings van tripanblou op die bloedtoestand en op die bloedvormende organe bestudeer. Hierdie deel van die werk

the pituitary gland. However, the injection of ACTH has no effect on the menstrual cycle. This observation suggests either that bovine ACTH, used in clinical medicine, is incapable of affecting the menstrual cycle, or else that the mechanism whereby pain and emotion are said to mediate their effects on the menstrual cycle, calls for re-examination.

#### Biochemical investigations of the menstrual cycle

The plasma proteins continue to be investigated by Dr. S. Cohen. Other workers are investigating electrolytes during the menstrual cycle and the variations in blood lipids and protein-bound iodines during the baboon menstrual cycle.

#### MACROMOLECULAR SYNDROME

##### Congenital malformations

We have completed a second report on congenital malformations in the young, born to mothers who were treated before and during pregnancy with trypan blue. In a total of 1,347 pups, we recorded 32.4% incidence of malformations. Defects of the brain, spinal cord, eye and ear, were particularly prevalent.

The pathogenesis of the congenital malformations produced in embryos removed from trypan blue treated mothers, is now being examined. This investigation promises to shed considerable light on some of the factors regulating normal growth and development.

##### Reticuloses

The pathogenesis of the lymphoma produced by trypan blue, has been fully examined. The material from all trypan-blue treated rats has now been assembled for histological examination. It is hoped that during 1952 and 1953 the descriptive part of the work will have been completed.

##### Haematological responses to macromolecules

As an essential preliminary to the interpretation of the profound haematological changes induced by repeated injections of trypan blue, we have investigated the blood pictures in approximately 800 of our stock untreated rats, at ages ranging from 50 to 900 days. Studies have now been made into the effects of various methods of collecting the blood specimens on the counts obtained. We hope that when our investigations have been reported, the results will constitute standards for other investigations on the haematology of the rat. We have now determined that the spontaneous incidence of leukaemia in our rats is approximately 0.4%.

We have repeated our studies of the effects on the blood picture and on the haemopoietic organs, of repeated injections of trypan blue. This part of the study was aimed at discovering the sequence of events

het ten doel die verklaring van die faktore wat in elke rot lei tot die karakteristieke hematologiese aandoenings wat aangetref word in 98% van die behandelde rotte.

Verdere eksperimente om die moontlike aandeel te bepaal van die selfontstaan van Bartonelle infeksies in die etiologie van bloedaandoenings wat deur tripanblou veroorsaak is, nader voltooiing. Vir hierdie doel is die milt verwyder in 'n groot aantal diere en is hul met tripanblou en/of arseen behandel.

Benewens bogenoemde proewe op rotte het ons deur konyne te gebruik probeer om die betekenis van die hemolitiese veranderinge wat veroorsaak word deur tripanblou in die etiologie van die bloedarmoede en limfomata wat deur makromolekules geproduseer word, te bepaal.

'n Verdere aspek van hematologiese studies was die analise van die oordraagbaarheid van chloroblastoom met en sonder leukemia wat in een van ons rotte gevind is wat slegs 'n enkele inspuiting tripanblou ontvang het.

##### Eksperimentele werk op tumore van die bindweefsels en bloedvormende organe

Hierdie aspek van die werk is ontwikkel ten einde die invloed van die primêre tumor op die reaksies van ander organe in die rot nader toe te lig. Ons hoop dat hierdie ondersoek ons in staat sal stel om met meer duidelikheid die verhouding tussen leukemia en aleukemiese leukemia te verstaan.

Etlke tumorstamme is in die rotkolonie ontwikkel en een van hulle is vir 14 geslagte oorgedra. Ons ondersoek dui daarop dat die leukemiese veranderinge in baie van die organe binne twee of drie weke na onderhuidse inenting met een van ons tumore, die oorhand kry.

#### NAVORSINGSEENHEID VIR KLINIESE VOEDING, KAAPSTAD

Hoof van die Eenheid: Prof. J. F. Brock, Universiteit van Kaapstad.

Die eenheid trek nog steeds voordeel uit die unieke natuurlike eksperiment wat in die Kaapse Skiereiland te vinde is vir die rasse-vergelyking van die siektegevalsyfer en sterftesyfer, veral soos dit bestaan tussen die Kaapse Kleurlinge en die Blanke bevolking van die Skiereiland. (Sien ook J. F. Brock. *The Cape Coloured People: Their Pattern of Health and Disease*. S.A. Tydskr. vir Geneeskunde, vol. 23. 1949. p. 1,000.)

Die navorsingsprogram is uitgebrei ten einde 'n vergelykende studie te maak van sekere aspekte van kliniese voeding in ander rasse, veral rondswerwende Bantoe-arbeiders in die Langa Naturellelokasie te Kaapstad.

in each individual culminating in the characteristic haematological disorders, which develop in 98% of our treated rats.

Further experiments are nearing completion to determine the possible rôle of spontaneous Bartonella infections in the aetiology of the blood diseases induced by trypan blue. To this end, a large number of animals have been splenectomized and treated with trypan blue and/or arsenic.

In addition to the above investigations in rats, we have attempted to determine in rabbits the significance of hemolytic changes induced by trypan blue in the aetiology of the anemias and lymphomata produced by macromolecules.

A further aspect of haematological studies was the analysis of the transmissibility of chloroblastoma with and without leukaemia, which we encountered in one of our rats, which had received a single injection of trypan blue.

##### Experimental work on tumours of the connective tissues and haemopoietic organs

This aspect of the work has been developed in order to elucidate the influence of the primary tumour on the reactions of other organs in the rat. This investigation we hope will allow us to understand more precisely the relationships of leukaemia to aleukaemia.

Several tumour strains have been developed in the colony and one of them has been passaged for 14 generations. Our investigations indicate that the leukaemoid changes in many of the organs supervene in the host animals within two to three weeks after subcutaneous implantation of one of our tumours.

#### RESEARCH UNIT IN CLINICAL NUTRITION, CAPE TOWN

Head of Unit: Prof. J. F. Brock, University of Cape Town.

The unit continues to take advantage of the unique natural experiment existing in the Cape Peninsula for interracial comparison of morbidity and mortality, particularly as between the Cape Coloured people and the Europeans of the Cape Peninsula. (See J. F. Brock. *The Cape Coloured People: Their Pattern of Health and Disease*, S.A. Medical Journal, 1949, Vol. 23, page 1,000.)

The programme has been widened to include a comparative study of certain aspects of clinical nutrition in other races, especially Bantu migrant labourers at the Langa Native Location, Cape Town. An opportunity

Op uitnodiging van die Provinsiale Administrasie van S.W.A. is daar ook van 'n geleentheid gebruik gemaak om 1,300 Boesmans in die Okavango-gebied te ondersoek.

Deurdar 'n Gesamentlike Mediese Personeel saamgestel is uit die mediese personeel van die Administrasie van die Kaapprovinsie en die mediese personeel van die Universiteit van Kaapstad is die probleem betreffende personeel vir navorsing tans opgelos. Die eenheid beskik tans oor 'n groep navorsers wat hul voltyds wy aan 'n gesamentlike lang-termyn navorsingsprogram wat ontwikkel en uitgebrei word deur gereelde navorsingskonferensies. Die klem word tans veral gelê op kliniese voeding maar die omvang van die werk is nie tot voeding alleen beperk nie. Dit behels alle omgewings, maatskaplike en genotipiese faktore wat die grondslag is van die groot rasse-verskille betreffende siektegevalsyfer en sterftesyfer wat in bogenoemde verhandeling beskryf word.

Die kern van die eenheid sluit die volgende persone in:

Professor J. F. Brock	} Gesamentlike personeel— word deur die Universiteit van Kaapstad besoldig.
Dr. L. Eales	
Dr. B. Bronte Stewart	}
Dr. J. Hickley, Senior Beurshouer, W.N.N.R.	
Dr. L. Arens, Senior Beurshouer, W.N.N.R.	
Mnr. T. J. Turner, Geskoolde Laboratoriumassistent, W.N.N.R.	
Mej. E. G. Black, Laboratoriumassistent, W.N.N.R.	
Mej. A. Moodie, Laboratoriumassistent, Maatskaplike Werkster, W.N.N.R.	

Hierbenewens is dit ook aangenaam om te kan vermeld:

- (1) Dat verdere samewerking bewerkstellig is met die personeel van ander departemente van die Universiteit wie se navorsingsbelange dié van die eenheid oorvleuel; en
- (2) dat jong navorsers daartoe neig om *ad hoc* navorsingsprobleme te ondersoek wat binne die omvang val van lang-termyn navorsingsprojekte.

Party van hierdie navorsers is lede van ander Departemente van die Universiteit met hul eie navorsingsprogramme wat die werk van die eenheid oorvleuel en party is verbonde aan die Departement Geneeskunde, hetsy met 'n afsonderlike navorsingsprogram wat dié van die eenheid oorvleuel hetsy op soek na 'n geskikte onderwerp vir navorsing vir 'n beperkte tydperk, soos byvoorbeeld vir 'n M.D.-tesis. Hierdie navorsingseenheid word tans beskou as 'n verwysingsbron wat sekere navorsingsprobleme betref en, na gehoop word, 'n prikkel vir navorsing in die algemeen.

#### Sekere aspekte van die werksaamhede van die eenheid.

Dr. L. Eales sit sy werksaamhede voort op nier-hemodinamika en elektroliet-metabolisme. Hy is tans besig om sy tegniek toe te pas in samewerking met dr. B. Bronte Stewart. Hy is ook besig om in samewerking

was also taken through an invitation from the Provincial Administration of S.W.A. to examine 1,300 Bushmen in the Okavango territory.

The institution of the Joint Medical Staff between the Administration of the Cape Province and the University of Cape Town, has stabilised the staff position in relation to research. The unit may now be regarded as having a permanent core working on a long-term collaborative research programme developed and extended through regular research conferences. The main emphasis is at present on clinical nutrition but the scope is not confined to nutrition. It covers all those environmental, social and genotypical influences which appear to underlie the great inter-racial differences in morbidity and mortality described in the communication referred to above.

The core of the unit consists at present of:

Professor J. F. Brock	} Joint staff salaried by
Dr. L. Eales	
Dr. B. Bronte Stewart	} University and Pro-
Dr. J. Hickley, Senior Bursar, C.S.I.R.	
Dr. L. Arens, Senior Bursar, C.S.I.R.	} vincial Administration
Mr. T. J. Turner, Skilled Laboratory Assistant, C.S.I.R.	
Miss E. G. Black, Laboratory Assistant, C.S.I.R.	
Miss A. Moodie, Laboratory Assistant—Social Worker, C.S.I.R.	

In addition, it is gratifying to report that there has been further development in:

- (1) Co-operation with the staff of other university departments whose research interests overlap those of the unit; and
- (2) the tendency for younger workers to seek *ad hoc* research problems within the ambit of a long term collaborative team project.

Some are in other University Departments with their own research programmes which overlap the interests of the unit and some are within the Department of Medicine, either with an independent programme of research which overlaps the activities of the unit or else seeking a suitable subject for research for a limited period as for an M.D. thesis. This unit, however, tends to become a point of reference in regard to certain lines of work and, it is hoped, a stimulus to research generally.

#### Certain aspects of the activities of the unit

Dr. L. Eales is actively continuing his work on renal haemodynamics and electrolyte metabolism. At present he is applying his techniques in collaboration with Dr. B. Bronte Stewart to cases of adult Bantu scurvy

met dr. B. Bronte Stewart sy tegniek toe te pas tot volwasse Naturelle wat aan skurbiuk ly. Hierdie proewe word uitgevoer gedurende 'n kontrole-tydperk waar die pasiente op 'n skurbiuk-diëet is nadat hulle met vitamien C (askorbiensuur) behandel is, en na 'n tydperk waar die pasiente op 'n volmaakte diëet was. Dieselfde tegniek word toegepas tot Bantoe-pasiente wat aan chroniese ondervoeding (pellagra) ly gedurende 'n kontrole-tydperk op 'n diëet waarin daar 'n tekort aan proteïenes en Vitamien B kompleks is en na 'n tydperk van volmaakte voeding.

