

*Handwritten signature*

N.I.P.R.  
JOHANNESBURG...  
N.I.P.N.

SOUTH AFRICAN  
COUNCIL FOR SCIENTIFIC  
AND INDUSTRIAL RESEARCH

# FOURTH ANNUAL REPORT

1948-1949

P.O. Box 395, Pretoria  
1st November, 1949.

Sir,

*I have the honour to present to you herewith the Fourth Annual Report of the Council for Scientific and Industrial Research for the year ended October 5th, 1949.*

*In accordance with the requirements of the Scientific Research Council Act, I present also a balance sheet and statement of income and expenditure certified by the Controller and Auditor-General for the financial year ended 31st March, 1949.*

*I have the honour to be,*

*Sir,*

*Your obedient Servant,*

**B. F. J. SCHONLAND.**

*President: Council for Scientific and Industrial Research.*

*Dr. the Hon. D. F. Malan,  
Prime Minister of the Union of South Africa,  
Prime Minister's Office,  
Union Buildings,  
PRETORIA.*

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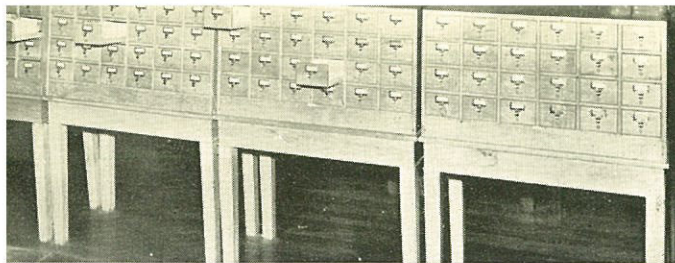


### *C.S.I.R. HEADQUARTERS IN VISAGIE STREET, PRETORIA*

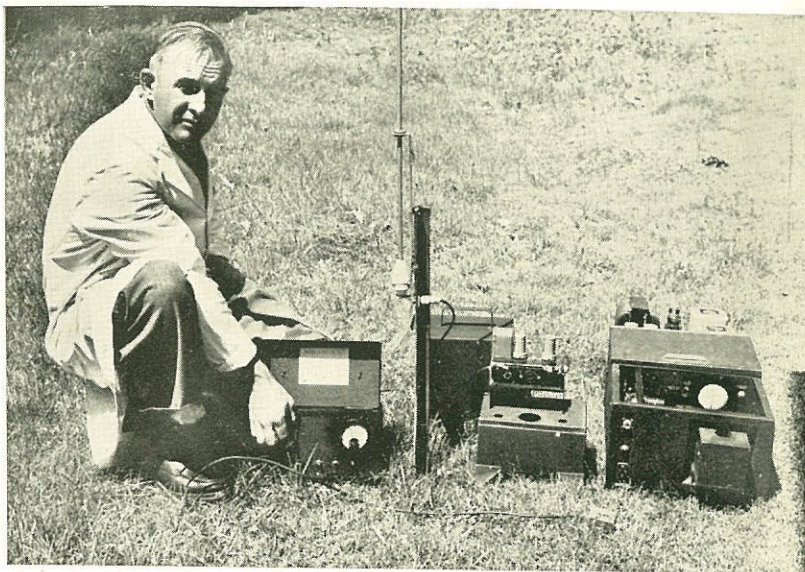
*Administrative Offices, the Library and Information Division and the National Physical Laboratory occupy the building in the foreground, and the National Building Research Institute and National Chemical Research Laboratory the building in the background. The National Institute for Personnel Research has its temporary headquarters in a building erected in the grounds of the University of the Witwatersrand, with a section accommodated in buildings adjacent to Defence Headquarters, Pretoria. The Telecommunications Research Laboratory is accommodated in the Department of Electrical Engineering, University of the Witwatersrand. The National Chemical Research Laboratory has units dealing with:*

*Fats and Proteins, in the Department of Chemistry, University of Cape Town  
Water Treatment, at the University of the Witwatersrand  
Nutrition at the South African Institute for Medical Research.*

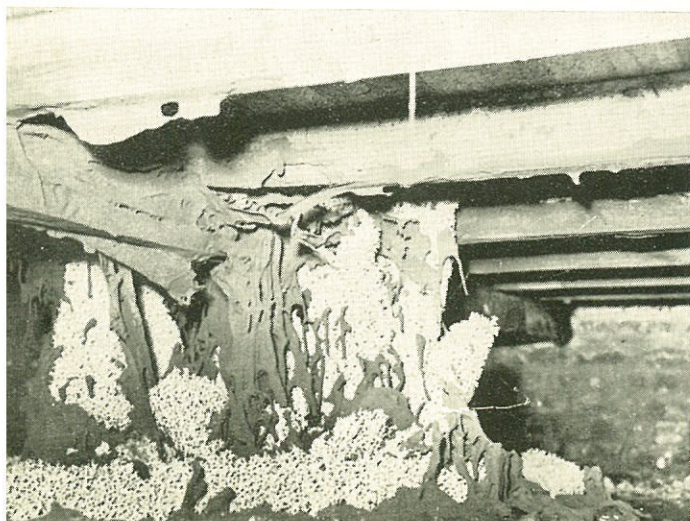
*The National Physical Laboratory has a decentralised unit dealing with Applied Geophysics, in the Bernard Price Institute of Geophysics; University of the Witwatersrand.*



The growing Card Catalogue of the Library and Information Division. It can be consulted to find out what material the Library has on any particular subject, and to locate any one of the books or pamphlets held by the Library. The stock is growing at the rate of about 3,000 books and 10,000 pamphlets per year.



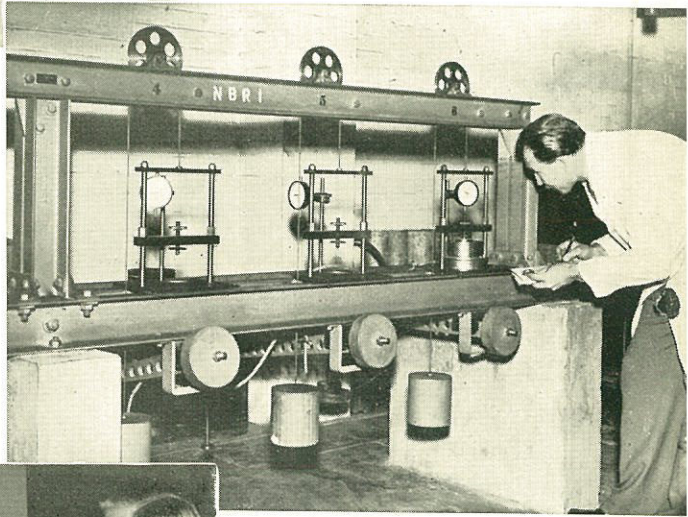
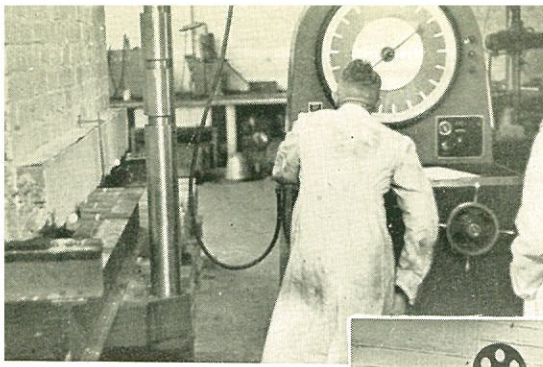
An automatic radio recorder, designed and built by the Telecommunications Research Laboratory. Simultaneous measurements with three of these instruments, at widely spaced points, will provide essential information on factors affecting the use of wireless air-navigation in Southern Africa.



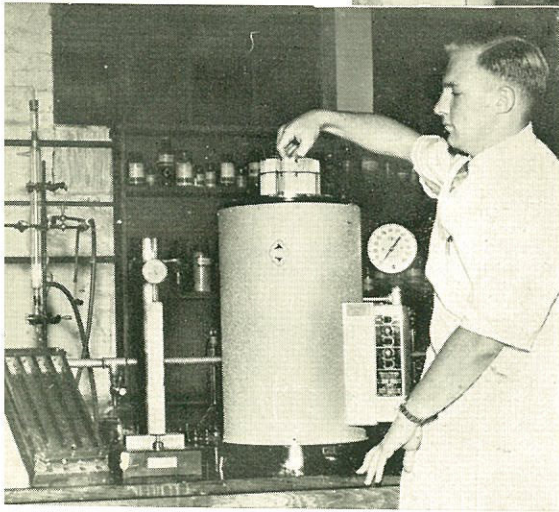
Termites (*Termes Badius*) attack the underside of boards and beams by building up a nest in the open, unventilated space below a suspended floor. A report on termite, beetle and fungal damage in buildings and recommended protective measures, is being prepared by a committee of experts, convened by the National Building Research Institute. (Photo. R. Schwab).

NATIONAL BUILDING  
RESEARCH INSTITUTE

*A universal testing machine being used by the Engineering Division to measure the deflection characteristics of a composite brick wall and concrete footing.*

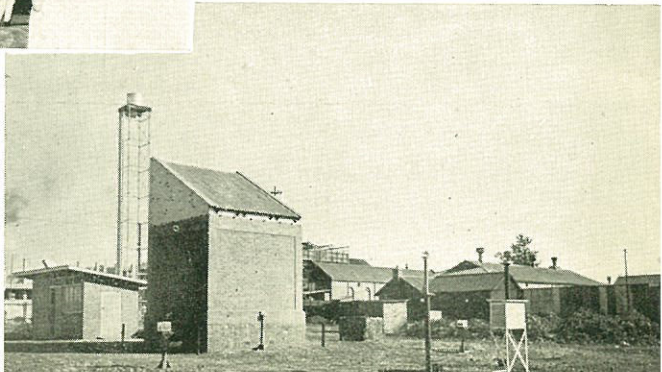


*A "consolidometer" made by the R. Workshops, being used by Soil Mechanics Division to measure the settlement characteristics of a soil sample for foundation analysis.*



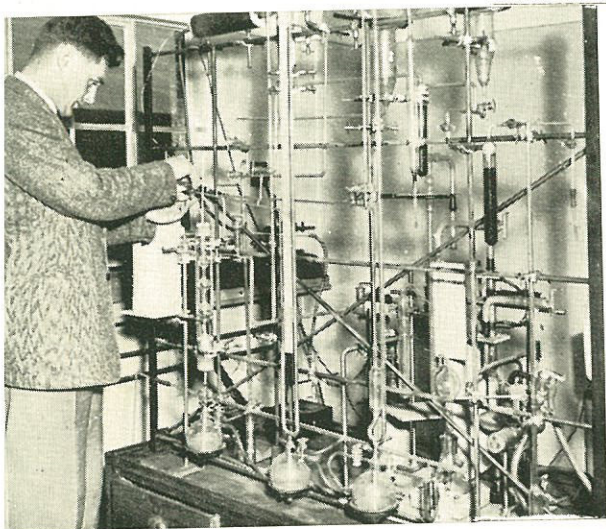
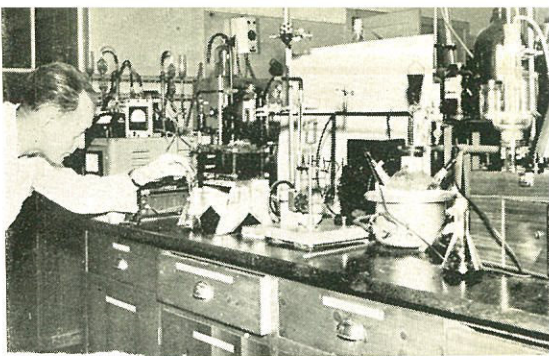
*The Materials Division is investigating the expansion of magnesia limes in relation to their hydration characteristics, by measuring the length of bars (cast in the moulds on the left) before and after autoclaving in the instrument on the right.*

*This test room is used by the National Efficiency Division for studying the heat transmission characteristics of building components, under conditions of periodic heat flow.*



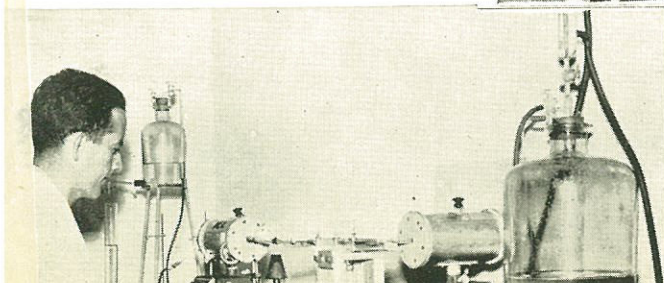
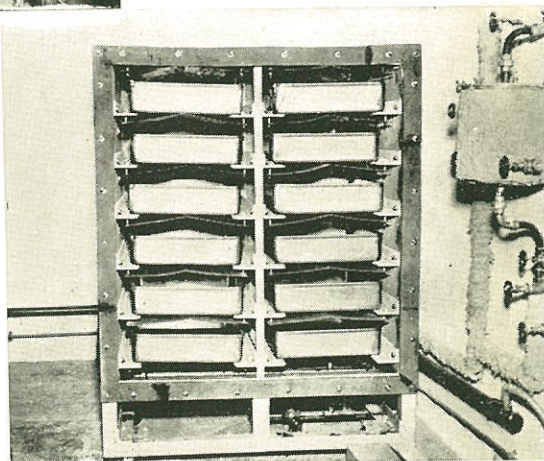
NATIONAL CHEMICAL  
RESEARCH LABORATORY

The chemistry of South African chrome deposits is one of the main studies being undertaken by the Physical and Analytical Chemistry Division. The photograph shows electro-winning of chromium being studied in a small laboratory cell preparatory to larger scale investigations by the Process Development Division.



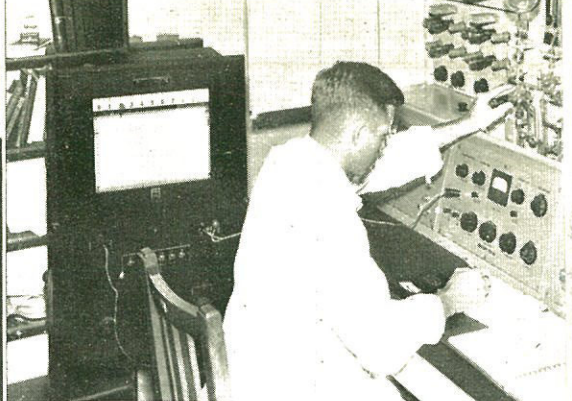
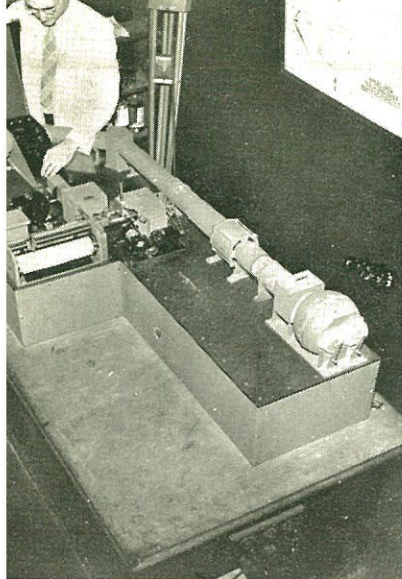
Gas-absorption apparatus, designed and built in the laboratory, being used for investigating the fine structure of South African coals; it is also used for determining surface areas and particle size.