Dr. Eales sal dieselfde tegniek toepas tot normale swanger vroue en sal daarna die resultate gebruik vir 'n ondersoek na swangerskap-toksemie (sien ook die afdeling wat handel met die werk van dr. Oosthuysen).

Dr. B. Bronte Stewart in samewerking met dr. Eales organiseer tans 'n noukeurige studie van sekere kliniese en bio-chemiese reaksies in gevalle wat aan ondervoeding ly, veral met betrekking tot skurbiuk soos dit voorkom in volwasse Naturelle, en in hartkwale wat voortspruit uit ondervoeding.

Dr. L. van R. Oosthuysen het feitlik sy opname van die rasse-voorkomssyfer van swangerskap-toksemie in die Kaapse Munisipale Gebied voltooi. Hierdie opname is gesteun deur die professor van Ginekologie en Verloskunde van die Universiteit Kaapstad en deur die Geneeskundige Gesondheidsbeampte van die Kaapstadse Munisipaliteit. Daar word gehoop dat 'n statistiese ontleding van die gegewens wat versamel is 'n antwoord sal gee op die vraag of daar werklik 'n besonder hoë voorkomssyfer van swangerskap toksemie is in die Kaapse Kleurlinge. Vir hierdie studie is Slam-aaiers van Kaapse Kleurlinge geskei en 'n voorlopige analise van die statistiek dui daarop dat daar 'n aansienlike verskil mag wees in die voorkomssyfer van hierdie aandoening tussen hierdie twee groepe van die Kaapse Kleurlinge. Professor E. Batson en sy personeel in die Departement Sosiologie het gedurende die afgelope jaar begin met 'n vergelykende diëetkundige opname van hierdie twee groepe en daar word gehoop dat daar deur vergelyking van die resultate van die twee opnames vasgestel sal kan word of daar 'n diëetkundige faktor is in die etiologie van swangerskap-toksemie en, indien wel, wat die aard daarvan is.

Dr. J. Hickley is tans een van die senior beurshouers in die eenheid. Sy is besig om in samewerking met die hoof van die eenheid 'n kliniese berekening van voeding te maak. Die Hoof van die Afdeling is gevra om 'n verdere verslag te lewer oor hierdie onderwerp op die volgende vergadering van die Gesamentlike VLO/WGL Deskundige Komitee oor Voeding en wy hom hoofsaaklik aan hierdie werk gedurende die jaar 1952. Die Komitee insake Liggaamsmeting van die Voedsel en Voedingsraad van die Nasionale Navorsingsraad van die Verenigde State van Amerika poog tans om 'n internasionale standaard vir hierdie studiegebied op te stel en het die Hoof van die Eenheid genader vir 'n verslag

during a control period on scorbutic diet, after saturation with ascorbic acid, and after a period of full and complete dieting. They are applying the same techniques to cases of chronic Bantu malnutrition (pellagra) during a control period on a diet deficient in protein and Vitamin B complex, and after a period of full and complete feeding.

Dr. Eales is also preparing to apply the same techniques to normal pregnant women with a view subsequently to applying them to the problem of pre-eclamptic toxæmia (see section below on the work of Dr. Oosthuysen).

Dr. B. Bronte Stewart in collaborating with Dr. Eales (see above) is organizing a detailed study of certain clinical and biochemical reactions in cases of malnutrition, notably in adult Bantu scurvy, in Bantu "pellagra" and in "nutrition hearts."

Dr. L. van R. Oosthuysen has almost completed his survey of the racial incidence of pregnancy toxæmia and eclampsia in the Cape Municipal area. This survey has had valuable support and help from the Professor of Obstetrics and Gynaecology and from the Medical Officer of Health for the Cape Town Municipality. It is hoped that statistical analysis of the data which have been collected will give a definite answer to the problem of whether there is really a very high incidence of these diseases in the Cape Coloured people. In the case of this work the general category of Cape Coloured people has been sub-divided into Malays and other Cape Coloureds and preliminary analysis of the statistics suggests that there may be a considerable difference in incidence between these two groups of the Cape Coloured people. Professor E. Batson and his staff in the Department of Social Science have during the last year undertaken a comparative dietary survey of these two groups and it is hoped that comparison of the results of the two surveys may give a clue to the question of whether there is a dietary factor in the aetiology of pregnancy toxæmia and eclampsia, and, if so, what its nature might be.

Dr. J. Hickley now holds one of the senior bursaries in the unit. She is engaged in collaboration with the Head of the Unit on the assessment of nutrition. There are two further developments in this project. The Head of the Unit has been asked to make a further report on this subject to the next meeting of the Joint FAO/WHO Expert Committee on Nutrition, and is making this his principal personal project during the year 1952. The Committee on Anthropometry of the Food and Nutrition Board of the National Research Council of the United States of America, is attempting to set up international standards in this field and has asked the Head of the Unit to report from South Africa. The co-operation has been obtained of Professor M. R. Drennan and several members of the staff of the Department of Anatomy in collating the standards of anthropological anthropometry and of constitutional somato-

oor Suid-Afrika. Die medewerking is verkry van professor M. R. Drennan en etlike lede van die personeel van die Departement Anatomie vir die kollasionering van die standaard van antropologiese liggaamsmeting en vir algemene liggaamstipering met die standaard vir voedingsantropometrie. Die geleentheid is ook te baat geneem om hierdie metings en korrelasies toe te pas tot die groep Boesmans wat die Van Riebeeck Feeskou in Kaapstad bygewoon het. Op uitnodiging van die Provinsiale Administrasie van S.W.A. het lede van die eenheid se personeel gedurende die Julie-vakansie ook 'n studie gemaak van die gesondheids- en voedingstoestand van meer as 1,300 Boesmans in die Okavango Gebied. Die hoeveelheid laboratoriumwerk wat onder uiters moeilike veldtoestande verrig is, was besonder bevredigend. Swellings- en flokkuleringsstoetse is op meer as 200 persone uitgevoer en bloed van dieselfde persone is terug gebring na Kaapstad waar dit in die laboratorium getoets sal word vir totale en fraksionele bepaling van serum-proteïenes deur gebruik van biochemiese en elektroforetiese tegnieke. Met behulp van dr. O. Budtz-Olsen van die Departement Fisiologie en dr. A. Zoutendyk van die Suid-Afrikaanse Mediese Navorsingsinstituut is 'n studie ook gemaak na die voorkomssyfer van bloed-, „sickling” en die verspreiding van die algemene bloedgroepe.

Dr. L. Arens is aangestel as Senior Beurshouer en is besig met 'n bestudering van die fraksionering van serum-proteïenes in Bantoe, Kaapse Kleurling en Blanke persone. Verslae wat uitgebring is deur professor Holmes wat in Kampala werksaam is en deur ander navorsers in Sentraal-Afrika stel die vraag of verandering in die globulein-fraksies verband hou met ondervoeding (moontlik deur die lewer) of met tropiese parasitisme. 'n Studie wat uitgevoer sal word op rondswerwende Bantoe-arbeiders en waar dieselfde tegniek en standaard gebruik sal word, sal, na gehoop word, lig werp op hierdie vraagstuk insoverre hierdie arbeiders vry is van tropiese parasiete dog meer of min dieselfde voedings-agtergrond het.

Dr. J. Hansen het nou die resultate van sy opname van die voorkomssyfer van lewersirroze in Kaapse Kleurlinge gepubliseer. (Dr. J. D. L. Hansen, *S.A. Tydskr. vir Geneeskunde*, vol. 26, 1952, p. 441). Hierdeur word die feit dat die voorkomssyfer van sirrose laer is by Kaapse Kleurlinge as by Blankes in die Kaapse Skiereiland, gestaaf. Hierdie rasse-vergelyking is veral verbasend aangesien die voorkomssyfer van dranksugtigheid en ondervoeding veel hoër is by Kleurlinge as by Blankes. Dit is ook interessant om hierdie resultate te vergelyk met die hoë voorkomssyfer van sirrose by die Bantoe. Die vergelykende histologie van sirrose soos dit aangetref word in Kaapse Kleurlinge word onderneem deur dr. Swanepoel terwyl dr. Hansen in Amerika verkeer.

Daar kan tot twee ander tentatiewe gevolgtrekkings gekom word uit hierdie rasse-vergelyking, wat, indien

typing with those of clinical and nutritional anthropometry. The opportunity was seized to apply these measurements and correlations to a party of Bushmen attending the Van Riebeeck Festival Fair at Cape Town. Subsequently on the invitation of the Provincial Administration of S.W.A. members of the unit made a study of the state of health and nutrition of over 1,300 Bushmen in the Okavango territory during the July vacation. The amount of laboratory work which was achieved under difficult field conditions is most gratifying. Turbidity and flocculation tests were applied to over 200 subjects and blood from the same subjects was brought back to Cape Town for total and fractional determination of serum proteins by biochemical and electrophoretic techniques. A study was also made with the assistance of Dr. O. Budtz-Olsen of the Department of Physiology and Dr. A. Zoutendyk of the South African Institute for Medical Research into the incidence of blood sickling and the distribution of the common blood groups.

Dr. L. Arens has now been appointed to a Senior Bursary and is engaged on a study of the fractionation of serum proteins in relation to Bantu, Cape Coloured and European subjects. Reports from Professor Holmes at Kampala and other workers in Central Africa have raised the problem of whether changes in the globulin fractions are related to malnutrition (possibly through the liver) or to tropical parasitism. A study with the same techniques and standards on Bantu migrant labourers will, it is hoped, give valuable evidence in that these labourers are free from any tropical parasites and yet have much the same nutritional background.

Dr. J. Hansen has now published the results of his survey of the incidence of cirrhosis of the liver in Cape Coloured people. (Dr. J. D. L. Hansen, *S.A. Medical Journal*, 1952, Vol. 26, page 441.) It confirms the fact that the incidence of cirrhosis in Cape Coloured people in the Cape Peninsula is lower than among Europeans. This is a most surprising inter-racial comparison since the incidence of alcoholism and the incidence of malnutrition are both higher among Cape Coloured than among European people. It is also in very interesting contrast with the high cirrhosis rate of the Bantu people. The comparative histology of Cape Coloured cirrhosis is being pursued by Dr. Swanepoel while Dr. Hansen is in America.

Two other tentative conclusions can be drawn from the inter-racial comparison which, if confirmed, will be of the greatest interest: (1) Nutritional heart disease as seen in the Cape Coloured people appears to be quite distinct from the nutritional heart disease recently defined in the Bantu people by Gillanders of Baragwanath Hospital. (2) Pellagra in the Cape Coloured people appears to be quite distinct from the pellagra described in Bantu people by the Gillmans, and to be nearer the classical type.

dit gestaaf word, van die grootste belang mag wees: (1) Hartkwaal wat voorspruit uit ondervoeding verskil heeltemaal in Kaapse Kleurlinge van die hartkwaal, ook te wyte aan ondervoeding, soos onlangs deur Gillanders van die Baragwanthse Hospitaal in Bantoe pasiente aangetref is. (2) Pellagra soos dit voorkom in Kaapse Kleurlinge verskil heeltemaal van die pellagra wat deur die Gillmans aangetref is in Bantoe-pasiente, en stem meer ooreen met die gewone tipe pellagra.