Semi-pilot plant equipment designed by the Process Development Division for studying the production of citric acid by the fermentation of sugar cane molasses—the initial laboratory stage of the investigation was carried out by the Microbiological Chemical Division.



Apparatus in use, in the micro-analytical laboratory of the Organic Chemistry Division, for the analysis of carbon and hydrogen in very small quantities of organic compounds.

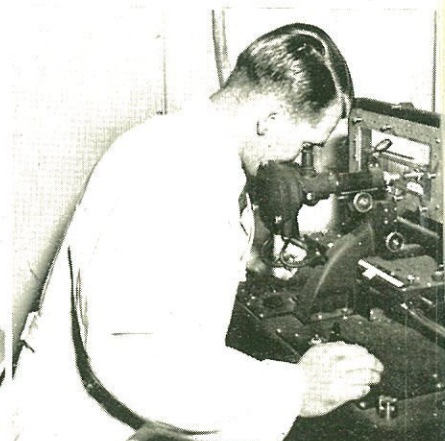
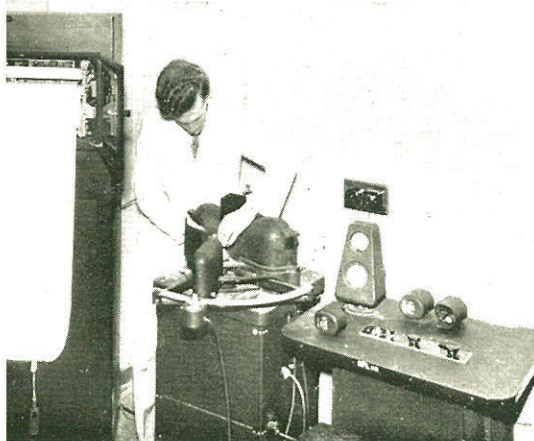




The laboratory's mass spectrometer, the first in South Africa, can be used for the analysis of carbon mixtures, and for the estimation of stable isotopes. In biological research, these estimations are used as an alternative to radioactive tracer techniques. The instrument is being adapted for assays of heavy elements, required in determinations of the age of rocks.

A Hardy recording spectro-photometer, used by the Optics Section for determining the reflection or absorption of light at all wavelengths in the visible spectrum, of materials such as dyed fabrics, painted surfaces, goggles, etc.

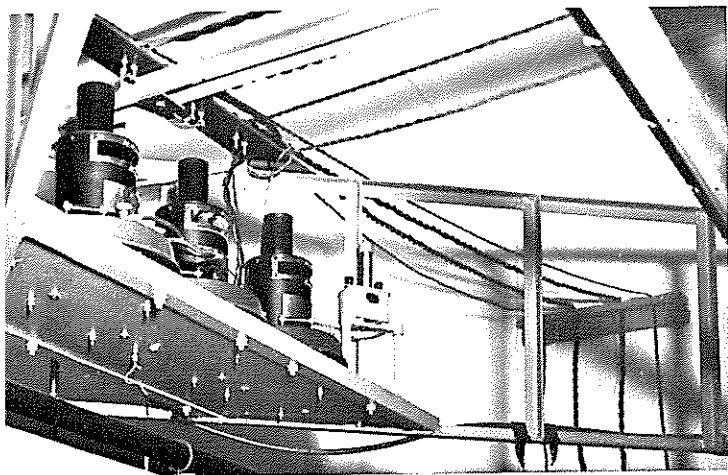
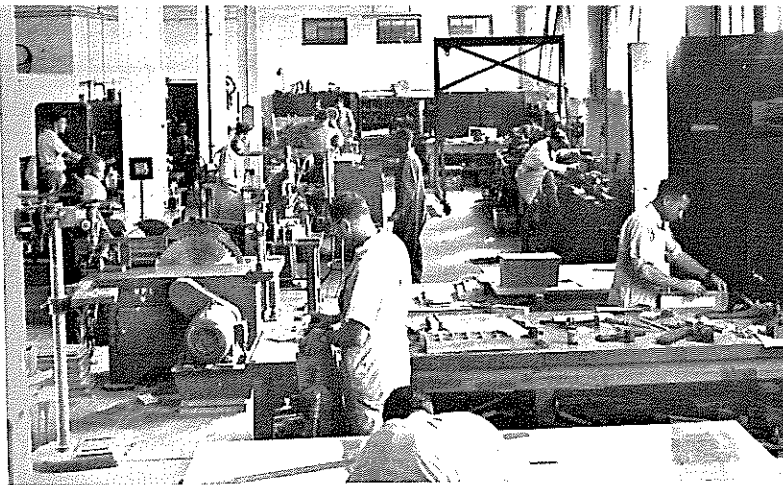
NATIONAL PHYSICAL LABORATORY



X-ray equipment used for accurate determinations of the composition and mode of crystallisation of minerals, dusts, rocks, metal alloys, limes, cements, etc.

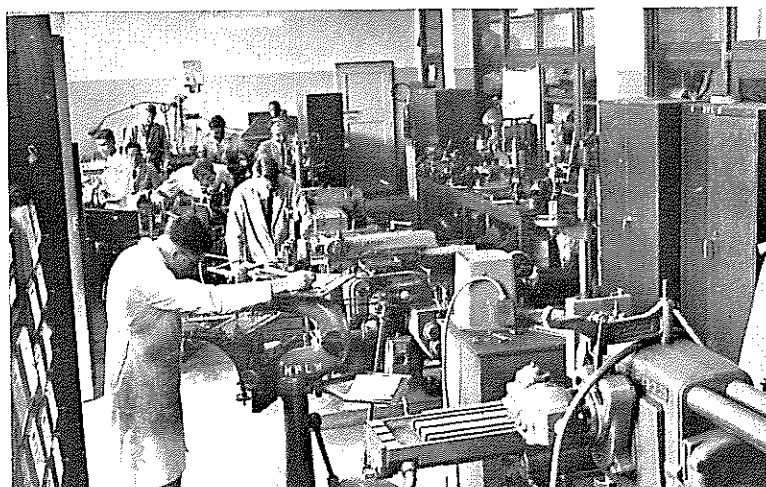
This spectro-photometer is used by the Spectrochemical Section for the measurement of spectrographic plates in the quantitative determination of impurities in metals (in proportions of a few parts per million) and of "trace" elements in soils.

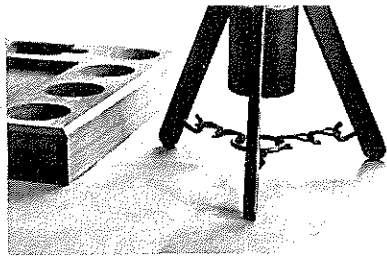
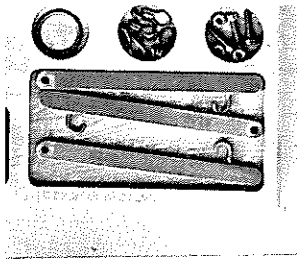
*Central Workshops:  
e of the bays in the  
gineering shop.*



*Electrical Standards  
Laboratory. The accuracy of alter-  
nating current instruments  
(ammeters, watt-meters and  
voltmeters) used in South  
Africa will, ultimately, de-  
pend on the accuracy of  
these reflecting instruments.  
They are used for calibra-  
ting alternating current in-  
struments in terms of direct  
current standards.*

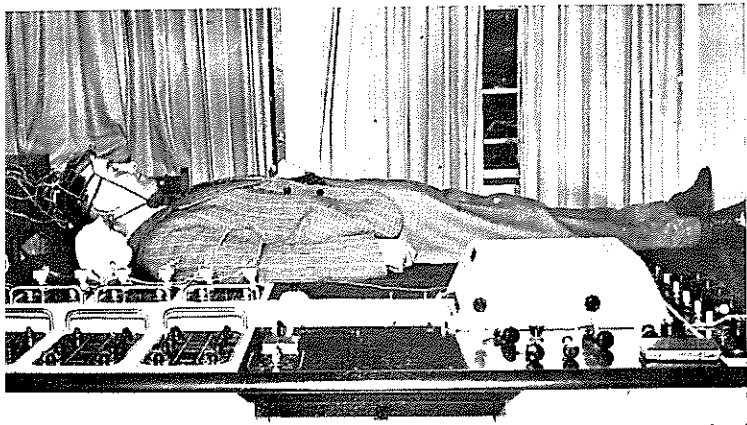
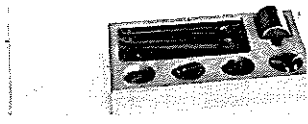
*In the precision  
shop of the Central  
Workshops.*



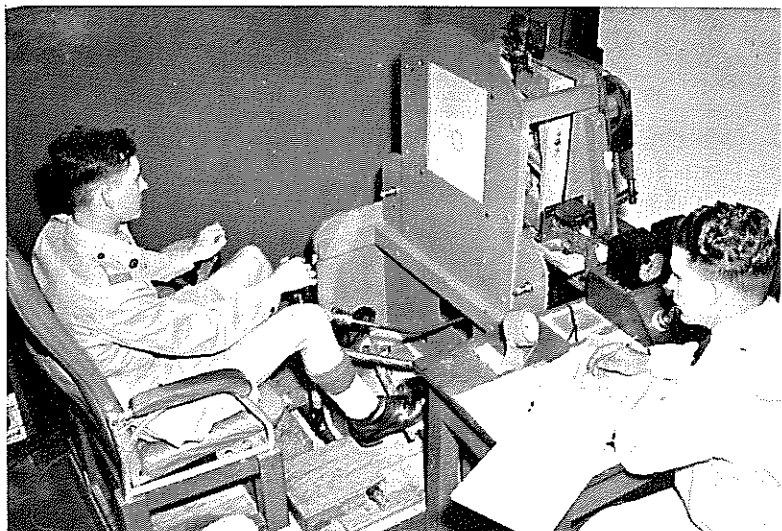


*This Tripod Assembly Test is one of a battery of tests designed by the Institute for measuring the mechanical ability of Native Mine Labourers. A candidate's score is determined by the number of parts correctly assembled a specific time.*

**NATIONAL INSTITUTE FOR PERSONNEL RESEARCH**



*The Institute's electroencephalograph, which is used for measuring the electrical activity of brains. Primarily concerned with the assessment of the psychological significance of normal brain rhythms, the Institute's Psychophysiological Laboratory also carries out clinical evaluation of disturbed brain activity.*



*Hand-foot coordination test for selecting potential aircraft pilots — equipment designed and built by the Institute.*



THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND  
INDUSTRIAL RESEARCH

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FOURTH ANNUAL REPORT  
1948—1949

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MEMBERSHIP AND MEETINGS OF THE COUNCIL

The membership of the Council during the year has been:—

DR. B. F. J. SCHONLAND (President)  
DR. F. J. DE VILLIERS  
MR. F. J. DU TOIT  
DR. P. J. DU TOIT  
PROF. S. F. OOSTHUIZEN  
MR. T.P. STRATTEN  
DR. E. TABERNER  
DR. H. J. VAN ECK  
DR. R. W. WILCOCKS  
MR. J. E. WORSDALE

Mr. F. J. du Toit was appointed by the Governor-General to fill the vacancy created by the death of Dr. Bernard Price, referred to in the last annual report. Dr. P. J. du Toit, Dr. H. J. van Eck and Dr. R. W. Wilcocks were reappointed by the Governor-General as members of Council, to serve for three years as from the 5th October, 1948. Mr. F. J. du Toit's appointment is for the same term.

Dr. P. J. du Toit acted as Deputy President of the Council as from the first of April, 1948; the President and the Council desire to record their appreciation of his assistance to them in this regard.

The Council held three meetings during the year, one in Johannesburg, one in Pretoria and one in Pietermaritzburg. In the course of these meetings it had valuable discussions with the Research Committees of the University of the Witwatersrand and the University of Natal, the Executive Committees of the Natal Chamber of Industries, the Paint Industries Research Institute and the Sugar Milling Research Institute.

The Executive Committee of the Council, which consisted of the President, Dr. P. J. du Toit (alternate Mr. T. P. Stratton) and Prof. S. F. Oosthuizen (alternate Dr. F. J. de Villiers), met six times during the year. On the 17th December, 1948, Prof. Oosthuizen asked to be relieved of this duty and his place was taken by Dr. F. J. de Villiers, with Mr. J. E. Worsdale as alternate.

In the course of the year Parliament amended the Scientific Research Council Act to increase the number of members of the Council from ten to twelve.

## GENERAL SURVEY AND ACTIVITIES OF THE COUNCIL

### *National Laboratories and Services*

Detailed accounts of the progress made by the national research laboratories and associated service departments of the Council, such as the Library and Information Division, the Liaison Division and the overseas liaison offices, are given later in this report.

The staffing and equipment of these sections is now approaching a satisfactory state and the Council can record gratifying progress in the service rendered by its staff to the industrial and general development of the country. Much remains to be done, but the steady progress achieved in four years, with increasing support from industry, shows clearly that the Council's policy and plans have fully merited the confidence of the Government.

This review of the Council's progress would be incomplete without reference to the enthusiasm and initiative of its staff, and the Council expresses its thanks to the Secretary/Treasurer, to the directors of its laboratories and to other responsible officers and their assistants, for their excellent work during the year.

### *Proposals in regard to permanent buildings*

For the past four years the Council's headquarters and library, together with the national laboratories for research in physics, chemistry and building, have been housed in part of the Visagie Street Government Buildings, built during the war for munitions production. With the help of the Public Works Department these buildings have been adapted so as to provide reasonably good laboratory facilities. The growth of the Council's activities has, however, resulted in much congestion and the buildings are not suited to the work that has to be done in them, since they were not planned for the purpose.

For this reason, and with an eye to future expansion, the Council has for some time been considering sites for permanent buildings to house its headquarters and laboratories. It has been fortunate in receiving a generous offer from the University of Pretoria of a portion of the University's experimental farm, 100 morgen (200 acres approx.) in extent, for the site of its future buildings. This site is ideally suited for the purpose in regard to situation and amenities, including road access from Johannesburg and the Eastern Witwatersrand. The Council, which has a reserve building fund sufficient to enable it to proceed with part at least of a building programme, has drawn up preliminary plans and estimates for such a programme and these are at present being considered by the Government.

#### *Industrial Research Contracts and Fellowships*

Work on sixty-five contracts for special investigations, mainly industrial research, was carried out during the year. These involved a total sum of £43,124 provided by the sponsors of contracts. Forty-three of these contracts were completed during the year.

The system of industrial research fellowships described in the last annual report received further support during the present year. The Council is at present providing supervision, accommodation and facilities for two such research fellowships, one financed by the Blue Lime Manufacturers' Association, and one by African Explosives and Chemical Industries for research into lightning problems. The South African Wool Board has arranged to provide two fellowships to deal with the chemistry of wool and its by-products. Appointments to these posts will soon be made.

#### *Industrial Research Associations*

During the year the Council assisted in the incorporation of the Paint Industries Research Institute and the Sugar Milling Research Institute as non-profit companies.

The Council has held successful discussions with the South African Wool Board regarding the establishment under its research association scheme of a Wool Textile Research Institute, which will relate research work on wool production with the developing wool textile industry of the Union. It is expected that the selection and the training of staff for such an Institute will take place in the near future.

The industrial research institutes, established under the Council's industrial research association scheme, have recorded satisfactory progress during the year. They are:—

*Fishing Industry Research Institute—*

Portswood Road,  
Sea Point,  
Cape Town.

Director: Dr. G. M. Dreosti.

*Leather Industries Research Institute—*

Rhodes University College,  
Grahamstown.

Director: Dr. S. G. Shuttleworth

*Paint Industries Research Institute—*

University of Natal,  
P.O. Box 1525,  
Durban.

Director: Dr. L. Whitby

*Sugar Milling Research Institute—*

University of Natal,  
P.O. Box 1525,  
Durban.

Director: Dr. K. Douwes-Dekker

*The African Regional Scientific Conference*

The Council, at the request of the Government, undertook the preparations and planning for an important African Regional Scientific Conference, held in Johannesburg in the latter part of October, 1949. The many preliminary arrangements for the conference were made by committees called together under the chairmanship of Dr. P. J. du Toit. They included the preparation of an illustrated brochure on *Science in South Africa*, which was distributed to delegates, and the printing of over a hundred scientific papers. In the running of the conference itself the Council received very great assistance from government departments. The Council is particularly grateful to the Department of External Affairs, which handled the actual organization with great energy and efficiency. The conference was attended by some 75 delegates from France, Belgium, Portugal and the United Kingdom and their African territories, as well as by delegates from Southern Rhodesia. The South African delegates numbered 36; in addition, over a hundred South African scientific workers attended for the reading of papers and for discussions.



The conference opened with an inspiring address by the Prime Minister, Dr. the Hon. D. F. Malan, on October 17th, 1949. In its final plenary sessions it adopted a number of resolutions aimed at the achievement of closer scientific collaboration between the territories situated in, or directly interested in, Africa south of the Sahara. The conference also passed unanimously a resolution inviting the governments concerned to set up an African Scientific Council, to unite in one advisory organisation all the functions necessary to ensure that the available scientific resources are used to the best advantage in the development of the human and material resources of the continent.

The Council has been pleased to learn that delegates to the conference consider that it was a success, and considers that through discussions and contacts it has already contributed much to the collaboration envisaged in these proposals.

#### *Research in the Universities*

During the year the Council provided a sum of £46,130 for assistance to research workers in the universities and to medical research units, of which £18,680 was for research in clinical medicine and surgery. This support took the form of 15 senior research bursaries, 52 student research bursaries, 16 research assistantships and 78 special grants for expenses, equipment and publication. All applications, after screening by the universities concerned, were referred to special referees to whom the Council wishes to express its thanks.

By arrangement with the Nuffield Foundation, the Council shared in the cost of a visit to the Union by Sir John Cockcroft, C.B.E., F.R.S., in July, 1949. In addition to lecturing and holding discussions at the National Physical Laboratory, the Universities of Pretoria, the Witwatersrand, Natal, Cape Town and Stellenbosch, Rhodes University College and Potchefstroom University College, Sir John Cockcroft advised the Council on nuclear research developments.

The Nuffield Foundation, at the invitation of the Council, acting for the University of Pretoria, generously arranged for a visit to the Union during the year by Prof. Charles Best of the University of Toronto. Professor Best visited and lectured at the medical schools of the Universities of the Witwatersrand and Cape Town, as well as that of the University of Pretoria. He also discussed medical research in South Africa with the Medical and Dental Research Committee.

As a special South African Committee of the Nuffield Foundation was formed during the year, the Council has now handed over to this committee the responsibility for dealing with requests from the universities to the Foundation, for arrangements in regard to visiting scientists. The secretary of the committee is Mr. J. R. Sorrie, c/o P.O. Box 395, Pretoria.

#### *General Co-ordinating and Advisory Functions*

The activities of the Council in this field, which were described in the last annual report, have been continued and extended. To the list of bodies on which it is represented must be added the Atomic Energy Board.

During the year, a strong advisory committee on chemical research has been developed under the Chairmanship of Dr. T. J. Wilken-Jorden, and the Council has had the benefit of advice from many special committees, including one on hydrological research and one on research into the use of bituminous materials of local origin as road-binders. Plans are at present being considered for research in the latter field in co-operation with the Ministry of Transport, the Provincial Administrations and the manufacturers of bituminous materials.

#### *Certification of industrial research expenditure for remission of income tax*

The Council is responsible for certifying to the Commissioner for Inland Revenue that claims for tax remission in respect of expenditure on research or on the subsidisation of research by industry are well-founded. This usually involves visits by officers of the Council to the factories concerned. During the year 18 such certificates were issued.

#### *Acknowledgments*

The Council wishes to thank its many advisory committees for the considerable help they have given to it during the year. It is particularly grateful to the University of Cape Town and the University of the Witwatersrand for their help in providing accommodation and services for off-shoots, or units, of its laboratories.

The following grants are acknowledged with thanks:—

The Administration of South West Africa, £1,000

The South African Broadcasting Corporation (radio research) £1,000

The Association of Fire Insurance Companies (lightning research) £580.

The Council wishes to thank the following for donations to the Library:—

African Explosives and Chemical Industries Ltd., Dr. P. A. Crous, Dr. P. J. du Toit, Imperial Chemical Industries Ltd., Johannesburg Public Library, Mr. D. G. Kingwill, Mr. H. J. Kleynhans, Dr. J. Lebrun, National Association of Manufacturers, New York, Dr. S. M. Naudé, Dr. W. S. Rapson, Dr. W. J. Schiff, Dr. B. F. J. Schonland, Todd Reference Books Ltd., London, The United Kingdom Information Office, University of Cape Town Library, Dr. Louis van den Berghe, Western Electric Company (N.E.) Johannesburg.

## MEDICAL RESEARCH

### *Advisory Committees*

The Medical and Dental Research Committee has consisted of the following:—

- Professor S. F. Oosthuizen, Chairman, Professor of Radiology, University of Pretoria
- Dr. B. F. J. Schonland, President of the Council for Scientific and Industrial Research
- Dr. P. J. du Toit, Deputy President of the Council for Scientific and Industrial Research
- Dr. G. W. Gale, Secretary for Health
- Mr. H. F. Pentz, Chairman, Transvaal Hospitals Advisory Council
- Professor A. Sutherland Strachan, Professor of Pathology, University of the Witwatersrand
- Professor J. F. Brock, Professor of Medicine, University of Cape Town
- Dr. E. H. Cluver, Director, South African Institute for Medical Research
- Professor G. A. Elliot, Professor of Medicine, University of the Witwatersrand
- Professor J. C. Middleton Shaw, Dean of the Faculty of Dentistry, University of the Witwatersrand
- Dr. J. H. S. Gear, South African Institute for Medical Research
- Professor M. van den Ende, Professor of Bacteriology, University of Cape Town.

During the year Dr. T. B. Davie, Principal of the University of Cape Town, was appointed to fill the vacancy caused by the death of Professor Sutherland Strachan.

Prof. S. F. Oosthuizen has continued to discharge the onerous duties of honorary secretary for medical research and has in the course of the year paid visits to various African territories, to establish liaison with them and to further medical research in this country.

Sir Edward Mellanby, Secretary of the Medical Research Council of Great Britain, visited the Union at the Council's invitation during the year to advise it on special problems, particularly in regard to research in nutrition. His advice proved most valuable to the Council.

Both the Council and the Medical and Dental Research Committee gratefully acknowledge the assistance rendered by the advisory sub-committees on dental diseases, social medicine, virus research, tuberculosis research, bilharziasis and tropical diseases, cardio-pulmonary research, nutrition research, radio-isotopes and therapeutic trials; and by the advisory panels which guide and assist the Council's medical research units.

Approximately £42,000 was allocated to medical research by the Council during the financial year 1949/50. Some £10,000 of this total was allocated to the support of medical research in the universities, £7,500 to the South African Institute for Medical Research, and approximately £25,000 to medical research units and administrative expenses, the latter being a very small part of the total.

#### *South African Institute for Medical Research*

The Institute has been supported not only by an annual grant of £7,500 but by placing a small nutrition research unit under Dr. A. R. P. Walker, of the Council's staff, at the Institute, and by the provision of a laboratory assistant for the Bilharzia Research Unit there.

The Council nominates two members of the board of control of the South African Institute for Medical Research. At the beginning of the year these members were Dr. B. F. J. Schonland and Professor S. F. Oosthuizen, with Dr. P. J. du Toit and Professor J. F. Brock as floating alternates. Early in the year Professor S. F. Oosthuizen resigned, to be replaced by Professor J. F. Brock, but he was subsequently reappointed to the board in the place of Dr. B. F. J. Schonland. Professor G. A. Elliott was appointed as a floating alternate. The Council's representatives on the board are, therefore, Professors S. F. Oosthuizen and J. F. Brock, with Dr. P. J. du Toit and Professor G. A. Elliott as alternates.

#### *Medical Research Units*

One of the most important activities on the Council's programme has been the development of research units, housed where most appropriate, and built round individuals competent to do the work. Problems of national importance have received priority. These units are assisted and guided by small panels and advisory committees.

To the governmental, provincial and other authorities and persons whose ready co-operation has assisted in the establishment of these units, the Council offers its thanks.

### *Tuberculosis Research Unit*

This unit has been established in partnership with the Department of Health. The Department has made Dr. D. A. Dormer's services available for the direction of the unit and provided accommodation, equipment and facilities at Durban. The Council has appointed Dr. P. Martinaglia, a retired veterinary surgeon, as a research assistant to the unit and has provided a senior bursary to enable Dr. P. Smit of the Department of Health to work overseas for a year. In addition, it has supplied a mass miniature X-ray set and certain funds for the operation of the unit.

The unit's programme includes the following projects: (a) correlation of pulmonary pathology with X-rays of the chest; (b) normal experimentation on rats with particular reference to diet; (c) investigation into the role played by intestinal parasites in the development of pulmonary tuberculosis, particularly in the Bantu; (d) development of liver biopsy to throw light on the effect of drugs like streptomycin on tubercles in the liver; (e) tubercular tests with particular reference to the effect of repeated tests on disease, graded tests and histoplasmin sensitivity in the lungs in cases with negative tubercular reactions; (f) the role of anti-biotics in tuberculosis, the typing of tubercle bacilli, the role played by para-amino salicylic acid, sulphone, etc., in tuberculosis, and (g) investigation into the importance of BCG and vole vaccination in tuberculosis.

### *Amoebiasis Research Unit*

The unit is being sponsored jointly by the Council, the Natal Provincial Administration and the Department of Health. It is situated at Durban under the direction of Dr. R. Elsdon-Dew, who recently returned from the U.S.A., where he did advanced work in this field with the assistance of a senior bursary from the Council.

The Natal Provincial Administration has made available the services of three medical officers, technical staff, accommodation and all normal laboratory and hospital equipment, and the staff of the Department of Health also assists.

The unit will investigate the following problems:—

What is the true incidence of acute and chronic infections in Natal and the carrier rate?

In what way and why does the incidence differ amongst races and among rural, urbanised and semi-urbanised Natives?

What form of treatment is most effective?

What factors precipitate the acute fulminating attack experienced in Natal?

### *Bilharziasis and Tropical Diseases Unit*

Efforts have been made, with some success, to co-ordinate and support research into the problems of *Bilharzia*, in order to combat the spread of this disease, to discover effective means of controlling it, and to support the development of its clinical treatment.

In addition to assistance received from the Department of Health, the Transvaal Provincial Administration and the University of Pretoria, the South African Institute for Medical Research has allowed Dr. B. de Meillon to head the unit at the Institute, which is studying the distribution of fresh-water bilharzia snails in the Union, the incidence of the disease, the ecology of the snail, and the determination of possible new vectors. A laboratory assistant from the Council's staff has been seconded to the unit. Consideration is being given to inviting Dr. C. H. Barlow, a malacologist of international standing, to the Union to advise on and assist in the work.

### *Cardio-pulmonary Research Unit*

This unit has been established at the University of the Witwatersrand under Professor G. A. Elliott, who is assisted by a laboratory assistant provided by the Council, and Dr. M. McGregor, a C.S.I.R. senior bursar.

The unit's programme covers the following projects:—

A statistical analysis of the incidence, morbidity and mortality associated with cardio-pulmonary disease

A study of the physical findings, including radiological electrocardiographic and circulatory studies, in the normal and diseased population

Pulmonary function tests with a view to selection and assessment of individuals with silicosis (an industrial problem unique to South Africa) and tuberculosis

Venous and cardiac catheterisation in relation to the above

The assessment of therapeutic programmes instituted for the prevention and treatment of cardio-pulmonary diseases.

### *Nutrition Research Units*

A small unit under Dr. A. R. P. Walker of the Council's staff is situated at the South African Institute for Medical Research, and is controlled by the Council's National Chemical Research Laboratory. Its programme and work are described on page 36 of this report, under the National Chemical Research Laboratory.

The major research unit in nutrition has been established in association with the University of the Witwatersrand, under the direction of Dr. J.

Gillman. The Council has provided considerable funds and equipment for this unit and has agreed to support it for an initial period of five years.

The unit's programme includes:—

Preparation of a medical geography of the various nutritional diseases in South Africa

The establishment of the complete natural history of malnourished subjects from birth to death

The effect of malnutrition on the evolution of diseases

The extent to which nutrition may influence the life track of individuals

A study of the reactivity of the organism

Nutritional techniques

Bio-assays of natural foods and combinations of foods and their use in the prevention and treatment of nutritional diseases.