Die Brock/Autret-verslag oor Kwashiorkor is nou gepubliseer (*Bulletin. Wêreld Gesondheidsliggaam*, 1952, vol. 5, p. 1) en is deur die W.G.L. herpubliseer in Frans en Spaans. Die verband wat hierdie siekte hou met die gesondheid van Moeder en Kind in Afrika sal die onderwerp wees van 'n buitengewone CCTA-konferensie wat gevolg sal word deur 'n sitting van die Gesamentlike VLO/WGL Deskundige Komitee insake Voeding wat gedurende November 1952 in die Gambia gehou is. Die Hoof van die Eenheid is uitgenooi om die W.G.L. op albei konferensies te verteenwoordig.

#### GESINSGESONDHEIDNAVORSINGSEENHEID, DURBAN

*Hoof van die Eenheid:* Dr. S. L. Kark, Unie Gesondheidsdepartement.

'n Aantal studies wat in verband staan met dié van die Eenheid is ontwikkel deur lede van die personeel van die Instituut vir Gesins en Gemeenskapsgesondheid en die Gesondheidsentra wat daaraan verbonde is. Ko-ordinering van hierdie verskillende studies is bewerkstellig deur die Hoof van die Eenheid in sy hoedanigheid as Verantwoordelike Mediese Beampte van die Instituut en daar was noue samewerking tussen navorsingsbeurshouers en personeel van die navorsings-eenheid en die personeel van die Instituut.

Hierdie onderlinge samewerking was besonder waardevol en aanmoedigend gedurende die afgelope jaar. Die verskillende studies word deur die volgende persone onderneem:

- |                |    |   |
|----------------|----|---|
| Dr. S. L. Kark | .. | Verantwoordelike mediese beampte van die Instituut vir Gesins en Gemeenskapsgesondheid, Merebank, Durban, en Hoof van die W.N.N.R. se Navorsingsheid. |
| Dr. Emily Kark | .. | Voltydse Navorsingsbeurshouer, W.N.N.R.   |
| Dr. E. Salber  | .. | Voltydse Navorsingsbeurshouer, W.N.N.R.   |
| Dr. J. Chesler | .. | Personeel: Instituut vir Gesins en Gemeenskapsgesondheid.   |
| Dr. B. Gampel  | .. | Personeel: Instituut vir Gesins en Gemeenskapsgesondheid.   |

The Brock/Autret report on Kwashiorkor is now published (*Bulletin. World Health Organization*, 1952, Vol. 5, page 1) and has been published by W.H.O. in French and Spanish. This disease in relation to the health of mother and child in Africa has been made the subject of a special CCTA Conference to be followed by a session of the Joint FAO/WHO Expert Committee on Nutrition in the Gambia in November, 1952. The Head of the Unit was invited to represent W.H.O. at both Conferences.

#### FAMILY HEALTH RESEARCH UNIT, DURBAN

*Head of Unit:* Dr. S. L. Kark, Union Health Department.

A number of studies related to that of the research unit has been developed by members of the staff of the Institute of Family and Community Health and its associated Health Centres. Co-ordination of these various studies has been effected by the Head of the Unit as Medical Officer-in-Charge of the Institute and co-operation between research bursars and staff of the research unit with the staff of the institute has been very close.

This mutually advantageous arrangement has been a most encouraging development during the past year. The various studies are being undertaken by the following:

- |                |    |   |
|----------------|----|---|
| Dr. S. L. Kark | .. | Medical Officer-in-Charge of the Institute of Family and Community Health Merebank, Durban, and Head of the C.S.I.R. Research Unit. |
| Dr. Emily Kark | .. | Full-time Research Bursar — C.S.I.R.  |
| Dr. E. Salber  | .. | Full-time Research Bursar — C.S.I.R.  |
| Dr. J. Chesler | .. | Staff: Institute of Family and Community Health.  |
| Dr. B. Gampel  | .. | Staff: Institute of Family and Community Health.  |

Mnr. G. W. Stuart.. Personeel: Instituut vir Gesins en Gemeenskaps-gesondheid.

Dr. H. Phillips .. . Personeel: Lamont Gesondheidsentrum\*

Dr. J. Cassel .. . Personeel: Pholela Gesondheidsentrum\*

Dr. J. Lapping .. . Personeel: Industriële Gesondheidsentrum\*

Mevr. E. Bradshaw .. Wetenskaplike assistente (Statistiek) W.N.N.R.

Mej. D. Piloso .. . Wetenskaplike Assistent, W.N.N.R.

Mevr. E. C. Smith .. Rekords (Liaseer/Klerikale assistente) W.N.N.R.

Mej. P. Boardman .. Wetenskaplike Assistent (Maatskaplikewerk) W.N.N.R.

\* Bogenoemde is drie van die agt gesondheidsentra wat aan die Instituut verbonde is en wat deur die Verantwoordelike Mediese Beampte van die Instituut bestuur word.

Benewens bogenoemde persone, wat die kern uitmaak van die ondersoekingspan was ander lede van die Instituut en die gesondheidsentra wat daaraanverbonde is besig met studies wat noue verband hou met die werk van die Eenheid: bv. dr. J. Abramson (van die Merebankse Gesondheidsentrum) wat saam met die Hoof van die Eenheid besig was met 'n studie van die groei van seuns en jong kinders (sien items 3 en 4(b)); dr. C. Slome en dr. B. Abrams (Onderskeidelik Mediese Beampte en Tandarts, van die Pholela Gesondheidsentrum) wat besig was met 'n studie van tanddeurbreking in Naturellebabas van Pholela en 'n vergelykende studie van die voorkomssyfer van tandevertrotting in stedelike en plattelandse Naturellekinders; het ons ook die voorreg gehad om hulp te verkry op die gebied van statistiek van professor Rayner (Professor van Biostatistiek, Fakulteit Landbou, Universiteit van Natal), professor Steyn en mnr. Cruse (onderskeidelik Professor en Senior Lektor in Wiskunde, Universiteit Natal) en is hulp ook aangebied deur dr. N. Sacks en dr. H. Homes van die Departement Radiologie van die Nattalse Provinsiale Administrasie vir enige radiologiese werk wat die eenheid mag benodig.

#### Voedingstoestand van die moeder met betrekking tot die ontwikkeling van die baba

Met die oog op ons voorlopige bevindings in verband met die verskil in oorlewing, gewig by geboorte en groei van babas in die verskillende rasse-groepe wat bestudeer word, is daar besluit om te begin met 'n langtermyn eksperiment in verband met die verhouding wat daar bestaan tussen die voedingstoestand van die moeder en die groei van die kind.

'n Groep swanger vroue wat terapeutiese byvoegsels tot hul diëet in die vorm van gedroogde afgeroomde

Mr. G. W. Stuart .. Staff: Institute of Family and Community Health.

Dr. H. Phillips .. . Staff: Lamont Health Centre\*

Dr. J. Cassel .. . Staff: Pholela Health Centre\*

Dr. J. Lapping .. . Staff: Industrial Health Centre\*

Mrs. E. Bradshaw .. Scientific Assistant (Statistics) C.S.I.R.

Miss L. Piloso .. . Scientific Assistant, C.S.I.R.

Mrs. E. C. Smith .. Records (Filing/Clerical Assistant) C.S.I.R.

Miss P. Boardman .. Scientific Assistant (Social Work) C.S.I.R.

\* These are three of the eight health centres associated with the Institute and administered by the Medical Officer-in-Charge of the Institute.

In addition to the above individuals, who constitute the core of the investigation team, other members of the staff of the Institute and its associated health centres have been associated with some closely related studies, e.g., Dr. J. Abramson, (of the Merebank Health Centre) who has been associated with the Head of the Unit in a study of growth of boys and young children (See below item 3 and 4 (b)); Drs. C. Slome and B. Abrams (Medical Officer and Dentist respectively at the Pholela Health Centre) who have been associated in a study of tooth eruption in Native babies of Pholela and a comparative study of the occurrence of dental caries in an urban and a rural group of Native children; we have also had the advantage of assistance in statistics from Professor Rayner (Professor of Biostatistics, Faculty of Agriculture, University of Natal), Professor Steyn and Mr. Cruse (Professor and Senior Lecturer respectively in Mathematics, University of Natal), and have been offered the full co-operation of Drs. N. Sacks and H. Holmes of the Department of Radiology, Natal Provincial Administration in any radiological work which the unit may require.

#### Maternal nutrition in relation to growth and development of the infant

In view of our preliminary findings in respect of differences in survival, birth weight, and infant growth as between the various race groups being studied, it was decided to embark upon a long-term experiment in the relationships between maternal nutrition and child growth.

A group of expectant mothers who are receiving therapeutic supplements of dried skim milk and vitaminized oil from a health centre, is being studied together

melk en gevitaminiseerde olie van die gesondheidsentrum ontvang, word bestudeer tesame met 'n kontrole groep wat geen byvoegsels tot hul diëet ontvang nie. Sowel die kontrole en eksperimentele groepe behels Bantoe en Indiër moeders wie se voedingstoestand bepaal word deur noukeurige kliniese en laboratorium ondersoekte. Die kinders wat aan hierdie moeders gebore word, word ondersoek deur noukeurige somatometrie en kliniese ondersoekte van moeder en kind teen gereelde tye uit te voer.

Hierdie werk word onderneem deur die Hoof van die Eenheid in samewerking met dr. J. Chesler.

Hierdie eksperimente sal bydra tot die opheldering van sekere aspekte van 'n ingewikkelde onderwerp waarvoor daar in die bestaande lektuur teenstrydige verslae verskyn.

Die voorkomssyfer en ernstigheidsgraad van die toestand van ondervoeding soos gevind in moeders wat tot op datum ondersoek is, is hoër as wat voorheen vermeld is in studies van hierdie aard. Om hierdie rede is dit dat deur die eksperiment lig gewerp mag word op hierdie ernstige probleem.

#### Die Baba

(a) Dr. E. Salber en mevr. Bradshaw het voortgegaan met hul studies van die geboortegewig en groei gedurende die eerste lewensjaar van Suid-Afrikaanse babas. Drie verslae van hulle werk op geboortegewig is gepubliseer in die *British Journal of Social Medicine* en behels 'n analise van die invloed wat uitgeoefen word deur ras, geslag, geboortetang en seisoen by geboorte.

Die vierde verslag oor die invloed van die ouderdom van die moeder op geboortegewig word tans persklaar gemaak.

Die groei van 'n gekose groep van redelik gesonde babas in Pholela is deur die Hoof van die Eenheid bestudeer. Hierdie studie het daarop gedui dat babas in Pholela gedurende die eerste 3 maande van hul lewe dieselfde gewigstoename toon as blanke en neger babas van die middelklas in Amerika en Engeland en dat hul gewigstoename hoër is as die van arm Amerikaanse Negerbabas. Na die ouderdom van drie maande is daar 'n duidelik merkbare afname in gewig by Pholelase babas in vergelyking met bogenoemde groepe.

(b) Dr. J. Cassel van Pholela was besig met die bestudering van „fisiologiese” gewigsafname in die pasgeborenes in Pholela. Deur die baba direk na geboorte aan die bors te sit en deur voorsiening te maak vir self aanvraagvoedings, het hy bewys dat fisiologiese gewigsafname tot 'n groot mate afhang van die voedingsregime. Sy verslag word tans voorberei.

Dr. E. Salber het ook 'n studie gemaak van die groei van pasgeborenes in twee Durbanse hospitale. Die vergelyking van haar bevindings met dié van dr. Cassel behoort verder lig te werp op hierdie vraagstuk.

(c) Dr. J. Chesler het haar bestudering van die ontwikkeling van Bantoe babas gedurende die eerste

with a control group not receiving this health centre service. Both the control and experimental groups include Bantu and Indian women whose nutritional state is being determined by a detailed clinical examination supplemented by laboratory investigations. The infants born of these mothers are being followed through and detailed somatometric and clinical examinations of mother and infant are carried out at periodic intervals.

This work is being undertaken by the Head of the Unit in association with Dr. J. Chesler.

The experiment should assist in unravelling some aspects of a complex subject in which the literature contains conflicting reports.

The incidence and severity of the malnutrition manifested by the women who have been examined to date is greater than that recorded in previous studies of this nature. It is because of this that more light may be thrown on this vital problem by this experiment.

#### The infant

(a) Dr. E. Salber and Mrs. Bradshaw have continued with their studies in the birthweight and growth in the first year of life of South African babies. Three reports of their work on birthweights have been published in the *British Journal of Social Medicine*, including an analysis of the influence of race, sex, birth rank and season.

The fourth report on influence of age of mother on birth weight is in preparation.

The growth of a selected group of moderately well babies of Pholela was studied by the Head of the Unit. The study indicated that during the first three months of life the Pholela babies' weight growth was equal to that of British and American White and Negro middle-class babies, and superior to that of American poor Negro babies. After the age of three months there was a decided lag in Pholela babies' growth compared with these other groups.

(b) Dr. Cassel of Pholela has been concerned with the study of "physiological" loss of weight in the newborn at Pholela. By introducing the baby to the breast immediately after birth and allowing for self-demand feeding, he has established that physiological loss of weight is to a considerable extent dependent upon the feeding regime. His report is in process of preparation.

Dr. Salber has also carried out a study of neonatal growth in two hospitals in Durban. The comparison between her findings and those of Dr. Cassel should provide further interesting information on this problem.

(c) Dr. Chesler has completed a developmental study of Bantu infants in their first year of life, using the developmental examination of Gesell of the Yale Child Development Clinic, and her findings are comparable

lewensjaar voltooi. Sy het vir hierdie doel gebruik gemaak van die metode van ondersoek soos gebruik deur Gesell van die Child Development Clinic te Yale, en haar bevindings kan vergelyk word met die standarde soos vasgestel deur Gesell. Hierdie bevindings word tans persklaar gemaak.

(d) Dieselfde groep babas wat deur dr. Chesler bestudeer is met betrekking tot ontwikkeling is deur dr. Gampel ondersoek ten einde 'n natuurlik geskiedenis te verkry van die ontwikkeling van infeksies in vroegste-jeug en jeug. Sy eerste verslag oor *Tuberculous Infection in Bantu Infants* is in die *S.A. Tydskrif vir Geneeskunde* gepubliseer.

'n Dergelike studie oor infeksie gedurende vroegste jeug is deur die Hoof van die Eenheid in Pholela uitgevoer en is vir publikasie voorberei.

(e) Om as agtergrond te dien vir hierdie verskillende groeistudies gedurende vroegste jeug was ons besig met studies in verband met die grootmaak van babas in verskillende gemeenskappe, veral met betrekking tot die voeding van babas.

Studies van hierdie aard is uitgevoer in Pholela en Lamontville (sodoende is 'n kennis verkry van die leefwyse van stedelike sowel as plattelandse Naturelle) en ook in 'n Blanke en in 'n Indiër gemeenskap.

Die studie wat in Pholela uitgevoer is, is vir publikasie voorberei en die res word tans ontleed. Die Departement Sielkunde van die Universiteit van Natal is tans besig met 'n studie na die speen van Naturellebabas in Pholela.

Benewens hierdie gemeenskapstudies ondersoek dr. E. Salber die voorkomssyfer van borsvoeding in drie Durbanse hospitale. Die samewerking en belangstelling van die personeel lede van die Addingtonse, Mothers' en McCordse hospitale word besonder op prys gestel.

#### Kinders van voor-skoolse ouderdom

Dr. H. Phillips het gegewens oor die groei van die kind van voor-skoolse ouderdom wat verkry is van verskillende klinieke en kleuterskole in Suid Afrika, ontleed en berei hierdie materiaal tans voor vir publikasie.

Die groei van 'n groep Blanke voor-skoolse kinders word deur die Hoof van die Eenheid in samewerking met dr. J. Chesler en dr. J. Abramson ondersoek.

#### Groei en ontwikkeling van die jong dogter en seun

##### (a) Meisies

Dr. Emily Kark het voortgegaan met haar studies na die groei en ontwikkeling van meisies in verskillende gemeenskappe. Met die oog daarop dat sy die groeiselnelheid en voedingstoestand in verhouding tot puberteit wil bestudeer, was haar eerste taak die bepaling van die ouderdom wanneer puberteit plaasvind. Hierdie stadium word bereken volgens die tyd wanneer die maandstondes 'n aanvang neem.

with the standards determined by Gesell. This material is in process of preparation for publication.

(d) The same group of babies studied by Dr. Chesler in respect of development have been studied by Dr. Gampel so as to obtain a natural history of the development of infections in infancy and early childhood. His first paper on the subject of *Tuberculous Infection in Bantu Babies* was published in the *South African Medical Journal* in 1952.

A similar study on infection in infancy was carried out at Pholela by the Head of the Unit and has been prepared for publication.

(e) As a background to these various growth studies in infancy we have been concerned with studies in the rearing of infants in different communities, with particular reference to infant feeding.

Such studies have now been carried out at Pholela and Lamontville (giving us a picture of rural and urban Bantu habits), as well as in a European community and an Indian community.

The Pholela study has been prepared for publication and the remainder are in process of analysis, and the University of Natal's department of psychology is now conducting a study into weaning of Native infants at Pholela.

In addition to these community studies an investigation of the incidence of breast feeding on discharge from hospital is being carried out by Dr. Salber at three Durban hospitals. The co-operation and interest of the staff of the Addington, Mothers' and McCord Hospitals is much appreciated.

#### Child of pre-school age

Dr. H. Phillips has analyzed material on the growth of the pre-school child in various clinics and nursery schools in South Africa and is preparing this material for publication.

The growth of a group of European pre-school children is being investigated by the Head of the Unit in association with Drs. J. Chesler and J. Abramson.

#### Growth and development of the young girl and boy:

##### (a) Girls

Dr. Emily Kark has continued with her growth and developmental studies in girls in different communities. In view of the fact that she wishes to relate the rate of growth and state of nutrition to puberty, her first concern has been to determine the age of puberty (as assessed by the menarche).

The communities include two groups of Coloured people living in different neighbourhoods in Durban, three groups of Indian girls in Durban and two Bantu—the one at Pholela and the other in Durban.

Die gemeenskappe wat bestudeer word behels twee groepe Kleurlinge wat in verskillende dele van Durban woon, drie groepe Indiërs in Durban en twee groepe Bantoe—die een waarvan in Pholela en die ander in Durban woonagtig is.

Die invloed wat uitgeoefen word deur puberteit op die voedingstoestand sal een van die belangrikste bevindings van hierdie studie wees. Dr. Emily Kark het nou haar ondersoek na die verhouding van groei tot volwassenheid uitgebrei tot 'n groep Indiër meisies en haar eerste ondersoek van hierdie groep is voltooi.

##### (b) Seuns

Die belangstelling wat verwek is deur hierdie bestudering van ontwikkeling in meisies het ons aangespoor om 'n dergelike studie te maak van seuns. Dr. H. Phillips en dr. J. Abramson tesame met die Hoof van die Afdeling het deelgeneem aan hierdie projek.

Die studies van Bantoe seuns en meisies het ons ook in die geleentheid gestel om 'n gekontroleerde voedings-eksperiment op versoek van die Suid Afrikaanse Nasionale Tuberkulose Vereniging en die Durbanse „Feed the Children” fonds te onderneem. Die doelstelling hiervan was om die invloed van 'n klein byvoegsel melk wat daagliks aan kinders by die Lamontvillese skool gegee word, te bepaal. Die laaste ondersoek van die eksperiment is uitgevoer en die gegewens word tans ontleed.

'n Diëetkundige studie wat gedoen is om die indiwiduele voedselgebruik van lede van 50 families in Lamontville te bepaal het nuttige inligting verstrek vir gebruik in hierdie bestudering van die groei en ontwikkeling van ouer kinders.

Hierdie studies was onder leiding van die Hoof van die Eenheid in samewerking met dr. J. Chesler en is uitgevoer deur 'n ervare veldnavorsingspan. Die belangrikste kenmerk van hierdie analise is die geringe hoeveelheid voedsel wat die volwasse arbeider in sy eie huis ontvang. Hierdie gegewens word vir 'n afsonderlike publikasie voorberei.

Dit is hierdie studiegebied, naamlik, die gesondheid van die arbeider, wat dr. D. Lapping van die Instituut se Industriële Afdeling veral mee betrokke is.

#### TUBERKULOSE-NAVORSINGSEENHEID, DURBAN

*Hoof van die Eenheid:* Dr. B. A. Dormer, Unie Gesondheidsdepartement.

#### Laboratoriumdiere

Die aantelhouke vir konyne en marmotte is voltooi en die teel van hierdie twee soort diere vorder. Moeilikhed is ondervind met die aankoop van die oorspronklike voorraad konyne. Die wat verkry is was besmet met eksterne parasiete, veral oor en gesigsmieter (*Psoroptes cuniculi*).

The influence of the occurrence of puberty itself on nutritional state will be one of the most interesting findings in the study. Dr. Emily Kark has now extended her examination of growth in relation to maturity to a group of Indian girls and her first examination of this group has been completed.

##### (b) Boys

The interest engendered by this study of development in girls has encouraged us to undertake a similar project among boys, in which Drs. H. Phillips and J. Abramson and the Head of the Unit have participated.

The studies among Bantu boys and girls offered a useful opportunity for a controlled feeding experiment which we were asked to undertake by S.A.N.T.A. and the Durban Feed the Children Fund. The aim was to determine the influence of a small supplement of milk given to the children daily at the Lamontville School. The last examination of the experiment has been carried out and analysis of the material is proceeding.

A useful background to these studies of growth and development in older children has been provided by a dietary study carried out on individual food consumption by the members of 50 families in Lamontville.

These studies were directed by the Head of the Unit in association with Dr. J. Chesler and carried out by an experienced team of field workers. The outstanding feature of the analysis to date is the very limited amount of food which the adult male worker receives in his own home. This material is being prepared for separate publication.

It is in this last field, namely, the health of the worker that Dr. D. Lapping, of the Institute's Industrial Section, has been mainly concerned.

#### TUBERCULOSIS RESEARCH UNIT, DURBAN

*Head of Unit:* Dr. B. A. Dormer, Union Health Department.

#### Laboratory animals

The rabbit and guinea pig breeding pens have been completed, and the breeding of these two species is progressing. There was difficulty in obtaining the foundation rabbit stock. Those obtained suffered from external parasites, especially ear and facial mites (*Psoroptes cuniculi*).

Hierdie aandoening is onder beheer gebring deur die diere te dip en deur die toediening van ascabial en ook deur die diere behoorlik skoon te hou.

Die diere-kolonie is nou gesond en teel vinnig aan.

#### Werk wat gedurende die jaar verrig is

Hou van toesig oor die teel, voeding en gesondheid van laboratoriumdiere.

Biologiese toets van hospitaalmonsters en navorsingspreparate voordat dit in gebruik geneem word.

Toets van afwykend suurvaste kulture; biologiese, kulturele en morfologiese ondersoek.

Huisvesting en uitstuur van suurvaste standaardkulture.

Voorbereiding van groot sneë van hele organe.

Registreer en voorbereiding van longmonsters wat deur operasie verkry is vir sneë en bestudering.

Toets van B.C.G. entmiddels vir lewensvatbaarheid.

Studies van afwykende suurvaste organismes vorder, maar aangesien hierdie werk stadig en nougeset uitgevoer moet word kan resultate nie binne 'n kort tyd verwag word nie.

Tipering van Tuberkulose op klein skaal met spesiaal uitgesoekte gevalle soos bv. been en korrelagtige tipes van besmette kinders van gebiede waar melk nie gepasteuriseer is nie.

Ons vinnige metode vir die voorbereiding van sneë van heel organe word tans toegepas op patologiese gebied, kliniese gebied, vir opvoedkundige tentoonstellings en vir die hou van permanente rekords. Die werk is ook ontwikkel in verband met longmonsters wat by operasies verkry is en wat deur ons versamel word vir verdere studie.