#### *Virus Research Unit*

This is being established at the University of Cape Town under the direction of Professor M. van den Ende, who was awarded a C.S.I.R. Senior Bursary to work overseas. The Council is providing an electrophoresis apparatus which will be installed for the unit by the university.

The unit's programme is the study of the metabolism of viruses and related problems. The virus diseases to which the unit will give attention may be grouped into—

those of the respiratory system, e.g. influenza

those of the nervous system, e.g. poliomyelitis

those of the viscera, e.g. yellow fever.

#### *Social Medicine Research Units*

A unit has been established at the University of Cape Town under the direction of Professor J. F. Brock. Its present short-term programme is to conduct a controlled comparative study of a cross-section of the European and Cape Coloured population to establish:—

The rates of morbidity and mortality of such social diseases as tuberculosis, eclampsia, infantile broncho-pneumonia and gastro-enteritis

The nutritional status of each section

Certain other social factors, such as housing and education, which bear upon the rates of morbidity and mortality.

The long-term background of the research is an attempt to establish the pattern of disease in the Cape Coloured population, and to compare it with that of the European.



Consideration is being given by the Council to the establishment, with the Department of Health, of a social medicine research unit in Durban, to undertake studies relating to problems of growth and development in the Union's four main racial groups.

#### *Radio-isotopes and therapeutic trials of new drugs*

A sub-committee of the Medical Research Committee advises the Council, the sole body authorised by the Atomic Energy Board to import radio-isotopes into South Africa, on their medical applications. On a number of occasions radio-isotopes have been made available for medical treatment and research in institutions and in private practice.

Two new drugs, Miracil D and Aureomycin, have received attention by the Bilharzia and Amoebiasis Research Units respectively.

#### *Medical Research in Universities*

The support of medical research workers at universities and other appropriate institutions, by the system of research awards, has continued. Bursaries, senior bursaries, research assistantships, specialised equipment and funds for consumables have been provided by the Council. Very close examination is made of applications for this purpose. The assistance given has greatly stimulated medical research in South Africa and, it is hoped, has laid good foundations for its development in the future.

In Appendix III of this report lists are given of research bursaries and assistantships granted by the Council to medical workers and, in Appendix II of publications received from medical holders of grants by the Council.

#### *Liaison*

Dr. Graham Bull, Honorary Medical Liaison Officer of the Council in the United Kingdom, has rendered invaluable assistance both in reporting general medical research developments in Great Britain, and in answering specific inquiries addressed to him through the Council's Scientific Liaison Officer in London.

Dr. L. Berk, the Council's Honorary Medical Liaison Officer in the U.S.A., prior to his untimely death, rendered similar assistance. Dr. R. M. Kark, Associate Professor of Medicine, University of Chicago, has been appointed to succeed the late Dr. Berk, and has pursued his duties with great vigour.

During the year the Medical and Dental Research Committee has received deputations from the Poliomyelitis Research Foundation, the

National Cancer Association of South Africa, and has considered representations by the South African Tuberculosis Association. The Council has advised the Government on several important questions relating to medical research.

#### *Library and Information Services*

Although it is not intended at the present stage to establish an extensive medical library at the Council's headquarters, a limited number of essential medical abstracting journals is being collected.

#### *Staff*

In addition to the staff provided by the Council to assist medical research units, a senior administrative officer and an assistant have been provided to handle the growing volume of administrative work in connexion with medical research.

## NATIONAL LABORATORIES AND SERVICES

### LIBRARY AND INFORMATION DIVISION

The Library and Information Division has continued its two-fold purpose of building up a library for the use of the scientists in the Council's own laboratories and of providing a library and information service for industrialists and individual scientists and technicians all over South Africa.

#### *Journals*

One of the Division's main handicaps has been its lack of back sets of standard scientific journals. The difficulties of obtaining such sets, at a period when so many war-devastated libraries in Europe were also bidding for the few that came on the market, have been considerable, and, although the problem has occasionally been eased by the issue of reprints of certain sets, the considerable cost has been comparatively little affected. The Library has, however, been able to secure back sets of certain journals. A list of these is being prepared and may be obtained from the Division.

The total number of current periodical publications received and on order is 665. Of these, some 80 are abstracting journals.

#### *Engineering Index*

During the year the library subscribed to the daily issue of the Engineering Index compiled by the Engineering Societies in New York. These cards form a current index to articles in engineering journals and are filed in a special cabinet for consultation by staff and visitors.

#### *Issues*

The total number of books, pamphlets and periodicals borrowed (including books on loan from other libraries) for the year August, 1948, to July, 1949, was 9,873. These figures include 666 borrowed by industrial firms and 401 borrowed by government departments.

#### *Bookstock*

The total number of bound volumes in the Library at the end of July, 1949, was 7,068; the estimated number of pamphlets was about 80,000.

### *Enquiries for information*

One hundred and thirty-nine enquiries for information were received. It became necessary in March, 1949, to appoint a special member of the staff to deal with requests for information.

### *Microfilms*

During the year ending July 31, 1949, the number of microfilm and photostat copies obtained for enquirers was:—

From South African sources .. .. .	111
From United Kingdom sources .. .. .	12
From U.S.A. sources .. .. .	38
	<hr/>
TOTAL .. .. .	161
	<hr/>

### *C.S.I.R. Information*

The monthly library accessions list, *C.S.I.R. Information*, reached its 39th number in July, 1949. It now has a total circulation of 804, and most of the requests for postal loans come from readers of this bulletin. In addition to lists of books and pamphlets received, news items, such as lists of overseas scientific conferences and notices of scholarships, are included.

Separate lists of the Library's books and pamphlets on (a) plastics and (b) architecture, town-planning, building, etc., were prepared for readers interested in these subjects and unable to come to consult the card catalogue in the Library.

### *Translators' Panel*

The Division has compiled a list of names of people proficient in languages (other than the two official languages of the Union) who are willing to undertake scientific and technical translation work. This panel is for the convenience of enquirers wanting to know, for example, whether there is anyone in the Union qualified to translate a Russian article on geophysics. All arrangements for the actual translation are made by the enquirer and the translator. The list includes 27 people willing to translate from 11 languages. Very few enquiries have so far been received.

### *School for Industrial Librarians*

On 21st February, 1949, the Division organised a second one-day school of library methods for workers in small technical libraries in this country, on the same lines as the school held in February, 1948. This was attended by 39 students, who came from industrial firms, research

institutions and government departments; some were scientists, some librarians and some consulting engineers; their very diversity may be taken as an indication of the expanding interest in information services in South Africa.

#### *Despatch of reports*

The Division has taken over the despatch of the C.S.I.R.'s annual reports and sent out 2,000 copies of the Third Annual Report. It circulated 21 offprints of scientific papers on behalf of the laboratories, mostly to the special mailing list of 110 people. It had the pleasure, also, of sending out nearly 200 copies of the report of the Royal Society Empire Scientific Conference in 1946, which the Royal Society made available for institutions in this country. The Department of Scientific and Industrial Research in London has also made available some copies of the F.I.A.T. reviews of German science, and the Division has begun sending these to university libraries in South Africa.

#### *"South African Libraries"*

The Officer-in-Charge of the Division, with the permission of the Council, took over the Hon. Editorship of *South African Libraries*, the official journal of the South African Library Association, from the beginning of 1949.

## NATIONAL BUILDING RESEARCH INSTITUTE

During the past year, the five divisions which make up the Institute, representing the professions of architecture, civil, mechanical and chemical engineering, have handled many projects as joint investigations, and committees made up of members of the different divisions have frequently been set up to undertake work in which no sharp division of function could be discerned. The interdependence of these four professions, when the fundamentals of any building problem come to be critically examined, has been clearly revealed.

The present research work of the Institute centres on four South African national problems which can only be solved by research in this country.

The social revolution at present taking place among the Bantu peoples has brought with it the largest single building problem facing the country, namely that of providing urban Native housing. It is considered that the solution to this problem must introduce new concepts for density of development, standards of accommodation, standards of structure and finally economics of building. Without a scientific attempt to resolve these questions for the peculiar conditions applying in this country, it cannot be expected that any satisfactory solution to the problem of providing urban Native housing will be found. It may also be stated that no other country will solve these questions on our behalf, despite the excellent leads and ideas given by their methods.

This also applies to building on the desiccated clay soils of our highveld. The continued observation of heaving rather than of settlement of buildings after construction, leads to the belief that a peculiar set of circumstances exists which cannot satisfactorily be explained by the theories of soil mechanics, as applied in the more highly developed countries. Similar heaving soil conditions are reported from Australia, Palestine, Texas and some South American countries, but the available information is still far from adequate.

The third national problem is associated with the gain and loss of heat in buildings under high insolation conditions. Generally, the problem may be stated to be one of "heat gain" rather than of "heat loss" (as in the older countries), and the high solar radiation experienced in South Africa has indicated that a periodic theory, rather than a steady state flow theory, is required for assessing the flow of heat into and out of buildings.

Finally, problems associated with the use of high magnesium limes are found to occupy a major part of the work of the Institute. South Africa is poor in limestones suitable for the production of high calcium limes, but extensive deposits of high magnesium limestones and dolomites occur. The use of these materials introduces problems which cannot be solved entirely from the results of overseas work.

These are the present major research interests of the Institute, all the more fundamental investigations being directly aimed at their solution. The Institute is, in addition, called upon to assist in the solution of a wide range of *ad hoc* problems, but in this broader field more reliance is being placed on the results of overseas work. The number of enquiries for scientific and technical information has continued to grow, and there are many indications that, in this way, the Institute is providing a service of value to the professions and trades.

#### *Building Research Advisory Committee*

This committee has again given valuable help to the Institute.

The following changes in membership are recorded:—

Mr. N. Shand has been appointed corresponding member in a personal capacity

Professor P. H. Connell has replaced Mr. Calvert McDonald as corresponding member to represent the University of Natal

Professor J. R. Raymond has replaced Professor Thomas, as corresponding member to represent the University of Natal

Professor R. Truter has been appointed to represent the University of Stellenbosch.

#### *Staff*

It is with regret that the resignations are recorded of Professor P. H. Connell, head of the Architectural Division, who has gone to the University of Natal as Professor of Architecture, and Mr. D. J. Henkel, head of the Soil Mechanics Division, who has gone to the University of London for further study. Both these men rendered outstanding service to the Institute during its foundation years.

#### *Overseas visits*

During the year the Director, Mr. J. E. Jennings, and the head of the Materials Division, Mr. N. Stutterheim, returned from overseas visits. The head of the Functional Efficiency Division, Dr. A. J. A. Roux, went on an extended visit to England, the Continent, and the United States of America.

## *Laboratories*

As a result of the building alterations which have been completed during the past year and the arrival of a large amount of equipment, the laboratories are better organised and equipped.

There is still much equipment for which orders have been or will be placed, which will assist in making the divisions more versatile and in reducing the waiting time for the manufacture or arrival of special equipment when unforeseen projects or contracts arise. A considerable amount of specially designed equipment has been manufactured by the C.S.I.R. workshops and the quality of work produced has been of a uniformly excellent standard.

## *Contracts*

The following new sponsored investigations have been undertaken under contract arrangements:—

C. 14.

Tests of stone from a proposed quarry, as an aggregate for concrete work

C. 15.

Tests on aluminium scaffolding tubes and fastenings

C. 16.

Tests on special roofing tiles as an insulator from solar radiation

C. 18.

Examination of the resistance of certain paints to fumes evolved during the photo printing process in the photo process rooms of a daily newspaper

C. 19.

Feasibility of the production of hydraulic cement from South African blastfurnace slag

C. 20.

Loading tests on the structural frame of a building in Salisbury

C. 21.

Consolidation characteristics of samples from an old slimes dam.

Work has continued on six contracts started during the previous year.

The following is a general survey of the main research projects undertaken by the five divisions of the Institute.



## STRUCTURAL ENGINEERING DIVISION

This Division has been seriously handicapped by shortage of staff and, being younger than other Divisions, its activities have not yet centred on a single major national problem, as have those of the other divisions. It has been suggested, however, that the Institute, in collaboration with the National Housing and Planning Commission, should give more attention to means of reducing building costs. This is a direct outcome of the work of the Research Committee on Minimum Standards of Accommodation and, since most of the obvious methods of cost reduction in buildings involve structural considerations, a programme of laboratory and field testing is in preparation. This may well develop into the main activity of the Division.

The following is a list of the projects on which the Division is engaged:—

- The physical properties of the various elements of buildings
- Costs of buildings with special reference to sub-economic housing
- Development of a concrete vibrator
- Silt pressures in storage reservoirs
- Development of a soil pressure cell
- Wind pressure on buildings
- The hail resistance of various roofing materials
- Deflection characteristics of a composite brickwall and concrete footing, acting as a beam.

## SOIL MECHANICS DIVISION

A group of consulting engineers has now established the first commercial soil mechanics laboratory equipped to undertake general soil mechanics consulting work. This has relieved the Institute of much contract work previously undertaken by it in the absence of such consultants. Consequently, more time has been devoted to the problem of the heaving of buildings observed on the highveld. This is a problem of national importance, as the view has been expressed that the development of the new goldfields in the Orange Free State is likely to be hampered by the difficulty of finding satisfactory foundation structures for use on the soils encountered there.

During the year the field techniques of soil sampling have been reviewed and the costs of this work have been considerably reduced. Emphasis on field observations has continued and a considerable portion of the Division's time is being devoted to observing the behaviour of buildings after erection.

In its work on house foundations, the examination of cracked buildings and the levelling of selected houses has continued; the heaving continued

to be evident. The field has been considerably extended and the same heaving has been observed at points as far apart as Port Elizabeth and Waterval Boven.

It has become clear that the classical theories of soil mechanics may not apply to heaving soils, and it has been necessary to re-examine the whole basis of these theories. Observations on similar conditions in Texas have indicated that the troubles can be overcome by the provision of anchor piles. This method has been recommended to consulting engineers and architects in South Africa, and the indications are that the procedure will be adopted.

A most noteworthy observation for assessment of these soils is that trouble may be expected if the structure of the clay is of a shattered, or slickensided, character. Very highly developed slickensides have been found in many of the soils and their presence indicates repeated polishing movements on definite planes in the soil mass. A satisfactory explanation for this slickensiding has not yet been found, and attention is being paid to the geological history of the soils in the hope that this will assist in providing an explanation.