Elf-honderd-drie-en-veertig kulture van *M. Tuberculosis* is onderwerp aan Streptomycin en P.S.A. sensitiviteitstoets. 'n Verdere reeks van 4,500 kulture is gemaak en word tans ondersoek.

Rimifon sensitiviteitstoets is mee begin en sal ons werk met 50% vermeerder.

Die personeel is ook besig met tegniese verbeterings van 'n vaste medium tegniek.

Dit is reeds dikwels opgemerk dat verskille in broei nie ongewoon is nie; geïsoleerde kweekgroepe wat vër verwyder is van die hoofkweekgroep groei in groter konsentrasies van die geneesmiddel.

Hierdeur mag lig gewerp word op die eindpunt tussen sensitiviteit en ongevoeligheid, en word dit derhalwe ondersoek.

#### VIRUSNAVORSINGSEENHEID, KAAPSTAD

Hoof van die Eenheid: Prof. M. van den Ende, Universiteit van Kaapstad.

This trouble was controlled by dipping and the application of ascabial and maintaining proper hygiene.

The animal colony is now healthy and increasing rapidly.

#### Duties performed during the year

Supervision of breeding, feeding and health of laboratory animals.

Biological testing of hospital specimens and research preparations before use.

Testing of atypical acid fast culture, biologically, culturally, and morphologically.

Keeping and transferring of acid fast stock cultures.

Preparing and compiling of large sections of whole organs.

Recording and preparing of thoracic post-operation specimens for sectioning and study.

Testing of B.C.G. vaccines for viability.

Studies are proceeding on atypical acid fast organisms, but as this work is slow and painstaking results cannot be expected within a short period.

Typing of Tuberculosis on a small scale with selected cases such as bone and granular types in infected juveniles from non-pasteurization areas.

Our rapid method of preparing sections of whole organs is now applied to pathology, clinical work, educational exhibitions and the keeping of permanent records for future reference. The work is developed also in connexion with thoracic post-operative specimens which we are collecting and preparing for future study.

Eleven hundred and forty-three cultures of *M. Tuberculosis* have been submitted to both Streptomycin and P.A.S. sensitivity tests. A further 4,500 cultures have been made and examined.

Rimifon sensitivity tests have commenced and will increase the work by 50%.

The staff has also been occupied in the pursuance of technical improvements of a "solid-medium" technique.

It has been observed on many occasions that variations of growth are not uncommon, e.g., isolated colony production, far removed from the main growth and growing in higher concentrations of the drug.

This may illustrate the end point between sensitivity and insensitivity, and is being investigated.

#### VIRUS RESEARCH UNIT, CAPE TOWN

Head of the Unit: Prof. M. van den Ende, University of Cape Town.

Diegene wat tans besig is met navorsing in die Virusnavorsingseenheid is die volgende:

Dr. T. H. Mead\*

Dr. A. Polson\*

Dr. G. Selzer

Dr. W. du T. Naudé

Dr. A. Linder

Prof. M. van den Ende

Mnr. G. S. Turner\*

Mej. T. Madsen\* (Vise mej. J. Weckesser)

Mej. E. J. Fowler (Vise mej. A. M. van Deventer)

Mej. D. L. Deeks (Eerste 6 maande)

Mej. M. G. Schouw (Tweede 6 maande)

\*Voltyds besig met navorsing.

*Pseudomonas aeruginosa* en sy fages: (dr. T. H. Mead en Prof. M. van den Ende).

'n Analise is gemaak van die somatiese antigeniese struktuur van hierdie groep. Op grond van presipitasietoets met Trichloroasietsuur estraereerbare, polysacchariedhoudende antigene, is die spesie in ses serologiese groepe onderverdeel. Die spesifieke somatiese antigenes is in groot hoeveelhede voorberei en die spesiviteit van antisera wat daarteen voorberei is, is deur presipitasie en bindingstoets getoets.

Hierbenewens is die fage-stuitende eienskappe van party van hierdie antigene ondersoek. Aandag is veral geskenk aan die werking van een van die antigene teen fages wat aktief is in 'n gasheer wat hierdie antigeen bevat en op fages waarvoor hierdie gasheer „lisonenies” is.

Die antigeniese ekstrakte is vir fages wat in besonder hoë verdunning is stuitend. Hierdie ondersoek is onderneem ten einde die meganisme waardeur fages gestuit word deur ekstrakte te ondersoek. Dit is veral interessant dat party van hierdie fages hoewel hul nie aktief lities vir die gasheer is nie, deur die somatiese antigeen wat van die gasheer-selle geïsoleer word, gestuit word. Besonderhede van werk wat tot dusvêr op hierdie gebied gedoen is, is vir publikasie voorberei.

Werk duur voort op die reiniging van fage-stuiters deur fisiese en chemiese (insluitende chromatografiese) metodes en daar is ook begin met die chemiese analise daarvan.

Ons is van mening dat 'n juiste verklaring van die meganisme wat betrokke is by die stuiting van fages daartoe sal bydra dat die aard van virusvoortplanting verklaar sal word en dat dit aanleiding sal gee tot die ontwikkeling van rasionele metodes vir die stuiting van virusse.

Fisiese studies: (Dr. A. Polson, dr. W. du T. Naudé, dr. G. Selzer en prof. M. van den Ende)

'n Metode is ontwikkel vir die juiste bepaling van virus-partikelgrootte deur sentrifugering—daar word gebruik gemaak van die voorbereidende Spinco-sentrifugeerder.

Those at present engaged on researches in the Virus Research Unit are:

Dr. T. H. Mead\*

Dr. A. Polson\*

Dr. G. Selzer

Dr. W. du T. Naudé

Dr. A. Linder

Prof. M. van den Ende

Mr. G. S. Turner\*

Miss T. Madsen\* (vice Miss J. Weckesser)

Miss E. J. Fowler (vice Miss A. M. van Deventer)

Miss D. L. Deeks (First 6 months)

Miss M. G. Schouw (Second 6 months).

\*Engaged full-time on research.

*Pseudomonas aeruginosa* and its phages: (Dr. T. H. Mead and Prof. M. van den Ende)

An analysis of the somatic antigenic structure of this group has been made. On the basis of precipitation tests with Trichloroacetic acid extractable, polysaccharide containing antigens, the species has been subdivided into six serological groups. The specific somatic antigens have been prepared in bulk and the specificity of antisera prepared against them tested in precipitation and agglutination tests.

In addition the phage inactivating properties of some of these antigens have been investigated. Particular attention has been paid to the action of one of the antigens against phages active on a bacterial host containing that antigen and on phages for which this host is "lysogenic". The antigenic extracts are inhibitory for phages in extremely high dilution. The aim of the investigation is to elucidate the mechanism of inhibition of phages by the extracts. It is particularly interesting that some of the phages, though not actively lytic for the host, are inhibited by the somatic antigen isolated from the host cells. The details of the investigations so far have been submitted for publication.

Work on the purification of phage inhibitors by physical and chemical (including chromatographic) method continues and a beginning has been made with chemical analysis.

It is considered that an exact elucidation of the mechanism of phage inhibition may help to clarify the nature of virus multiplication and point to rational methods for the inhibition of viruses.

Physical studies: (Drs. A. Polson, W. du T. Naudé, G. Selzer and Prof. M. van den Ende)

A method has been worked out for the exact determination of virus particle size by centrifugation—using the preparative Spinco centrifuge.



Knoppiesvelsiektevirus was die kleinste wat tot dusvêr gemeet is. Die groottebepaling van die Poliomyelitis (Lansing) virus stem ooreen met dié wat gevind is deur navorsers wat vir hierdie doel elektronmikroskopie gebruik het.

Elektroforese-studies duur voort. In die brein van muis wil dit voorkom asof die poliomyelitis-virus met die globulienfraksie beweeg en nie soos byvoorbeeld die Perdesiekte virus nie wat die mobiliteit van albumien het nie.

Dit was as moontlik beskou dat virusse in weefsel-suspensies nou verbonde is aan die gasheer-proteïenes. Aangesien hierdie feit moontlik van belang kon wees in serologiese spesifisiteit en gasheer-aanpassing, is pogings aangewend om die polio-virus af te sonder van vesel-proteïenes deur middel van triptiese vertering. Getripsineerde virusse is gebruik in 'n poging om die virus tot eiers te laat adapteer; alle pogings was tot dusvêr egter nog onsuksesvol.

Dit was moontlik om te wys dat poliovirus in die chorio-allantoïese holte van 'n eier vir 48 of meer uur kan bestaan, maar daar kon geen virusse in die chorio-allantoïese membraan gevind word nie. Dieselfde resultate is verkry met onbehandelde, met eter behandelde en deur tripsien verteerde virusse. Ons resultate dui daarop dat „long passage” in soogende muis die vatbaarheid van die virus tot tripsien vermeerder.

'n Multimembraan elektroforese apparaat is deur dr. A. Polson uitgedink en dit is moontlik om daarmee proteïene en virusse vinnig te reining.

Dr. W. Naudé was besig met die bestudering van die diffusie spoed van bakteriofages in verskillende media. Fage is lae konsentrasie blyk buitengewone diffusiespoed in 'n kweekbodem te hê maar 'n diffusie wat ooreenstem met die partikelgrootte wat gevind word wanneer die kweekbodem proteïenes (bv. hemoglobien) bevat.

**Groeiensnelheid van bloutongvirus:** (Prof. M. van Ende, dr. A. Linder en dr. G. Selzer)

Bloutongvirus in eiers blyk besonder gevoelig te wees vir temperatuur. 'n Veel groter opbrengs virus word verkry uit eiers wat teen 33° C. as by 37° C. uitgebroei word. Dit sal 'n „nuttige” virus wees vir die bestudering van die groei van virusse. As voorloper tot 'n noukeurige kwantitatiewe bestudering in eiers, is daar besluit om immune sera voor te berei waarmee dit moontlik sal wees om komplementbindingstoetse uit te voer.

Die virus word maklik geadapteer tot die breine van soogende muis en bereik daar hoë titres. Die virus maak gereeld muis van 2-11 dae oud binne 3-6 dae dood. Volgroeiende muis toon egter geen simptome na i.c. innokulasie. Dit was derhalwe 'n onverwagte bevinding dat die virus vinnig aanteel in die breine van volgroeiende muis sonder dat dit waarneembare simptome veroorsaak.

Die groeiensnelheid van die virus in eiers en in muis sal in besonderhede bestudeer word.

Lumpy Skin Disease virus has proved to be the smallest so far measured. The size determined for the Poliomyelitis (Lansing) virus agrees with that found by workers using electron microscopy.

Electrophoresis studies have also continued. Poliomyelitis virus in mouse brain appears to migrate with the globulin fraction unlike, e.g., the Horse Sickness virus which has the mobility of albumin.

It was considered possible that viruses in tissue suspensions are closely attached to host protein. Believing this fact to be of possible importance in serological specificity and host adaptability, attempts have been made to free polio virus of tissue protein by tryptic digestion. Such trypsinized virus has been used in attempts at egg adaption, so far without success.

It has been possible to show that polio virus survives in the chorio-allantoic cavity of eggs for 48 hours or more, but no virus could be recovered from the chorio-allantoic membranes. The same results have been obtained with untreated, ether treated and trypsin digested virus. Our results suggest that prolonged passage in sucking mice increases the susceptibility of virus to trypsin.

A multimembrane electrophoresis apparatus has been devised by Dr. Polson, which allows of rapid purification of proteins and viruses.

Dr. Naudé has been studying the rates of diffusion of bacteriophages in different media. Phage in low concentration appears to have an abnormally high diffusion rate in broth, but a diffusion corresponding to particle size when the medium contains protein (e.g. haemoglobin).

**Growth rate of blue tongue virus:** (Prof. M. van den Ende, Dr. A. Linder and Dr. G. Selzer)

Blue tongue virus in eggs appears to be extremely sensitive to temperature. A much higher yield of virus is obtained from eggs incubated at 33° C. than at 37° C. It promised to be a “useful” virus for the study of virus growth. Preparatory to a detailed quantitative study in eggs it was decided to prepare immune sera which would allow complement fixation tests to be carried out.

The virus is easily adapted to the brains of sucking mice in which it reaches a high titre. The virus regularly kills 2 to 11 day-old mice in 3 to 6 days. Adult mice however show no symptoms after i.c. inoculation. It was therefore an unexpected finding that the virus multiplies rapidly in the brains of adult mice without producing recognizable symptoms.

The growth rate of the virus in eggs and mice will be studied in detail.

Dit was ook moontlik om sera in muis voor te berei wat indien dit in hoë mate verdun is 'n komplement-binding sal vorm met antigene wat deur die aseton en eterbehandeling van bloutong besmette muisbreine voorberei is.

#### Griep

Virusse is geïsoleer van gorrelprodukte en die longe van een sterfgeval gedurende die onlangse epidemie. Noukeurige bestudering van antigeniese struktuur (komplementbindings en hemagglutineringsstuiting) het aangedui dat alle stamme van die virus wat gevind is van die A primêre tipe was.

#### Publikasies

Publikasies wat gedurende die afgelope jaar verskyn het word in Bylaag IC aangegee.

It has been possible incidentally to prepare sera in mice which will in high dilution fix complement with antigens prepared by acetone and ether treatment of Blue tongue infected mouse brains.

#### Influenza

Virus strains have been isolated from garglings and the lung of one fatal case during the recent epidemic. Detailed studies of antigenic structure (complement fixation and haemagglutination inhibition) have shown all the strains to be of the A prime type.

#### Publications

Publications which have appeared during the past year are listed in Appendix IC.

## Publikasies — Publications

### A. W.N.N.R. Publikasies/C.S.I.R. Publications

B. Publikasies in tydskrifte deur lede van die W.N.N.R. personeel/Publications in periodicals by members of the C.S.I.R. staff

C. Publikasies wat van mediese navorsingseenhede ontvang is/Publications received from members of medical research units

D. Publikasies wat gedurende 1952 ontvang is van houers van W.N.N.R. navorsingstoekennings/Publications received during 1952 from holders of C.S.I.R. research awards

### A — W.N.N.R. PUBLIKASIES/C.S.I.R. PUBLICATIONS

#### Biblioteek en Inligtingsafdeling/Library and Information Division

*W.N.N.R. Inligting/C.S.I.R. Information* (maandelikse biblioteek-byvoegingslys/monthly library accessions list).

Register van die huidige wetenskaplike navorsing aan Suid-Afrikaanse universiteit/Register of current scientific research at South African universities. Pretoria, W.N.N.R./C.S.I.R., 1952.

#### Nasionale Instituut vir Personeelnavorsing/National Institute for Personnel Research

BULLETINS, (Bevat artikels oor onderwerpe in verband met die werk van die Instituut/Comprise articles on topics relating to the work of the Institute)

*Bulletin*, vol. IV. no. 1. Junie/June, 1952.

*Bulletin*, vol. III. no. 3 Desember/December, 1951

Some impressions on the employment potentialities of the Knysna forest-labourer community. By D. J. M. Vorster.

The role of arithmetical items in tests of general intelligence. By S. Biesheuvel.

The use of the second language as a medium for a mathematical achievement and a scientific information test. By F. W. Beezhold.

A preliminary study of experimental investigation of psycho-motor learning in African natives employed underground on certain gold mines of the Witwatersrand. By E. F. Hayes.

Studies on the nature and measurement of temperament and personality: I. Problems in the N.I.P.R. technique of temperament assessment by means of observational methods. By M. E. Baehr.

The application of performance tests to an African native family containing three microcephalic members. By W. Hudson and A. M. Masilela.

The measurement of mental imagery: A preliminary investigation. By A. C. Mundy-Castle.

An investigation into the visibility of road signs. By S. Biesheuvel and A. C. Mundy-Castle.

'n Aantekening oor die Suid-Afrikaanse groepsverstandstoets. Deur D. J. Gouws.

"The Heymans-Wiersma theory of temperament". A discussion with reference to animal and clinical studies. By J. J. Cowley.

A technique for the classification and coding of labour-turnover data for Hollerith analysis. By D. I. Williams.

Pfahler's karakterkunde compared with the Heymans-Wiersma theory of temperament. By H. Reuning.

The test-performance of psychiatric patients. By M. J. Goldstein.

Author's summary of articles which appeared elsewhere. "A case in which visual hallucinations related to past experience were evoked by photic stimulation". By A. C. Mundy-Castle.

Author summary: "The contribution of two group discussion techniques to a validated test battery for the selection of administrative personnel." By A. G. Arbous and Joy Maree.

Book review: "Theory and practice of psychological testing". By Frank S. Freeman. Reviewed by D. J. Gouws.

Book review: "Skill and age." By A. T. Welford. Reviewed by S. Biesheuvel.

Telekommunikasie-Navorsingslaboratorium/Telecommunications Research Laboratory

Maandelikse basiese radiovoortplantingsvoorspellings vir Suidelike Afrika/Monthly basic radio-propagation-predictions for Southern Africa (Afgerol/Mimeographed).

Nasionale Bounavorsingsinstituut/National Building Research Institute

Inligtingspamflette, (DIS) twee-maandelikse seleksie van tegniese navrae met antwoorde/Information sheets, (DIS) bi-monthly selections of technical enquiries, with replies.

BULLETINS, (DB) (Artikels oor onderwerpe wat in verband staan met die werk van die Instituut/Articles on topics relating to the work of the Institute.)

Bulletin No. 7. Pretoria, W.N.N.R./C.S.I.R., Desember/December, 1951. (DB-7).

Site selection in Non-European housing estate layouts. deur/by D. M. Calderwood.

The planning of Non-European residential areas in South Africa. deur/by D. M. Calderwood.

The costs of Native housing—Present day costs of brick houses at Vereeniging. deur/by A. L. Glen.

The resistance of thin walls to rain penetration—A review of the literature. deur/by S. J. P. Joubert.

A simplified method of calculating artificial light. deur/by W. M. H. Rennhackkamp.

NAVORSINGSVERSLAG/RESEARCH REPORT

ROUX, A. J. A., J. Visser and P. C. Minaar. Periodic heat flow through building components—heat transfer through homogeneous wall panels from

Skakelafdeling/Liaison Division

Jaarverslae van die W.N.N.R./Annual Reports of the C.S.I.R.

Navorsingsoorsig/Research Review

Driemaandelikse oorsig van W.N.N.R. werksaamhede/Quarterly review of C.S.I.R. activities.

B. — PUBLIKASIES IN TYDSKRIFTE DEUR LEDE VAN DIE W.N.N.R. PERSONEEL/  
PUBLICATIONS IN PERIODICALS BY MEMBERS OF THE C.S.I.R. STAFF

Nasionale Chemiese Navorsingslaboratorium/National Chemical Research Laboratory

BLUMBERG, R., C. L. Southall, N. J. van Rensburg and O. B. Volckman. South African fish products. XXXII. The rock lobster: A study of chitin production from processing wastes. *J. Sci. Food Agric.*, vol. 2, no. 12, December, 1951. pp. 571-576.

Maandelikse bulletin van ionosferiese karakteristieke soos waargeneem in Johannesburg en Kaapstad/Monthly bulletin of ionospheric characteristics observed at Johannesburg and Cape Town. (Afgerol/Mimeographed.)

Bulletin, No. 8. Pretoria, W.N.N.R./C.S.I.R., Junie/June, 1952. (DB-8).

The properties and uses of lightweight foamed slag concretes. deur/by N. Stutterheim.

The nature of heaving foundations: Some experimental installations in the field at Leeuhof, Vereeniging. deur/by A. K. Steyn and L. E. Collins.

The measurement of temperatures, moisture contents and electrical potentials in the soil under a building at Vereeniging. deur/by L. L. van den Heever.

Cost norms of Native housing. deur/by A. L. Glen.

A study of the socio-economic status of Native families in the Payneville Location, Springs. deur/by H. J. J. van Beinum.

Minimum standards of accommodation for the housing of non-Europeans in South Africa. deur/by D. M. Calderwood and P. H. Connell.

the outdoor climatic environment to the indoor air. Pretoria, W.N.N.R./C.S.S.R. DR-9.

KINGWILL, D. G., red./ed. Adresboek van navorsingsliggame in die Unie van Suid-Afrika. Pretoria, W.N.N.R./C.S.I.R., 1952.

BOTHA, G. R. The quality requirements of water for industrial use. *S.A. Ind. Chem.*, vol. 6, no. 6, June, 1952. pp. 121-123.

CARMAN, P. C. Adsorption of gases on porous solids. II. Calculation of pore size distributions. *Proc. Roy. Soc.*, vol. 209A, no. 1096, October, 1951. p. 69.

CARMAN, P. C. and F. A. Raal. Diffusion and flow of gases and vapours through micropores. Part III. Surface diffusion coefficients and activation energies. *Proc. Roy. Soc.*, vol. 209A, no. 1096, October, 1951. p. 38.

CARMAN, P. C. Diffusion and flow of gases through micropores. IV: Flow of capillary condensate. *Proc. Roy. Soc.*, vol. 211, no. 1107, 20th March, 1951. p. 526.

CARMAN, P. C. and F. A. Raal. Physical adsorption of gases in porous solids. Part I. Comparison of loose powders and porous plugs. *Proc. Roy. Soc.*, vol. 209A, no. 1096, October, 1951. p. 59.

CILLIE, G. G. The quality requirements of water for domestic use. *S.A. Ind. Chem.*, vol. 6, no. 6, June, 1952. pp. 119-121.

CILLIE, G. G. The treatment of tannery effluents. *Municipal Affairs*, vol. XVII, no. 195, November 1951. p. 23.

CLINGMAN, A. L. and D. A. Sutton. Separation of benzene carboxylic acids by paper chromatography. *Fuel*, vol. 31, no. 2, April, 1952. pp. 259-260.

DRY, F. W., R. W. Burley and J. D. Speakman. Plasticity of wool. *Nature*, vol. 169, no. 4296, March 1, 1952. p. 371.

GRAY, D. J. S. et al. Whale processing. I. The composition of the products obtained by the concentration and spray-drying of glue waters. *J. Sci. Food Agric.*, vol. 2, no. 10, October, 1951. pp. 450-454.

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ELSDON-DEW, R. and L. Freedman. Intestinal parasites in the Natal Bantu. *S.A. Journal of Clinical Science*, vol. 3. no. 2. June, 1952. pp. 59-65.

ELSDON-DEW, R. and Shirley E. Maddison. Amoebic complementfixation reaction. *The Journal of Tropical Medicine and Hygiene*, vol. 5. no. 9. September, 1952. pp. 208-211.

WILLMOT, A. J., T. G. Armstrong and R. Elsdon-Dew. Aureomycin in amoebic liver abscess. *S.A. Journal of Tropical Medicine and Hygiene*, vol. 1. no. 3. May, 1952.

D. — PUBLIKASIES WAT GEDURENDE 1952 ONTVANG IS VAN HOUERS VAN W.N.N.R.  
NAVORSINGSTOEKENINGS/PUBLICATIONS RECEIVED DURING 1952 FROM  
HOLDERS OF C.S.I.R. RESEARCH AWARDS

ALGEMENE NAVORSINGS/GENERAL RESEARCH

BENNETT, R. N. E. *Euphorbia resins*. The triterpenes from *E. Tirucalli*: Euphadeienol and Tirucalladienol. Ph.D. thesis—University of Natal.