Field observation has been accompanied by laboratory testing and analysis, and several important leads have been observed. The first of these relates the natural moisture content to the shrinkage limits of the soil; the second is the principle of loading the clays heavily enough to resist the pressure of swelling as the moisture content increases; a third introduces an idea of residual pressures in the soils and methods of evaluating these pressures have been suggested. These may all be very important considerations which, after the necessary field construction and experiment, may assist in providing a solution to these problems.

Other projects on which this Division is engaged are:—

Foundation analysis for the Umbilo-Umhlatuzana Canal Bridges—  
Durban (Contract)

Foundation investigation for the Salt River B Power Station  
(Contract)

Selection and control of soils in Rooikrantz Earthfill Dam (Contract)

Foundation investigation for Electrical and Mechanical Workshops  
in Durban (Contract).

#### FUNCTIONAL EFFICIENCY DIVISION

During the year, attention has been concentrated chiefly on the construction and installation of apparatus for the determination of the thermal conductivity of building materials, and on experimental work in connexion

with the heat transmission test room. The importance of the latter has been further emphasized by enquiries received in connexion with the design of industrial buildings for air conditioning, and by the fact that authorities responsible for Native housing are urgently seeking cheaper types of construction without seriously affecting the present accepted standards of accommodation, particularly those in regard to the thermal comfort of the occupants.

In investigations into standards of human comfort, pilot tests have been instituted to relate the comfort vote of members of staff with *Equivalent Temperature* and *Normal Corrected Effective Temperature*. This has been done with the object of comparing the two scales of warmth and to obtain some idea of the limits of comfort in local conditions.

A preliminary analysis of outdoor air temperature data for Germiston covering the period 1936 to 1945 has been completed, but it has been necessary to defer the analyses for other stations.

Research on the thermal properties of building materials has involved the construction of two types of thermal conductivity apparatus, one for brick specimens and the other for wall sections; these have been completed and work on the permanent electrical connexions is now in progress. Work on the determination of thermal conductivities in thin slab materials has continued.

A research report has been published, describing in detail the construction, control system and method of operation of the test room which was built to study the heat transmission characteristics of building components under conditions of periodic heat flow.

Native housing authorities throughout the country have shown great interest in the possibility of reducing costs by building houses with very much thinner walls than those commonly erected, and an investigation has recently been undertaken to study the thermal conditions inside such houses and, if necessary, to examine suitable means whereby improvements may be effected.

A sponsored investigation into the extent to which a flat concrete roof is protected from solar radiation by insulation tiles, manufactured by the sponsor, was completed and a report issued.

A 10-ft. diameter low velocity wind tunnel and associated equipment for use in investigations on roof ventilators has been delivered, and work on this project will be continued as soon as the building to house this equipment is erected.

The first stage of investigations into ventilation in buildings, involving the construction of a 2-ft. octagonal straight-through wind tunnel, has been started. It has been designed principally for the purpose of calibrating air flow instruments and to study film co-efficients under forced convection.

Other investigations include:—

The acoustical properties of building materials

Lighting of buildings

Improvements in and standardisation of tests for warmth of floors

Rain resisting properties of building materials

Utilisation of solar heat

#### MATERIALS DIVISION

Work in this Division has received considerable impetus with the return of its leader from an extended visit overseas.

The main research projects are those associated with the use of high magnesium limes, which occur widely in South Africa, and a contract to investigate the feasibility of making hydraulic cement from high magnesium blast furnace slags is of particular importance, because of its great economic possibilities to the South African building industry.

This Division receives more enquiries for information and advice than any other in the Institute, and a considerable amount of time is spent in dealing with these requests for specific information. A number of small projects has also been started, many of these arising from enquiries, but this work is generally more of an *ad hoc* nature.

Research into the development of a bituminous floor was started with a view to finding a cheap flooring material for use in Native houses, the aim being to reduce the cost to considerably less than the cost of conventional warmer flooring finishes. A mixture has now been developed which shows considerable promise and enough specimens are being made to conduct field tests.

In studies of the capacity for the improvement of Portland Cement, progress has been made in studying the phase composition-temperature relations within the Silica, Alumina, Calcia and Magnesia quaternary system. This work is proceeding together with associated studies of quality.

Work on expansive mortars has received particular attention. Tests on rates of hydration of dolomites and magnesite, calcined under various conditions, have continued and it is likely that this series of tests will have an important bearing on the problem of the delayed hydration of these

limes. During the year the Transvaal Associated Blue Lime Manufacturers established a research fellowship in the Institute with the object of undertaking research into the properties of magnesium limes, correct methods of using and mixing to prevent failures and the development of a works test for control purposes. This work is guided by a steering committee on which the sponsors and the National Chemical Research Laboratory are represented.

The investigation into the use of lime in building has also involved the application of differential thermal analysis of limes used in building, with the object of developing a rapid technique for assessing quantitatively the amounts of various compounds present in lime.

Other projects include investigations on:

- the short life of paints on corrugated iron roofs
- the efficacy of commercial waterproofing agents
- South African standard sand
- termite, beetle and fungal damage in buildings
- efflorescence in brickwork.

#### ARCHITECTURAL DIVISION

Work in this Division has always been handicapped by the difficulty of engaging suitable staff. During the year it has been further upset by the loss of its leader, who was appointed to the chair of Architecture in the University of Natal. The Institute has, however, been fortunate in securing the services of two senior architects capable of dealing with the important problems which are being investigated by this Division.

The study of housing, involving a study of the attitudes of occupants to housing and environment, has continued; this work is included in the general problem of minimum standards of accommodation. The report of the Research Committee on Minimum Standards of Accommodation, endorsing the findings of its eight special sub-committees, has been prepared. Separate reports for each of these sub-committees have also been prepared so that the full set comprises nine reports in all. The general findings propose certain reductions in space in some classes of housing but increasing standards of space in others; detailed recommendations for areas of rooms and for measures to promote health, morality and amenities are made. Recommendations are also made regarding the density of urban development. Release of these reports is being delayed until the National Housing and Planning Commission has considered them.

## NATIONAL CHEMICAL RESEARCH LABORATORY

The past year has been one of rapid expansion in accommodation, facilities, staff and research activities.

The remaining sections of the laboratory accommodation in Pretoria became available for occupation in February and made possible the operation of the Microbiological Chemistry, Organic Chemistry, Process Development and Service Divisions of the Laboratory on a proper basis. At the same time the fitting out of accommodation for the Water Treatment Research Unit at the University of the Witwatersrand was completed and provided facilities for the smoother operation of this Unit.

The scientific staff of the laboratory, including assistants, has increased from 30 to 55. Officers in charge of the Process Development and Organic Chemistry Divisions have assumed duty.

A National Advisory Committee on Chemical Research has been established with sub-committees advising on special fields of work such as Mineral Products, Water Treatment, Nutrition, Corrosion and Surface Coatings, Coal and Derived Products, Microbiological Chemistry. The Council is much indebted to the members of these committees for effective help in the planning of research activities.

The South African Wool Board has instituted two industrial research fellowships for fundamental work on wool and its by-products. One fellowship will be for work on wool by-products and will reinforce the present programme of work in this direction. The other will be for work on protein fibres and the Fellow will reinforce the small unit being built up in the laboratory for work on high polymers. These fellowships will provide a valuable stimulus for work on what is one of South Africa's most important raw materials.

The assignment of an officer of the Liaison Division to work within the Laboratory has led to a great increase in efficiency, and an increasing number of technical enquiries is being answered each month. All these enquiries are dealt with by this officer who draws on the specialised advice of laboratory personnel whenever necessary. In addition to answering technical enquiries, this Division is taking the initiative in making surveys. A report on the possibilities of citric acid production in the Union has been published and a report on pectin production has been completed. A report on the rot-proofing of grain bags has also been drawn up.

*Studies of clays and related materials*

A research officer with specialised overseas training in ceramics joined the staff towards the end of 1948. A study has been made of the constitution of a number of South African clays, especially those being used to replace bentonite in foundry sands. Owing to import control, this is now a critical problem. Thus far, no South African clay containing a large proportion of minerals of the montmorillonite group has been found. Clays being used with some degree of success are illites, and these minerals do not seem to be uncommon. Attention is also being paid to a group of plastic clays used in the Transvaal which consist of kaolinite, but have very high base exchange capacities. Thus far, samples have not been collected systematically. The Geological Survey has, however, kindly agreed to make the collection of clay samples a regular duty of their field teams and to forward them for examination.

Soil colloids from two sources are being examined: (a) typical South African soils, from the Division of Chemical Services of the Department of Agriculture; (b) clays which give rise to expansion and cause cracking when used as foundations of buildings, from the National Building Research Institute. Such colloids are frequently complex mixtures and, while giving perfectly reproducible peaks when examined by differential thermal analysis, the interpretation of these peaks is not always an easy matter. An essential development here is the collection of well-defined materials from other laboratories, and a regular interchange of samples and information.

Attention has been given to developing a more rapid method for measuring base exchange capacities. By using a leaching solution containing silver ions instead of ammonium ions, and determining silver by potentiometric titration, a method which gives a very considerable saving of time has been worked out. Applied to a wide variety of soils and clays, it gives results in agreement with the normal method.

*Chromium Chemistry*

Having in mind the possibility of recovering chromium from extensive deposits of low grade ores, most attention has been devoted to the dissolution of Transvaal chromite in sulphuric acid, and to electro-winning of chromium. This project falls under the Process Development Division, but all work is at present in the laboratory stage. Electro-winning has been carried out in a small cell only, with a diaphragm area of about 20 sq. ins., so that close control is impossible. Despite this, efficiencies of about 30 per cent. have been attainable.

In dissolution of chromite, particular attention is being paid to particle size and percentage of iron in the ferrous conditions, as these are important variables which have not been studied.

Crystals of pure chromous acetate, of a size large enough for X-ray examination, have been prepared and are at present being examined. Preliminary work has also been carried out on the preparation and properties of "chromic chromates".

#### *Studies of very finely divided and porous materials*

Work on the application of gas permeabilities to measurement of the surface of very fine particles has been continued as a part-time project. Attention is being given mainly to samples acquired from overseas workers, and measured by them, using other methods.

Arising from this, fundamental studies have been undertaken of flow of gases through fine pores under conditions where Knudsen flow takes place. If gases undergo physical adsorption, surface diffusion is also experienced under the same conditions, and considerable attention is being given to separation of the two effects.

Gas adsorption is being applied as an independent method of measuring surfaces. Data are also obtained for correlating measurements on surface diffusion discussed in the previous paragraph.

Work on the micropore structure of coals now occupies most of the time of the research officer in charge of the work on gas adsorption. The object is to apply gas adsorption techniques to measurement of the internal surface and pore structure of South African coals. The work arises from a long-term study by the South African Fuel Research Institute of the tendency toward spontaneous combustion in South African coal and is being carried out in connexion with this programme.

Adsorption of argon and of nitrogen at liquid oxygen temperatures has been found to show very long times of equilibration and a strong hysteresis on desorption, extending down to very low relative pressures. Further, estimates of internal surface prove to be very much lower than for British coals, using heat of wetting by methyl alcohol. It is possible, therefore, that gas adsorption may prove to be less useful than was at first hoped, but further experiments are necessary before drawing conclusions.

#### *High Polymer Studies*

A research officer, sent overseas to work on proteins with Professor Rideal at the Royal Institution, has been studying the formation of complexes between peanut protein and various detergents.



### *Metallic corrosion*

Towards the end of 1948, a research officer, who had been sent to the University of Cambridge for training with Dr. U. R. Evans, returned to take charge of a section on corrosion. A problem of fundamental significance in corrosion of iron, namely interaction of ferrous hydroxide with water in the absence of oxygen, was begun at Cambridge and has been continued. During 1949, apparatus has been acquired and a number of practical corrosion problems, both from outside bodies and from the National Chemical Research Laboratory itself, have been dealt with.

An important observation has been the severe attack experienced by aluminium when tested as a material for use in citric acid fermentation, using molasses. Aluminium is a recognised material for citric acid, including trays for citric acid fermentation, using cane sugar.

### *Analytical Laboratory*

Much of the work in the analytical laboratory has been concerned with the work of the Microbiological Section. A satisfactory colorimetric method was evolved for citric acid determination, using the Spekker absorptiometer. A colorimetric method for individual determination of fructose and glucose in itaconic acid fermentation media was also worked out, but, in practice, has proved to be unsatisfactory, since the intensity of the colours obtained is markedly influenced by as little as one part per million of ferric iron and of other impurities in hydrochloric acid, as well as by other substances in the fermentation medium. Only by rigid control can reproducible results be obtained.

In analysis of chromites, particular care has been given to determination of ferrous iron. At first, dissolution in phosphoric acid gave rise to low results, apparently due to an unknown substance which acts as an oxidising agent at high temperatures. This impurity was not present in phosphoric acid from other sources and results using this acid are in accord with completely independent determinations of ferrous iron by dry oxidation.

A large number of clay analyses are required, and attention is now being given to quick methods of analysis.

### PROCESS DEVELOPMENT DIVISION

This Division came into being towards the beginning of the year, and much effort has of necessity been directed to the acquiring of equipment, the provision or extension of essential services and the organisation of a workshop necessary for the proper functioning of the Division. The greater part of the equipment so far ordered will not be received until the new year and the work of the Division has therefore been severely restricted.

The production of chromium by the electrolysis of chromous salt solution prepared from low-grade Transvaal chromite is being investigated. Preliminary work has progressed far enough for the design of a small pilot plant to be undertaken. This plant will give essential information on the process which it is not possible to obtain with the laboratory-size electrolysis cells at present in use.

Work on the production of citric acid from cane molasses has extended to the design of plant which is being installed to enable the laboratory work to be extended to the operation of the process under conditions approaching those met with in industry. This phase of the development is of particular importance in view of the sterilization and corrosion problems met with in early work.

Equipment has been designed for a preliminary study of the carbonisation of South African coals using the fluidized bed technique.

#### ORGANIC CHEMISTRY DIVISION

##### *Marine Products*

The examination of crawfish waste in an attempt to promote its chemical processing to new products has been completed. It has been demonstrated that a considerable tonnage of chitin can be made available from this source. A request for a pilot plant shipment was received from overseas and an industrial firm was helped to fulfil this order.

With the rapid increase in production of marine oils which has occurred in the past two years, investigations have been continued with a view to providing background data to facilitate their exploitation. Constitutional studies of pilchard and maasbanker oils have been completed by conventional methods, and an attempt is being made to develop chromatographic techniques for the isolation of individual component acids for more detailed study. Examination of the unsaponifiable fractions of a wide variety of marine oils has continued.

##### *Plant Products*

As part of a study of indigenous oil seeds the seed oils of various *Ximania* species are under investigation. The preliminary work has already established that these oils are unique from a number of points of view. The seed coat fats of various *Strychnos* species and, in particular, *Strychnos innocua* are also being examined, and a report on the seed and funicle oils of *Acacia cyclopsis* has been completed.