BOUWER, S. R. The skin and the thyroid gland of *Bufo regularis* Reuss in relation to moulting. M.Sc. thesis—University of Natal.

BROOM, R. and J. T. Robinson. Swartkrans Ape-man (*Paranthropus Crassidens*). *Transvaal Museum Memoir*, No. 6. March, 1952.

CANHAM, P. A. S. and F. L. Warren. The Saponins. Part II. The isolation of gitogenin and digitogenin from *Cestrum parqui*. *J. S. Afr. Chem. Inst.*, vol. 3. no. 12a. December, 1950. pp. 63-65.

CAVE, MARION S. and Mary Agard Pocock. Karyological studies in the volvocaceae. *Amer. J. Botany*, vol. 38. no. 10. December, 1951. pp. 800-811.

CAVE, MARION S. and M. A. Pocock. The Acetocarmine technique applied to the colonial volvocales. *Stain Technology*, vol. 26. no. 3. July, 1951. pp. 173-174.

COOKE, B. A. The viscosity and thermal diffusion of boron trifluoride. M.Sc. thesis—University of Natal.  
DODDS, S. Contribution to the study of the humidity reactions of *Peripatopsis Moseleyi* (Wood Mason) and of *Tenebrio Molitor L.* M.Sc. thesis—University of Natal.

EWER, D. W. Animal weather-prophets. *Weather*, vol. 7. January, 1952. pp. 16-19.

EWER, R. F. Water uptake and moulting in *Bufo regularis* Reuss. *J. Experimental Biology*, vol. 28. no. 3. September, 1951. pp. 369-373.

EWER, R. F. The effect of Pitressin and Pitocin on water balance in *Bufo regularis* Reuss. *J. Experimental Biology*, vol. 28. no. 3. September, 1951. pp. 374-384.

FOURIE, R. M. Reduced pressure distillation of water and the vapourpressure of H<sub>2</sub>O<sup>18</sup>. M.Sc. thesis—University of Natal.

GROBBELAAR, N. A preliminary study of the amino acids and proteins of the pea (*Pisum sativum*), at different stages of growth. M.Sc. thesis—University of Pretoria.

JACKSON, S. P. Climates of Southern Africa. *S. Afr. Geographical Journal*, vol. 33. September, 1951. pp. 1-21.

JANSE, A. J. T. The moths of South Africa. *Gelechiidae*. Transvaal Museum. 1951.

JANSE, A. J. T. Plates to Volume 5 of *The Moths of South Africa*. Transvaal Museum. 1950.

JORDAAN, P. G. Gemeenskapontwikkeling en veldbeheer. *Tydskr. Wetenskap en Kuns*, Oktober, 1949. pp. 204-214.

JORDAAN, P. G. Aantekeninge oor die voortplanting en brandperiodes van *Protea Mellifera Thunb.* *J. S. Afr. Botany*, October, 1949. pp. 121-125.

JORDAAN, P. G. (a) Die saadknop en embriologie van *Leucadendron*. (b) Die saadknop en embriologie van *Leucospermum Conocarpum*, R. Br. *Annale van die Universiteit van Stellenbosch*, Jaargang 23, Reeks A, no. 3. 1945. pp. 1-54.

JORDAAN, P. G. Die saadknop en embriologie van *Brabeium Stellatifolium*, L. *J. S. Afr. Botany*, January, 1946. pp. 15-26.

KOCH, C. Die Tenebrioniden des Südlichen Afrikas. *Estratto dagli Atti della Societa Italiana di Scienze Naturali*, vol. 90. 1951.

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LAWRENCE, R. F. New parasitic mites from South African lizards. *Annals of the Transvaal Museum*, vol. 2. Part 4. July 6th, 1951. pp. 447-459.

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LUCKHOFF, C. A. The Stapelieae of Southern Africa. A. A. Balkema/Cape Town/Amsterdam. 1952. p. 281.

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PHILLIPS, W. E. Atmospheric super-refraction and the anomalous propagation of radio waves off the coast of Natal. *S. Afr. J. Science*, vol. 48. no. 5. December, 1951. p. 163.

PIETERSE, P. J. S. Die invloed van avitaminose A op die histologiese struktuur van die endokriene kliere by jong albino-rotte met spesiale verwysing na die thymus. M.Sc. verhandeling—Potchefstroomse Universiteit vir C.H.O.

PINHEY, E. C. G. The dragonflies of Southern Africa. *Transvaal Museum Memoir*, no. 5. October, 1951.

POCOCK, M. A. Notes on the occurrence in New Zealand of *Volvox Steinii* Playfair and species of *Volvox* Linnaeus. *Rec. Cant. Mus.*, vol. 6. no. 1. pp. 1-8.

POCOCK, M. A. A rare Algae from Stonehenge. *Nature*, vol. 168. September 22nd, 1951. p. 524.

SMITH, J. L. B. A case of poisoning by the Stonefish *Synanceja verrucosa*. *Copeia*, no. 3. August 31st, 1951. p. 207.

SMITH, J. L. B. A juvenile of the man-eater, *Carcharodon carcharias* Linn. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. IV, August, 1951. p. 729.

SMITH, J. L. B. A new hound shark from South Africa, and new records. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. V. March, 1952. p. 223.

SMITH, J. L. B. *Carcharinus Zambezensis* Peters, 1852, with notes on other chondrichthyan fishes. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. V. September, 1952. p. 857.

SMITH, J. L. B. Cyprinodont fishes from a sulphur-producing lake in Cyrenaica. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. V. October, 1952. p. 888.

SMITH, J. L. B. Plesiopid fishes from South and East Africa. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. V. February, 1952. p. 139.

SMITH, J. L. B. Preliminary notes on fishes of the family Plecyothynchidae from South and East

MEDIESE, TANDHEELKUNDIGE EN VOEDINGSNAVORSING/MEDICAL, DENTAL AND NUTRITIONAL RESEARCH

IRVING, J. T. Macrophages in the periodontal tissues of rats' incisor teeth. Letter to the Editor. *Nature*, vol. 169. no. 4327. October 4th, 1952. pp. 573-574.

LUCK, C. P. A membrane manometer with secondary air transmission. *J. Sci. Instruments*, vol. 28. June, 1951. pp. 173-176.

MULLER, TOBIE. The effect of estrogen on the loose connective tissue of the albino rat. *Anat. Rec.*, vol. 2. no. 3. November, 1951. pp. 355-380.

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SMITH, J. L. B. Sexual dimorphism in the genus *Naso* Lacepede, 1802, with a description of a new species and new records. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. IV. November, 1951. p. 1126.

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SMITH, J. L. B. The fishes of the family Cirrhitidae of the Western Indian Ocean. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. IV. July, 1951. p. 625.

SMITH, J. L. B. The fishes of the family Haliophidae. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. V. January, 1952. p. 85.

SMITH, J. L. B. Trigger action in *Quinquarius capensis* Cuvier (1829), with a description of the adult form. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. IV. September, 1951. p. 873.

SMITH, J. L. B. Two chondrichthyan fishes new to South Africa. *Ann. Mag. Nat. Hist.*, Ser. 12. vol. V. August, 1952. p. 759.

VAN DUUREN, B. L. and F. L. Warren. Nitric acid oxidation of coal. *J. S. Afr. Chem. Inst.*, vol. 3. no. 2. December, 1950. pp. 67-72.

VAN ZINDEREN BAKKER, E. M. Archaeology and palynology. *S. Afr. Archaeological Bulletin*, vol. 6. no. 23. September, 1951. p. 1-8.

VAN ZINDEREN BAKKER, E. M. Prospects of palynology in South Africa. *S. Afr. J. Science*, vol. 48. no. 5. December, 1951. pp. 167-174.

VINCENT, J. A check list of the Birds of South Africa. South African Ornithological Society. 1952.

WOOD, D. A. The Euphorbia resins. (i) The analysis of the resin from *E. ingens*. (ii) The structure of Euphorbol with special reference to the hydroxyl group and the active athylenic linkage. M.Sc. thesis—University of Natal.

ZEEMAN, P. B. Spectrum and structure of the Boron monosulphide (BS) molecule. *Canadian J. Physics*, vol. 29. 1951. pp. 336-356.

PIJPER, A. and A. Kistner. Slides and cover-glasses for dark-ground microscopy. *J. Royal Microscopical Soc.*, vol. 71. 1951. pp. 176-180.

WOLPE, JOSEPH. The formation of negative habits: A neuro-physiological view. *Psychological Review*, vol. 59. no. 4. July, 1952. pp. 290-299.

RESEARCH BURSARIES and ASSISTANTSHIPS awarded by the C.S.I.R. during 1952  
NAVORSINGSBEURSE en ASSISTENTSKAPPE wat deur die W.N.N.R. gedurende 1952  
toegeken is

A. GENERAL RESEARCH—ALGEMENE NAVORSING

1. BURSARIES—BEURSE

i) SENIOR BURSARIES—SENIOR BEURSE (£200-£1,000)

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
DAY, Professor J. H. Ph.D. Prof. of Zoology £500	—	University of Cape Town	Estuarine Ecology of South Africa and Polychaeta of South Africa.
KOCH, Dr. C. D.Sc. Hon. Coleopterologist £600	1949 1950 1951	Transvaal Museum	Monograph of the Tenebrionidae (Coleoptera) of Southern Africa.
SCHUTTE, H. J. M.Sc., D.Sc. £200	—	Tegniese Hoërskool, Delft	Ondersoek in verband met 'n moderne algebraïese onderwerp.
SMITH, Professor J. L. B. Ph.D., F.R.S.S.A. Professor of Ichthyology £1,000	1946, 1947 1948, 1949 1950 1951	Rhodes University	Fishes of South Africa.
TESCHE, Dr. O. A. Ph.D. Lecturer in Physics £700	1951	University of Cape Town	X-ray diffraction by crystals of fatty acids and their structural analysis.

## (ii) STUDENT BURSARIES — STUDENTE BEURSE (£100-£200)

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
BOTANY/PLANTKUNDE DE BRUYN, J. A. B.Sc., M.Sc.	—	Universiteit van Chicago	Die fisiologiese betekenis van spoor-elemente vir plante.
THOMSON, G. M. B.Sc.	—	University of Natal	The fixation of Nitrogen and Nitrification in soils of the Natal Midlands.
CHEMISTRY/SKEIKUNDE CARR, A. D. B.Sc.	1951	University of Cape Town	Multistage counter-current liquid-liquid extraction.
COOKE, B. A. B.Sc.	1951	University of Natal	Isotopic Equilibria in the Boron Halides.
COOKE, J. K. B.Sc.	—	University of Natal	Alkaloids from South African plants. Special attention is to be devoted to the possibility of isolation and constitutional studies of quaternary bases with possible curare-like action.
COOPER, Miss M. J. O. B.Sc.	—	University of Natal	Study of the volatile oils from Lantana species.
DAWSON, M. F. B.Sc.	—	Rhodes University	A study of the thermal decomposition of Calcium Lactate.
DE VALENCÉ, L. P. B.Sc., M.Sc.	—	University of London	1) Techniques of dosage determination in X and Gamma Ray Therapy. 2) Biological effects of ionising radiations.
DE VILLIERS, I. J. B. Sc.	—	Universiteit van Pretoria	1) Isolasi en struktuur bepaling van die aktiewe stof van Hertia Palleus (Springbok Bos) of 'n ander Suid-Afrikaanse giftige plant, of 2) Addisieprodukte van 2,4 Dinitrobenzeneensulfeniel Kloried aan Styrene.
DRY, L. J. B.Sc., M.Sc.	1951	University of Natal	The synthesis of the Polyhydroxy Aliphatic acids with particular reference to the stereochemistry of these acids.
DU TOIT, A. A. B.Sc., B.Sc. (Hons)	1951	Rhodes University	A statistical investigation of cation exchange processes in South African soils.
EVE, A. J. B.Sc., B.Sc. (Hons)	1951	Rhodes University	Polarographic determination of trace elements in "pure" copper.
FAURE, P. K. B.Sc., B.Sc. (Hons)	1951	Rhodes University	A conductometric study of adsorption from and certain reactions in extremely dilute solutions.
FEWSTER, (Miss) M. E. B.Sc.	1951	University of Leeds	The rate of bacterial metabolism of aromatic amino acids.
FOURIE, R. M. B.Sc., B.Sc. (Hons)	1951	University of Natal	Determinations of the physical properties of gaseous Boron Trifluoride.
JACH, J. B.Sc.	—	University of Cape Town	Micro investigation of phase changes with particular reference to close study of melting phenomena of pure substances.

## (ii) STUDENT BURSARIES — STUDENTE BEURSE (Continued—Vervolg)

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
LOURENS, W. A. B.Sc.	—	University of Natal	Sterols with special reference to materials which could be used as starting substances for the synthesis of Cortisone.
MARKS, G. C. B.Sc.	1951	University of Cape Town	Elucidation of the structural features necessary for the production of pseudo tubercular lesions by branched chain fatty acids.
MILNER, (Mrs.) A. M. B.Sc., M.Sc.	1950 1951	University of Natal	Isotopic exchange between aquo-ions and water.
ROUSSOUW, A. J. B.Sc.	—	University of Natal	Construction of single beam, prism type, recording infra-red spectrometer of high resolution together with the experimental study and theoretical interpretation of the infra-red spectra of chemical substances.
TE GROEN, P. W. B.Sc.	—	Universiteit van Pretoria	(a) Isolasi en struktuur bepaling van die aktiewe stof van Dipoandi Glaucum (Malkop-ui) of 'n ander Suid-Afrikaanse giftige plant, of (b) Benso-nietrieloeksied as addend vir dubbel-binding-sisteme.
VAN ZYL, F. W. M.Sc.	1951	Universiteit van Stellenbosch	Die ensimatiëse konversie en fermentasie van stysel.
CHEMICAL ENGINEERING/ CHEMIESE INGENIEURSWESE HAWES, J. B.Sc. (Chem)	1951	University of Natal	Isotopic exchange of oxygen between carbon monoxide and carbon dioxide.
JOFFIN, M. M.	—	University of the Witwatersrand	A colloid chemical study of Pectin from South African citrus fruits.
RAW, C. J. G. B.Sc.	—	University of Natal	Determinations on the physical properties of gaseous Boron Trifluoride.
ELECTRICAL ENGINEERING/ ELEKTRIESE INGENIEURSWESE SCHEDIVETZ, (Miss) G. M. T.	—	University of Natal	A quantitative investigation of the propagation of 3 and 10 cm. radio energy over land paths and the correlation of field-strength measurements with the existing meteorological conditions.
GEOLOGY/GEOLOGIE AMDURER, S. S. B.A.	—	University of Cape Town	The engineering geology of the Cape Flats.
STOCKEN, G. C. B.Sc., M.Sc.	1951	University of Cape Town	The geology of the Cango Beds, Oudtshoorn.
MECHANICAL ENGINEERING/ WERKTUIGKUNDIGE INGENIEURSWESE BOSMAN, D. L. B.Sc., (Mech. Eng.)	1951	University of the Witwatersrand	Photoelasticity with special reference to dynamic effects.
HERMANN, W. B.Sc., (Mech. Eng.)	1951	University of the Witwatersrand	Interferometric study of supersonic gas-flow phenomena.



2. ASSISTANTSHIPS — ASSISTENTSKAPPE (£450-£650)

(a) GRANTS FOR THE EMPLOYMENT OF SKILLED RESEARCH ASSISTANTS — TOEKENNINGS VIR DIE INDIENSNEEMING VAN GESKOOLDE NAVORSINGSASSISTENTE

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
BOTHA, Dr. P. J. M.Sc., Ph.D. Senior Lektor—Plantkunde	1946, 1947 1949, 1950 1951	Universiteit van Potchefstroom	Die ontkiemingsfisiologie van angiospermiëse wortelparasiete.
CONNELL, Professor P. H. B.Arch. Professor of Architecture	1951	University of Natal	1) Survey of geographic distribution of building materials in South Africa. 2) Convertibility and usage of materials.
DAY, Professor J. H. Ph.D. Professor of Zoology	1947, 1948 1950, 1951 1951	University of Cape Town	A biological survey of South African Estuaries. Stream survey project.
GANE, Dr. P. C. M.Sc., Ph.D. Deputy Director, Bernard Price Institute	1949 1950 1951	University of the Witwatersrand	Seismic travel times in the Transvaal.
MES, Professor M. G. Ph.D.	1951	Universiteit van Pretoria	(a) Studie van moontlike afskeiding van minerale deur blare van plante onder die invloed van reën. (b) Studie van moontlike afskeiding van minerale elemente, veral fosfor, deur wortels van plante.
OCKLESTON, Dr. A. J. B.E., Ph.D., D.Sc.	—	University of the Witwatersrand	Demolition tests on the University Dental Hospital building, and the necessary analytical studies and follow-up tests.
WARREN, Professor F. L. Ph.D., D.Sc., D.I.C. Professor of Chemistry	1950 1951	University of Natal	Investigations on medical and toxic principles in South African plants.

(b) GRANTS FOR THE EMPLOYMENT OF UNSKILLED RESEARCH ASSISTANTS — TOEKENNINGS VIR DIE INDIENSNEEMING VAN ONGESKOOLDE NAVORSINGSASSISTENTE — (£350-£450)

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
ELOFF, Dr. G. M.A., D.Sc. Senior Lektor	1950 1951	Universiteit van die Oranje-Vrystaat	Lewenswyse van knaag-dier molle met spesiale aandag aan ons in heemse soorte.
ISAAC, Professor W. E. B.Sc., Ph.D. Professor of Botany	1950 1951	University of Cape Town	(a) (i) Wt. densities of communities of selected seaweed species. (ii) Rate of regeneration studies. (iii) Seasonal reproductive cycles. (b) Continuation of regional surveys.
OCKLESTON, Dr. A. J. B.E., Ph.D., D.Sc.	—	University of the Witwatersrand	Demolition tests on the University Dental Hospital building, and the necessary analytical studies and follow-up tests.

(ii) STUDENT BURSARIES — STUDENTE BEURSE (Continued—Vervolg)

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
PHYSICS/FISIKA			
AHLERS, W. C. B.Sc.	—	Universiteit van Pretoria	Ondersoek van die kinetika van uitruil reaksies met radioaktiewe indikator.
HOLT, D. B. B.Sc.	—	University of the Witwatersrand	Physics of metals.
LITTLE, W. A. B.Sc.	—	Rhodes University	The fluorescence induced in organic crystals and liquids by ionising radiations.
MARTINS, J. S. B.Sc.	—	University of Natal	Measurement of the specific surface of powders and the heat of adsorption of gases and vapours on crystal surfaces.
RITTER, G. J. B.Sc.	—	Universiteit van Stellenbosch	Bou van die King-oond en sy gebruik by die opwerking en bestudering van bandspektra.
STOKER, D. J. B.Sc., B.Sc. (Hons)	—	Universiteit van Potchefstroom	Die wiskundige teorie van statistiek met sy toepassing.
ZOOLOGY/DIERKUNDE			
BOUWER, (Miss) S. R. B.Sc.	1951	University of Natal	Control of moulting in Bufo Regularis.
CHURCHER, C. S. B.Sc.	—	University of Natal	A study of the Fossil Hyraces of South Africa.
FRANK, G. H. B.Sc., M.Sc.	1951	Universiteit van Stellenbosch	Development of the Chondrocranium of the Ostrich.
MEYER, (Mej.) M. R. P.	—	Universiteit van Potchefstroom	Parasiete van insekte.

B. MEDICAL DENTAL AND NUTRITIONAL RESEARCH—MEDIËSE,  
TANDHEELKUNDIGE EN VOEDINGSNAVORSING

1. BURSARIES — BEURSE

(i) SENIOR BURSARIES — SENIOR BEURSE (£200—£1,000)

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
MUSPRATT, J. B.A. Entomologist £500	1950 1951	South African Institute of Medical Research	On the <i>Aedes</i> and allied mosquitoes of South Africa in relation to Yellow Fever prevention.

2. ASSISTANTSHIPS — ASSISTENTSKAPPE (£450—£650)

(a) GRANTS FOR THE EMPLOYMENT OF SKILLED RESEARCH ASSISTANTS — TOEKENNINGS  
VIR DIE INDIENSNEEMING VAN GESKOOLDE NAVORSINGSASSISTENTE

Name and qualifications Naam en kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
BOTHWELL, Dr. T. H. M.B., Ch.B.	1951	University of the Witwatersrand	To continue and expand the present study on iron metabolism in the various syndromes of iron excess.
ERASMUS, Professor J. F. P. Ch.M., M.D. Professor of Surgery	—	University of Cape Town	A study of the effects of Trauma, in- cluding surgical operation on blood volume, blood chemistry. Woundheal- ing. The effects of anti-histamine drugs in reduction of fluid loss. The effects of the diet of local racial groups on these problems.
GORDON, Dr. I. M.B., Ch.B. Senior Government Pathologist	1951	Durban	Forensic pathology.
HEYNS, Professor O. S. M.A., B.Sc., D.Sc., M.R.C.S., L.R.C.P., F.R.C.O.G. Professor of Obstetrics and Gynaecology	1947 1950 1951	University of the Witwatersrand	A study of the pattern of electrical potentials observed in the human uterus during pregnancy and labour.
IRVING, Professor J. T. Ph.D., M.D., M.R.C.S., L.R.C.P. Professor of Physiology	1946, 1947 1948, 1950 1951	University of Cape Town	Influence of endocrine and dietary factors on enamel and dentin for- mation.
ODENDAAL, Dr. W. A. D.Sc. Snyman, Professor H. W. M.D., Steyn, Professor D. G. Dr. Med., Vet., D.VSc. TE GROEN, Professor L. J. M.D.	1947 1948 1949 1950 1951	Universiteit van Pretoria	Nutrisionele en endokrinologiese studie.
ODENDAAL, Dr. W. A. D.Sc. Senior Lektor, Universiteit van Pretoria	1951	Universiteit van Pretoria	Voedingsopname eenheid.

Name and qualifications Naam en Kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
PIDPER, Professor A. M.D. Professor in Patologie	1947, 1948 1949, 1950 1951	Universiteit van Pretoria	Ondersoek na die aard spesiaal chemies van bakterie flagella.
SNYMAN, Professor H. W. M.B., Ch.B., M.D. Hoof, Dept. Interne Genees- kunde	1951	Universiteit van Pretoria	1) Lewensfunksie tydens pneumonie by die Bantoe. 2) Maagsap analise by die Bantoe.
STEYN, Professor D. G. Dr. Med., Vet., D.VSc.	1950 1951	Universiteit van Pretoria	Die maontlike skadelike hoedanighede van kleursel in voedsel en drank.
THERON, Dr. P. M.B., Ch.M., F.R.C.S. Senior Surgeon Jhb. Hospital	1951	University of the Witwatersrand	(a) Portal hypertensions. (b) The study of the effects of liver anoxaemia on peripheral circula- tory tone.

(b) GRANTS FOR THE EMPLOYMENT OF UNSKILLED RESEARCH ASSISTANTS — TOEKENNINGS  
VIR DIE INDIENSNEEMING VAN ONGESKOOLDE NAVORSINGSASSISTENTE — (£350—£450)

Name and qualifications Naam en Kwalifikasies	Previous awards Vorige toekennings	Where tenable Waar geldig	Subject of research Onderwerp van navorsing
HEEREMA, Dr. J. C. Oogaarts (Utrecht) Ophthalmic Surgeon	1950	University of Cape Town	Investigation of the physico chemical nature of migrating cells.