### *Coal tar investigations*

These have not progressed rapidly owing to delays in transferring equipment to new accommodation. As an addition to the studies of the bases from high temperature coal tar, the basic fraction from the product of distillation of torbanite is under investigation. The vapour phase catalytic oxidation of quinoline bases has so far not yielded results of interest.

### *Wool by-products*

The application of chromatographic methods to the isolation of minor components of the unsaponifiable fraction of wool grease is under way and good progress has been made. Experience to date confirms the difficulties experienced by others working with this material, and indicates that these investigations will be prolonged.

### *Microanalytical Services*

With the appointment of an officer for training in organic microanalytical techniques, a beginning has been made on the provision of a service in this connexion. Delays have, however, occurred in the delivery of essential apparatus.

## MICROBIOLOGICAL CHEMISTRY DIVISION

### *Mould fermentations*

In collaboration with the Process Development Section, apparatus has been constructed for the large scale production of citric acid from molasses. The collaboration of an industrial firm has been obtained in this project, and one of their research workers is temporarily attached to the laboratory's staff.

In the meantime, the possibility of submerged citric acid production is being studied further. As a first approach, the influence of the composition of the gas phase on citric acid formation has been studied. The work is still in progress.

Suitable strains of *Aspergillus terreus* have been selected for the production of itaconic acid from sugar, and the influence of culture conditions and method of oxygen supply are now under investigation.

A start has been made with a fundamental study of the mechanism of production of organic acids by moulds and enzyme systems isolated from them.

### *Halophilic micro-organisms*

The organism responsible for the red coloration of Cape-Cross salt has been obtained in pure culture and characterised microbiologically. The carotenoid pigments of the bacterium are being studied in some detail.

### *Amino-acid assays*

The amino-acid composition of a commercial fish liver product is being studied by paper partition chromatography methods.

### *Culture collection of micro-organisms*

During the year a number of new species of micro-organisms have been added to the collection, most of which are fungi, related to *A. niger* and *A. terreus*. Cultures of several micro-organisms have been supplied to other laboratories in the Union, and contact has been maintained with other institutes which have culture collections.

### NUTRITION UNIT (South African Institute for Medical Research)

Most attention has been devoted to studies on the absorption of fat by humans. This work initially arose from the observation that Bantu subjects, when consuming their traditional diet, low in fat and high in fibre, excrete unusually large amounts of faecal fat. Balance observations, for short and long-term periods, conducted on European and Bantu subjects, indicate that: (a) the relatively large amount of fat excreted during dietary regimens low in fat and high in fibre, is probably wholly of endogenous origin; (b) the fats of maize and wheat are as highly digestible as are animal fats; (c) within certain limits, faecal fat excretion is almost independent of dietary fat intake; (d) variations in the amount of faecal fat excreted occur independently of fat intake. Considerable scientific discussion has followed publication of the above conclusions.

*In vitro* and *in vivo* experiments carried out on cereal phytase and phytic acid, have thrown increasing doubt on the reported rickets-producing property of phytic acid. A comprehensive review of this subject has been completed for publication, in which the allegation that cereals and cereal products which contain phytic acid are rachitogenic is shown to be unwarranted.

Experimental work has revealed that during the cooking of Bantu foodstuffs in the usual iron pots, there is a relatively large uptake of iron which may be of some nutritional significance.

The application of the Anaerobic or Methane Fermentation process to the purification of molasses fermentation and wine distillation residues has been the subject of considerable study and sufficient data will soon be available to make possible the planning of pilot plant studies. Special attention has been paid in these investigations to the influence of the solid phase, the effect of reducible sulphur compounds (which are present in considerable quantity in the residues from molasses fermentation), and the effect of nitrogenous supplements to the fermentation mixtures. The extension of these investigations to other concentrated organic industrial wastes is in progress.

In the studies of residues from the alcoholic fermentation of molasses, an analytical scheme for following the course of the fermentations has been evolved and a study of the carbohydrate constituents of the residues carried out by partition chromatography.

A consequence of the high degree of infestation of native populations with intestinal parasites is that sewage in South Africa is heavily infected with parasitic ova and cysts. Methods of sterilisation of sewage sludges are therefore under investigation.

Officers from the unit have served on committees of the South African Bureau of Standards concerned with standards for water supplies and effluents.

The deterioration of timbers in the cooling towers of power stations is a heavy maintenance charge at certain power stations. In an attempt to improve the position, officers of the Unit made a preliminary investigation into the causes of this deterioration, and this investigation was later supplemented as a result of enquiries made overseas. In order to plan further action, a co-ordinating committee has been set up by the Electricity Supply Commission which includes representatives of the Council for Scientific and Industrial Research, the Chamber of Mines Research Laboratory, and the Department of Forestry.

In order to place the activities of the unit on a regional basis, the establishment of further small groups of workers in Natal and in the Cape is under consideration. This would enable the programme of research on water treatment problems to be considerably expanded.

## NATIONAL INSTITUTE FOR PERSONNEL RESEARCH

The volume of field research work carried out by the Institute has shown a further increase. As a result, the staff of the Institute has been increased from 49 in 1948, to a total of 63 in 1949, of which 37 are temporary and 26 are on the permanent staff.

The work of the Institute is split up between the following teams and sections:—

- Industrial Research Team
- Mines Research Team
- Defence and Public Service Research Team
- Test Construction Team
- Clinical Research Team
- Psychophysiological Research Unit
- Statistical Section
- Abstracting Section
- Workshop.

### *Industrial Research Team*

The Johannesburg industrial research team has done no further field work for the clothing industry. The analysis of data obtained from the occupational efficiency studies and the follow-up of test performances of garment workers has been completed, and final reports are being prepared. The team has handled an increased flow of testing on a number of minor projects, such as the selection of artisan apprentices for a variety of organisations, European officials for special duties on the mines, articled clerks for the accounting profession (a project for the Transvaal Society of Accountants), recruits for the South African Naval Forces (who are not tested in Pretoria), applicants for C.S.I.R. appointments, and a variety of vocational guidance cases. The team also tested all pupils at the Johannesburg Trades School to obtain additional material for the validation and standardisation of artisan selection tests. It also assisted in the selection of administrative trainees for Iscor, a project which was carried out on a much larger scale than had been anticipated.

The Pretoria industrial research team has confined itself to personnel research at Iscor, where in addition to administrative trainee selection, it initiated a detailed survey of absenteeism, labour turnover and accidents. An intensive study of the determinants of these forms of occupational

maladjustment is being made for one division of the Works. A start was made with a job evaluation study for the administrative staff, using analytical procedures not hitherto applied to this kind of problem. Unfortunately, further work on this project has had to be deferred until the extreme pressure of events following upon Iscor's present rapid expansion is ameliorated.

It has become obvious that industrial personnel research will, for a number of years at least, be chiefly confined to large undertakings. Smaller factories or business houses do not have a sufficiently large staff or staff-turnover to make the construction or validation of tests, or the study of absenteeism or labour turnover, either practical or economical. When standard testing instruments with a wide range of occupational norms are available, and when more is known about the population, the Institute will be better equipped to meet the needs of smaller industrial units.

All the major industrial research projects are contributing to this end. Artisan apprentices are being tested in a wide variety of contexts. Iscor and the Transvaal Association of Accountants are providing material for the upper administrative and clerical levels, the Job Evaluation Project being an essential part of this study. Test data and job descriptions of the medium and lower clerical levels will follow once the latter have been completed. Information on operative categories is already available from the clothing industry investigation, though this will need to be supplemented by studies of a similar kind in other manufacturing industries.

The Iscor studies of absenteeism and labour turnover are based on findings derived from the techniques developed in preliminary investigations carried out in the clothing industry and a number of smaller manufacturing and constructional engineering works. These studies are now entering into a clinical and sociological stage. Here the effects of individual adjustment and domestic circumstances on occupational stability will be studied. A survey will also be made of the composition, antecedents, and occupational attitudes of the South African industrial population, in the light of which the findings of individual adjustment will have to be interpreted. This is really the most fundamental piece of work now being planned by the Industrial Section of the Institute, as knowledge about these background factors is essential, before adequate personnel selection procedures can be established for the lower occupational levels.

The N.I.P.R. has hitherto concentrated on sponsored research of direct practical value, in the course of which problems of a more fundamental kind are constantly being raised. As a reasonable income is now assured from this source, more time can be devoted to fundamental enquiries which bring in no income, but which will furnish the essential information, without which sponsored research can make no progress.

### *Mines Research Team*

Considerable expansion has taken place in the work of the Mines Research Team. The construction of a general classification test for native mine labourers and a selection test for boss boys was satisfactorily completed. A 1,200-ft. film was made, whereby it will be possible to give the general classification tests to large groups, under standard conditions, and without the use of verbal instructions. Preliminary investigations have shown that both tests do what is expected of them. Significantly different scores were obtained for samples representative of the major job families. For boss boys, the test scores gave a good prediction of training school results and of efficiency assessments made by various officials on the job.

On the strength of these findings, three mining houses have decided to introduce the tests on an experimental basis. The Institute will operate the test programmes for a period of two years, during which time technical staff for routine operation will be selected and trained, follow-up validations will be carried out, the effects of testing on production will be studied, and final selection and classification standards will be laid down. Training research will be undertaken in order that the best possible use may be made of those scientific manning procedures. Attention will also be paid to the selection and training of certain categories of European officials, particularly those concerned with the supervision and training of natives. Methods of testing proficiency after training and on the job will be studied, as a means of improving both training and selection procedures.

Preparations for this extensive research programme were made during 1949. A testing centre was established at Grootvlei to serve all Union Corporation mines on the East Rand. It will work in close collaboration with the Officials Training Centre, which has also been moved to Grootvlei. As this is the biggest project, and research will continue for a period of five years, the team has set up its headquarters here, excellent accommodation having been provided for the purpose by the Union Corporation. Testing centres have also been set up at East Daggafontein (for the Anglo-American Corporation) where both selection and classification will be carried out, and at Modderfontein B (for the Central Mining and Investment Corporation) where boss boys will be selected. An extensive training research programme is also being carried out for the latter group.

These long-term research projects will enable the Institute to undertake a series of studies of the intellectual potentialities, personality attributes and trainability of Africans from all parts of the Continent south of the Sahara and the Sudan. Little is known about African potentialities, and in view of the increasing dependence of industry on African labour, and the shortages which are already being experienced in industry, information



about the manner in which these potentialities can be fully realised should be of value. Such studies are, furthermore, of considerable scientific interest, as they will contribute to knowledge of the growth of intelligence and aptitudes, and will throw further light on the nature of racial differences.

#### *Defence and Public Service Research Team*

The major portion of this team's time has been devoted to research and routine testing on behalf of the Department of Defence. Further information has been collected on existing long-term projects. Preliminary follow-up investigations indicate that selection and classification procedures are proceeding along sound lines. By means of new formulae, developed by the Statistical Section, it has been possible to calculate the operating characteristics of the battery of screening tests on which recruits must qualify. In relation to training courses at the South African Military College, Coastal Artillery and Telecommunications Training Centres, the efficiency of the battery (percentage increase in successful candidates, resulting from selection by means of tests, as compared with chance selection) is 15 per cent. at the present acceptance level and 24 per cent. if a somewhat higher entrance standard is set. At these two levels, failures would be reduced by 52 per cent. and 74 per cent., though at a sacrifice of 10 per cent. and 26 per cent., respectively, of potentially successful candidates.

These figures are very tentative and will probably require to be modified when further follow-up data become available. What is important, however, is that the test battery (consisting of four pencil and paper tests) provides a means of pursuing a scientific manning policy, as for each score level it will be possible to determine: (a) what percentage of the recruit population will qualify for admission to the Service; (b) what percentage of those qualifying will succeed in certain training courses; (c) what percentage of those rejected by the test could have qualified. By shifting the entrance qualification mark, the needs of the moment can be met in relation to the available amount and quality of manpower. Quality control methods and population trend charts are being used to ensure that the conditions, subject to which the operating characteristics of the battery have been calculated, remain constant.

Follow-up research dealing with the effect of personnel selection on other training courses, on discharges, disciplinary offences and occupational maladjustments is in progress.

Lectures are being given in training courses, and assistance is also being rendered with regard to examination and merit rating techniques.

A screening test was also constructed, with the assistance of the Test Construction Team, to be used at a number of recruiting centres through-

out the country by army officers trained for this purpose, whereby it will be possible to eliminate the majority of the unsuitable candidates without having to send them to Pretoria, where the Entrance Selection Test will now only be applied to those with a prima facie chance of succeeding.

New ground was broken in the course of the year by the extension of classification and selection tests to artisan trainees for A.C.F. Air Squadrons, and to a variety of specialist courses. This steady expansion, maintained over a period of years, is the best indication of the benefits derived by the Services from personnel research.

There has been no substantial increase in the work done for government departments. Long-term research projects on artisan selection and classification for the Post Office, the Mint, the Public Works Department and a few smaller sections is proceeding.

#### *Test Construction Team*

This team has rendered technical service to the field research teams, notably in the construction of a screening test for the Permanent Force. It has converted the Institute's existing tests to electrical machine scoring, and has initiated research into methods of testing temperament and personality. The latter project involves a number of fundamental studies on the nature of temperament which are relevant to all laboratory and field research projects on which the Institute is engaged, and which are of considerable theoretical interest, apart from their practical value.

The team's programme of work for the past year included the construction of a battery of vocational placement tests for use at the Juvenile Affairs Board. Through lack of the necessary financial support, further development and practical application of this project has been held up.

One of the most important tasks confronting the team is the establishment of Master Population Standards for a number of the Institute's tests used for general testing purposes. It is intended to gather test scores on population samples representative in terms of education, age, occupation, sex, and socio-economic background. Record cards have been prepared for the coding of existing information derived from all testing projects, but extensive testing will have to be undertaken whenever an opportunity presents itself, to obtain representative samples. It is estimated that this project will take a number of years to complete.

#### *Clinical Research Team*

A team of three has been working at Tara Neuropsychiatric Hospital to determine the effects of a variety of affective disorders, of hospitalisation

in general and of particular types of treatment on aptitude test performance. It is intended, in due course, to establish a vocational guidance unit at Tara to facilitate occupational rehabilitation. The testing of psychoneurotic patients raises a number of problems of interpretation which should be solved before the results of testing can be used with confidence. The team is also working on a South African standardisation of the Wechsler-Bellevue Test, which is much used for diagnostic testing abroad.

### *Psychophysiological Research Unit*

This unit was formed in January of this year, its purpose being to carry out laboratory research on the physiological correlates and determinants of temperament, personality and personality deviations. Detailed studies are being made of various features of normal and abnormal electroencephalograms, the latter being obtained from patients in the Pretoria Mental Hospital, Tara Neuropsychiatric Hospital, neurosurgical units and a number of clinics. A six-channel Ediswan electroencephalograph (E.E.G.) has been acquired for this purpose. Physiological phenomena being investigated are flicker-fusion frequency, and adaptation rate of the electrodermal reflex, both of which appear to be throwing light on one of the neural elements which is also involved in the E.E.G., and which may be the basis of one of the temperament variables to which a good deal of importance is attached in the Institute's research.

The normal E.E.G. has so far not received much attention, its value as a means of diagnosing cerebral pathology having overshadowed its psychophysiological significance. It is still too early to say what this significance will prove to be, and whether the study of the E.E.G. will add anything to our knowledge of normal behaviour. Some promising lines of research have emerged, which are now being pursued.

The ultimate purpose of the research done in this section is to enable the Institute through a more thorough knowledge of the determinants of temperament, to devise objective and reliable methods of measuring this important element in occupational adjustment.

### *Statistical Section*

This section has made significant contributions to psychological statistics in the course of the year. A new method of calculating standard scores was worked out (in collaboration with the sub-department of Mathematical Statistics at the University of the Witwatersrand) which is applicable even to grossly abnormal distributions. A number of formulae were developed by means of which it is possible to determine: (1) the probability that a candidate with a given test score will succeed in the

job; (2) the probability that a candidate with a given ability will be selected by the battery; (3) the efficiency index of the battery, which gives the percentage gain in successes which can be expected from the tests, as compared with chance selection, at any particular acceptance level; (4) the percentage of potential successes, rejected by the tests, in order to achieve any particular reduction in wastage rate on the job. By means of these operating characteristics, it will be possible to carry out a scientific manning policy, in which supply and demand can be equated by shifting the qualification mark on the tests, and amount of wastage will be known in advance and can be allowed for.

In addition to this work, the section made various contributions to theoretical statistics. Advisory work on sampling specifications was done for the Bureau of Standards.

### *Abstracting Section*

Digests of literature on a number of subjects were prepared for the Institute's use. These include: selection procedures for engineers, tests of mechanical aptitude, the Rorschach Test, racial differences in intelligence and aptitude.

The section has also been responsible for the publication of the Institute's Bulletin, a paper with a limited private circulation, the purpose of which is to keep members of the Institute's staff informed about the research activities of its various sections and to serve as a forum for discussion and criticism.

### *Workshop*

The Institute's departmental workshop has turned out some new psychological apparatus, including a portable Multiple Choice Reaction Test, a Critical Fusion Frequency Meter (to measure threshold for flicker in temperament research), and a Distribution of Attention Test (to be used in the selection of native winch drivers on the mines). An improved Two-Hand Co-ordinator (a test which is extensively used in laboratory and applied psychological work) and a pursuit meter intended for the study of co-ordination, were designed by the C.S.I.R. Central Workshop. Two models of each were built.

## NATIONAL PHYSICAL LABORATORY

Most of the sections are now well equipped and capable of carrying out both applied and fundamental studies. Because of its fundamental nature, physics is not as quickly made use of by industry as other branches of science and, because of the slowness with which research apparatus can be acquired and assembled, a rather long development phase is necessary in the history of a physical laboratory. Now this phase is over, and every section of the laboratory is effectively occupied with enquiries from industrial and governmental sources as well as with research of a fundamental nature.

The policy of sending members of staff overseas to broaden their interests and increase their technical knowledge is continuing, and the heads of the Nuclear Physics, Acoustics and Spectrochemistry Sections are at present overseas.

The National Physical Laboratory has been represented during the year on the following committees:—

Chamber of Mines Committee on Heat Flow in Mines

Chamber of Mines Committee on Dust Control

Joint Committee of South African Railways, Rand Water Board  
and General Post Office on Electrolysis due to Railway  
Electrification

Bureau of Standards Committee on Code of Practice for the Medical  
Use of X-rays

### *Advisory Committees*

The Laboratory has five separate committees to advise it on its activities in the following fields:—

Electrotechnics and electronics

Heat

Acoustics

General physics, including light, spectrochemistry, X-rays and  
electron microscopy

Biophysics

These committees, which cover the full scope of the laboratory's functions, have met during the year and provided valuable advice on the development of the various sections and the initiation of research projects.

### *Acknowledgements*

Assistance received in various ways from the National Physical Laboratory, Teddington, the National Bureau of Standards, Washington, the Physics Section of the National Research Council of Canada, the Physical Laboratory of the Commonwealth Scientific and Industrial Research Organisation of Australia and the South African Bureau of Standards, Pretoria, is gratefully acknowledged. The Physics Department, University of Birmingham, the Nobel Institute for Nuclear Research at Stockholm, the Acoustical Laboratory of Harvard University, the Bell Telephone Laboratories at Murray Hill and the Acoustical Section, National Bureau of Standards, Washington, have helped us greatly by extending their hospitality to two of our staff members, who studied nuclear physics and Acoustics respectively. The National Bureau of Standards, Washington, has also assisted us very much by standardising several instruments free of charge.

### ELECTROTECHNOLOGY AND ELECTRONICS DIVISION

#### *Electrical Standards Section*

Most of the apparatus ordered in 1946 has arrived and good progress has been made towards providing a number of services, including standards of voltage, resistance, frequency, inductance and capacitance.

A pointer instrument testing station, including transfer standards having a ten-foot scale, an additional versatile transfer instrument for covering low ranges of current voltage and an electronic sine-wave generator, have been used for calibrating a number of instruments for outside organisations and other departments of the C.S.I.R.

An Epstein square, incorporating a sensitive reflecting wattmeter, has been set up for making measurements of magnetic permeability and loss. A number of tests have been made for outside organisations.

A set of resistances, so designed that stray capacitance and resistance can be calculated, is being developed for use as standards of comparison in determining phase errors in resistance standards, volt-ratio-boxes, etc.

Equipment for testing current transformers, according to the Arnold method, has been received and installed. Standard current transformers, with primary currents of from five to six thousand amperes, are available.

#### *Electronics Section*

Work on borehole logging equipment, which was described in the 1947-48 report, was continued and two temperature "feeler" units and two radio-

activity pick-up units were developed, together with their associated amplifiers and recorders. A hand operated hoist was designed in the department and was built by an outside firm. This group of instruments was tested and passed as satisfactory. It is now being used by the Geological Survey (Department of Mines) and enquiries have been received from mining companies.

In conjunction with the National Chemical Research Laboratory, an instrument was developed for measuring and recording the thermocouple voltages generated in the differential thermal analysis of clays.

The sine wave generator, which was reported on in the 1947-48 report, has now been brought to completion. It has a two-phase output with a power of fifty watts per phase, and it is possible to shift the phases from zero to one hundred and eighty degrees relative to one another. The instrument is under test in the electrical standards section and, so far, its performance has been satisfactory. It should be useful to municipal electrical undertakings in meter testing.

The construction of a saturated diode transfer standard is nearly complete. The principle of operation of this instrument is the dependence of electron emission from a hot tungsten filament upon the temperature of the filament. An amplifier is incorporated so that measurements of high accuracy can be made on low power sources.

An instrument (quantometer) is being developed for use in spectrochemical work which, in principle, is a photo-multiplier tube circuit for the measurement of the intensity of a spectral line directly, instead of by the older method of exposing a photographic plate and measuring the blackening of the emulsion.

An electric concrete vibrator, which can operate at one hundred and fifty cycles per second and which has no rotating parts, has been constructed and is at present undergoing tests with the National Building Research Institute.

### *Acoustics Section*

The decision to delay the building of acoustic test rooms until permanent laboratories are built has made it impossible to carry out some types of work, but the section has been kept occupied with instrument construction and tests.

An electronic liquid pressure meter, which makes use of the principles employed in the micro-manometer developed in 1947-48, is being used by medical research workers to measure blood pressure inside veins and arteries.

Following on experiments carried out in 1947-48, a naval-type under water sound generator was tested as a possible source of ultrasonics for use as an emulsifier. With certain modifications it appears that satisfactory results can be obtained.

Measurement of sound absorption and reflection by means of a resonance tube has been improved, and a number of samples have been measured for commercial firms. At present there are no facilities for the measurement of sound transmission of panels, although a number of enquiries for this type of study have been received.

Tests were carried out during flight on the sound-absorbing properties of noise reducing materials installed in aircraft of the South African Air Force.

Exhaustive tests were carried out on the Pretoria City Hall and Pretorius Hall, on behalf of the architects who have undertaken the improvement of the acoustical design of these two halls.

#### PHYSICS OF MATTER DIVISION

##### *Mechanical Standards Section*

The staff of this section is still limited to one scientific assistant and part of the time of a principal research officer. Attention has mainly been directed to standards of mass.

##### *Nuclear Physics Section*

A Scintillation Assay Meter, which is being developed for the assay of uranium oxide in acid solution, makes use of a photo-multiplier tube in conjunction with a zinc sulphide fluorescent screen, to count the alpha-particles emitted from an evaporated specimen.

A Kevatron Particle Accelerator was begun at the latter end of 1948 and is at the point of receiving a first trial run. This apparatus uses the two hundred thousand volts of a therapy X-ray plant, to accelerate heavy hydrogen atoms down a porcelain tube four feet long, where they fall on a heavy water target producing a copious flux of neutrons which are then available for disintegration experiments and the production of radioactive isotopes.

During the year about fifty Geiger-Müller tubes have been made for the Government Metallurgical Laboratory, mining companies, the Geological Survey, university departments and other sections of the National Physical Laboratory. An improved evaporating method for producing the cathodes has been developed, which enables the percentage of dead volume in the



tube to be appreciably reduced. By constructing the tubes in the National Physical Laboratory, instead of importing them, they can be made to fit the apparatus instead of having to design apparatus to suit the tube.

Research has been carried out on the influence of the pressure of the gas fillings upon the performance of the tubes and has thrown new light upon the theories of the action of the quenching gases in Geiger-Müller tubes.

Work has started on the construction of neutron sensitive tubes and on tubes with low working voltages.

A Ra-Be neutron source, which arrived from Canada during the year, has been studied to see what useful isotopes could be produced with it for radioactive tracer experiments.

### *Biophysics Section*

Work on protection and X-ray dosimetry includes a film badge service which is well established.

So far, information has been given to two local radiological departments on the doses being received by the staff and, in each case, the demonstration of overdoses has resulted in improved conditions of work and techniques. It is expected that there will be an extensive demand for the service.

The section's work on radio elements is concerned, to a considerable extent, with standardisation. This is inevitable because the first needs of the section are radio-isotope supplies, and methods of determining their activity.

Arising from the steady importation of radio-isotopes from England and the United States, many comparisons of activities have been made, and some discrepancies have been found and reported.

Research on the rate of secretion of phosphorous 32 in saliva have been continued in collaboration with a dental research worker in Johannesburg. Auto-radiograph technique has been improved and has been used in this research.

Several radiotherapists have been assisted with cases of thyroid cancer, by measurements on patients who received tracer doses of radio-iodine.

Assistance was also given in the processing and measurement of solutions to therapists using radiophosphorus.

Some preliminary work was done on the uptake of iron in brain tumours, including work on infected fowls and on one human patient.

The X-ray Department of the Pretoria General Hospital has made available a therapy machine for irradiations required in investigating the indirect effects of radiation on bacteriophage, and its effects on animals and humans. Investigations into the effect of hydrogen peroxide (produced by the rays) upon living tissues, are being continued in this way.

### *Heat Section*

Use was made of the available temperature measuring instruments and standardising baths to calibrate various instruments for other divisions of the Council for Scientific and Industrial Research and for outside firms. These instruments include 122 thermometers of various types, nine thermocouple pyrometers and one disappearing filament optical pyrometer.

The main details of the design of a standard optical pyrometer were worked out in consultation with the Optics Department, which is now working on the lenses.

Apparatus for measuring the thermal conductivity of slab materials, one foot square, was used to test vermiculite-latex slabs for an industrial concern.

In conjunction with the Geological Survey, an extensive programme of measurement of conductivity of rock samples from an Orange Free State borehole was undertaken and is in progress.

Apparatus for making emissivity determinations was standardised and used to measure the total emissivity of aluminium plate for the Building Research Institute.

Measurements of specific heats of rocks and of building materials have been made for mining houses and for the Building Research Institute.

In the flights undertaken in connexion with the artificial stimulation of rain in the summer 1948-49, the section was responsible for air temperature measurement from the aircraft. In addition, an electric furnace was built for the generation of silver iodide smoke, and this was used from the aircraft on several occasions. With the help of the Onderstepoort Veterinary Laboratory, the particle size of the silver iodide smoke was measured with an electron microscope.

Tests of the stability of the electrical resistance of thermistors, at zero degrees centigrade, were carried out over a period of six months.

## RADIATION DIVISION

### *X-ray Section.*

The section's X-ray spectrometer has been modified and fitted with a new slit system, so that clay minerals with large basal spacings can be adequately dealt with.

A new method of measuring preferred orientation in metals and alloys has been developed. A prototype model of the necessary apparatus has been built and successfully tried out.

A high temperature camera has been designed and built. This will enable X-ray studies to be made of phase changes up to temperatures of 1,500° C., which will be particularly useful in work on metals and alloys.

Some of the practical uses of these instruments are listed below:—

A study of the tricalcium and dicalcium content of cement clinker is being undertaken for a cement company, and work is in progress.

At the request of the National Building Research Institute, a study was made of the effect of variation of burning-time on the calcium oxide and magnesium oxide content of limes produced from South African dolomite.

Examination of the crystal structure of para-dinitro-benzene was undertaken to standardise the single crystal cameras and to test measuring scales computed and manufactured to speed up the interpretation of oscillation photographs.

Chromous-acetate has recently been crystallised in the National Chemical Research Laboratory and a study of internal structure has begun.

Compounds in dust, clay minerals and ores have been identified, on request, for industrial firms.

### *Optics Section*

A recording spectrophotometer has been installed and its performance has been found to be satisfactory; it has been used for determination of the spectral transmission of two athermal glasses in the special range 300 to 1,500 milliocrons (in conjunction with a U.V. spectrophotometer) for measuring the reflectance of thirty-six paint specimens and for determining the spectral absorption of twelve goggle glasses.

The section will soon be in a position to issue colour temperature standards.

The colorimetric and spectrophotometric equipment also includes a tintometer, a multi-purpose reflectometer and a large daylight unit.

A photometric laboratory has been constructed to house a four metre photometric bench. A one-metre integrating sphere is being constructed in the workshops, and this unit should soon be in working order. Photometric sub-standards have arrived and the section should be in a position to calibrate sub-standards by the end of 1949.

A galvanometer amplifier is under construction in the workshops, with which the section will be able to determine photocell and phototube sensitiveness (both relative and absolute).

Radiometric sub-standards (in the form of thermopiles from the National Physical Laboratory, England, and lamps from the National Bureau of Standards, United States of America) are kept in the section. Both absolute and spectroradiometric calibrations can be undertaken.

The following optical designs were constructed for other organisations:—

Raster design, which is to be used in connexion with stereophotography (this was mainly a problem in lens design)

Provisional design of a double spectrum projector

Micro-projector

Optical plotting table for the Civil Aviation Board (for plotting information passed by direction-finding stations)

Galvanometer amplifier

Optical lever for use with the standard balances of the Physics of Matter section

Provisional designs of the optical system for a precision optical pyrometer (in collaboration with the Heat Section)

Considerable time was also spent in dealing with numerous enquiries in connexion with optical systems and problems.

Binocular microscopes of various manufacture were tested for the Union Tender Board in connexion with purchases by the Board.

Considerable attention has been given to lens designing, and ray tracing procedures were adapted for use with a calculating machine. A systematic study of this field is now being undertaken by a member of staff specially appointed for this purpose. Several simple lenses have already been produced for different purposes.

A considerable amount of work has been done by the optics workshop, including lenses, prisms, quartz and glass windows, filters, flats and twenty-two pairs of proof planes.

The mass spectrometer which arrived from America has been given a thorough test; one or two defects in the valve amplifier section have not yet been completely removed. The instrument is, however, capable of immediate use for the identification and assay of all atoms and molecules with a weight less than 50—which makes it very suitable for chemical and biological work, and its range will later be extended to the heavy atoms with the aid of a stronger magnet. It will then be available for work of geological interest in studying the ages of rock formations.

### *Spectrochemistry Section*

The section has been engaged on the development of the following techniques:—

A general semi-quantitative method for the quick assay of substances when high accuracy is not required

A flame photometric method for the estimation of the alkali metals

A method for estimating the halogens

Work on the measurement of high concentrations of antimony in lead and of trace elements in lead was undertaken to meet the needs of manufacturers of lead batteries and of lead piping. Now that the methods have been developed a number of firms are making use of the facilities of the section on the basis of a charge made for every determination.

During the year two scientific workers from other institutions have been working in the section, learning techniques and gaining experience.

A considerable number of analyses for business firms have been made during the year, using conventional methods.

### *Applied Geophysics Section*

A gravity survey of the Union, South West Africa, Bechuanaland and Southern Rhodesia is being conducted in collaboration with the Geological and Trigonometrical Surveys. Gravimeter determinations of  $g$  were made at 53 stations, 150 to 200 miles apart, in a series of loops linking base stations in Cape Town and Johannesburg. These base stations have been accurately tied to Cambridge (which is accurately tied to the international absolute stations at Teddington, Washington and Potsdam) by means of absolute determinations made with two sets of three invar steel pendulums and a quartz crystal clock, lent for this purpose by the Department of Geodesy and Geophysics of the University of Cambridge.

Seismic prospecting equipment, which had previously been built for the Geological Survey, was modified and improved and has since been used extensively in the Vryburg area and in the Kalahari.

### *Director's Research Laboratory*

During the past year the Director has found time for private research with the help of a research assistant. Attention was first concentrated on the activity in counters caused by mechanical working of metals placed in them. A preliminary paper on the results obtained has been published.

Further work has been concentrated on the study of the spectra of various molecules.

## TELECOMMUNICATIONS RESEARCH LABORATORY

The laboratory has been concentrating more and more on the factors affecting radio wave propagation in Southern Africa. These factors include the ionosphere, radio noise levels, and the physical constants of the ground.

Other work includes the development of a high performance communications receiver on a new principle, the development of an automatic weather station, the study of thunderstorms by radar, and lightning research.

Regular measurements of the height vs. frequency characteristics of the ionosphere have been made at Johannesburg and Cape Town and have been published monthly.

Predictions of the high frequency radio propagation conditions for Southern Africa have been prepared monthly and issued in the form of a bulletin with graphs of "optimum frequency vs. time of day" for various transmission distances and latitudes.

To provide a preliminary short-term prediction service of abnormal ionospheric conditions, a statement of ionospheric conditions, as observed in the Laboratory at 8 a.m., is issued daily. This statement is broadcast by the South African Air Force Station ZRB. When possible, an indication of the trend for the following few days is given. No satisfactory system, however, has yet been evolved on which a regular short-term service can be based.

A limited series of measurements of ionosphere absorption was undertaken at the request of the Division of Civil Aviation of the Department of Transport. Vertical incidence measurements were made at various frequencies, using the Johannesburg ionosphere recorder which was suitably calibrated for this purpose. Oblique incidence measurements were made using continuous wave transmissions from Cape Town, provided by the Division of Civil Aviation.

In measurements of radio noise levels, the original proposal to use airborne noise recorders operating on 100 kc./sec. has been abandoned in favour of continuous recording on the ground at various places.

For this purpose three automatic noise recorders have been built and regular measurements are now being made at Palmietfontein Airport. Arrangements are being made for two of these recorders to be installed in territories to the north of the Union.

Factors affecting the application of the results to various navigation systems are now being determined by making simultaneous measurements under conditions of atmospheric noise.

The equipment necessary for conducting a ground constants survey has been developed in the Laboratory and measurements in the field will shortly be commenced by a mobile team. The South African Air Force is collaborating in this work.

The automatic weather station described in the last progress report is being installed at Marion Island. Preliminary trials were conducted successfully in Pretoria. Reports from Marion Island indicate that the equipment is working but that it has not yet been installed on the selected site.

The 3-c.m. radar used for the detection and tracking of thunderstorms has been in operation throughout the 1948-49 thunderstorm season. In addition to the type of work described in previous progress reports, arrangements were made to pass information on local thunderstorms to the Modderfontein Dynamite Factory and, secondly, correlation between radar records and simultaneous noise level records was attempted.

The Laboratory again participated in the experiments conducted jointly by the Meteorological Office, the S.A.A.F. and the National Physical Laboratory on the artificial stimulation of rain. Improved facilities were provided for tracking the aircraft.

The holder of the lightning research fellowship established by Messrs. African Explosives and Chemical Industries, is on the staff of the Telecommunications Research Laboratory but is accommodated at the Bernard Price Institute of Geophysical Research.

The study of lightning protection with particular attention to earthing techniques has continued.

Five B.P.I. electrostatic fluxmeters were installed at outstations on the radio-telemeter network of the Bernard Price Institute of Geophysics, enabling continuous records to be made.

A new type of lightning alarm is under development. It will be installed at the Modderfontein Dynamite Factory and results will be studied in conjunction with the radar weather observations over that area.

Work on the sound ranging of thunder and on the Ceraunograph (lightning counter) is continuing.

The standard of radio frequency described in the last report has been in operation for the greater part of the year and is performing very satisfactorily. A number of organisations have made use of this standard.

Information on radio developments in various overseas laboratories and organisations is held in the Laboratory Library, the services of which are available to other organisations through the medium of the main C.S.I.R. Library and Information Division.



## CENTRAL WORKSHOPS

### *General*

The activities and work programme of the Workshops are controlled by a committee consisting of the directors of the laboratories, the secretary-treasurer, the manager and the work supervisor of the workshop. This committee meets about once a month under the chairmanship of the director of the National Physical Laboratory, to whom the manager of the workshop is responsible.

To meet the varied demands of the research laboratories, the workshop is organised in five sections, viz., precision, engineering, pattern making and woodworking, optical and electrical. Owing to the limitation of the accommodation available, the workshop has not been able to keep pace with the considerable development of the laboratories, and it has consequently been necessary to place a considerable portion of the work with outside firms.

### *Production*

The following is a selected list of some of the major items of equipment produced during the year. Items which have been capitalised have a total value of £7,639 12s. 9d.

#### *National Physical Laboratory*

- Two borehole logging devices for recording temperature changes and two similar devices for recording radio-activity for the Department of Mines
- Lead castle for beta-ray counting for the Biophysics Section
- Electrode cutting apparatus: an improved system of cutting and shaping electrodes for spectrographs
- Rotating sampler for the Biophysics Section for handling radioactive isotopes
- Standard resistances for precision a.c. measurements (Electrical Standards Section)
- Constant temperature cabinet for standard cells
- Patterns and castings for integrating sphere for total light output determinations from lamps (Optics Section)
- Astbury camera for X-ray photography of powdered samples and fibrous materials (X-ray Section)
- Ion source apparatus for kevatron particle accelerator (Nuclear Physics Section)
- Ionisation chamber for X-ray dosage standardisation (Biophysics Section)

### *National Building Research Institute*

- Experimental pressure cell for observing soil pressure changes at varying depths over long periods of time
- Hydration apparatus for measuring volume change characteristics of limes
- Heater plate for determination of natural and forced convection film coefficients
- Torsion apparatus for vane tester for *in situ* soils shearing test
- Bench comparator for measuring autoclave test specimens
- Micrometer for accurate positioning of Pitot tubes and thermocouples in wind tunnel
- Concrete vibrator—a new experimental type still undergoing tests
- Octagonal wind tunnel of wooden construction for calibration of wind speed instruments
- Soil probe apparatus—“Dutch deep sounding *in situ* soils shear device”
- Tank for reproducing quick-sand conditions in soils
- Concrete fluidity meter for measuring mobility of fresh concrete

### *National Chemical Research Laboratory*

- Distillation apparatus—for separating organic liquids
- Ammonia distillation apparatus—for Kjeldahl method
- Two thermostat baths for the Water Treatment Research Unit
- Electrodialysis cell for treatment of clays
- Fermentation cabinet for production of citric acid from molasses

### *National Institute for Personnel Research*

- Two sets for testing hand steadiness used in the selection of pupil pilots
- Two star tracing sets for testing motor learning
- Two two-hand co-ordinators (designed by the National Physical Laboratory) used in a battery of tests for selection of apprentices and pupil pilots
- Two pursuit meters (designed by the National Physical Laboratory) used in general aptitude testing

## LIAISON DIVISION AND SCIENTIFIC LIAISON OFFICES

### *Liaison Division, Pretoria*

This division has assisted the President in exploring the need for the development and co-ordination of research in fields such as scientific hydrology, the use of locally produced bituminous materials in road construction, and artificial stimulation of rain from clouds. It has also been active in promoting the development of co-operative industrial research.

It is responsible for editing and publishing the Council's annual report, as well as for providing material for publication on the Council's activities and on scientific and industrial research in South Africa.

The division provided secretarial services for the Preliminary Organising Committee of the African Regional Scientific Conference. The Officer-in-Charge assisted with the drafting of the agenda and programme of the conference, as well as with editing and publishing the Communications to the Conference and an illustrated booklet on *Science in South Africa* which was issued to delegates. Serving as Assistant Secretary (Scientific), the Officer-in-Charge assisted with the organisation and running of the Conference.

### *South African Scientific Liaison Office, London*

Africa House, Kingsway, London, W.C. 2.

Telephone: Holborn 3422

### *South African Scientific Liaison Office, Washington*

1800 K Street, N.W., Washington, D.C.

Telephone: Decatur 9000

These offices have continued to provide invaluable services to the country in arranging itineraries and making travel arrangements for visiting South African scientists, in placing orders for equipment required by scientific organisations in South Africa and in obtaining first hand information in response to scientific and technical enquiries from South Africa. They have kept the Council and its staff in touch with the latest scientific developments overseas and, on many occasions, provided scientific organisations in America and Europe with information on scientific work in South Africa.

SENIOR MEMBERS OF STAFF AND HEADS OF SECTIONS ON  
1st JUNE, 1949

SENIOR LEDE VAN PERSONEEL EN HOOFDE VAN AFDELINGS  
OP 1 JUNIE, 1949

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*Fats and Proteins (University of Cape Town)—Vette en Proteïene (Universiteit van Kaapstad)*

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*Nutrition (S.A. Institute for Medical Research, Johannesburg)—Voeding (S.A. Instituut vir Mediese Navorsing, Johannesburg)*

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*Electrotechnology and Electronics—Elektrotegnologie en Elektronika:*

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*Acoustics—Akoestiek:*

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*Biophysics—Biofisika:*

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*Applied Mathematics—Toegepaste Wiskunde:*

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SENTRALE WERKPLAAS

*Officer-in-Charge—Verantwoordelike Beampte:*

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*Mines Research—Myn Navorsing:*

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*Statistics—Statistieke:*

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*Industrial Research—Nywerheidsnavorsing:*

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*Test Construction—Toetskonstruksie:*

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*Workshop—Werkplaas:*

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*Clinical Research—Kliniese Navorsing:*

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PUBLICATIONS—PUBLIKASIES.

A.—C.S.I.R. LABORATORIES—W.N.N.R. LABORATORIUMS

1. LIBRARY AND INFORMATION DIVISION—BIBLIOTEK EN INLIGTINGSAFDELING

*Published Papers/Gepubliseerde Artikels*

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2. NATIONAL BUILDING RESEARCH INSTITUTE—  
NASIONALE BOUNAVORSINGSINSTITUUT

*Published Papers/Gepubliseerde Artikels*

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3. NATIONAL CHEMICAL RESEARCH LABORATORY—  
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4. NATIONAL INSTITUTE FOR PERSONNEL RESEARCH—  
NASIONALE INSTITUUT VIR PERSONEELNAVORSING

*Published Papers/Gepubliseerde Artikels*

*Air Personnel Research in South Africa, 1939—1945*, by S. Biesheuvel. In: *Progress of Psychotechnics*, published by the International Association of Psychotechnics, A. Francke A. G. Verlag, Bern, Switzerland, 1, 1949, 12—48.

*Psychological Tests and their Application to Non-European Peoples*, by S. Biesheuvel. In: *University of London Yearbook of Education*, London, 1949, 87—126.

*Die Toepaslikheid van Verstands- en Aanlegsmeting op die Naturel*, deur S. Biesheuvel. In: *Tydskrif vir Geesteswetenskappe*, Universiteit van Pretoria, 6, 2, April 1949, 14—26.

*The Human Factor in Flying Accidents*, by S. Biesheuvel with M. E. White. In: *South African Air Force Journal*, 2, January, 1949, 25—31.

*Recent Developments in Personnel Research in South Africa*, by S. Biesheuvel. In: *Personnel Management—The Journal of the South African Institute of Personnel Management*, 4, 1, January—March, 1949, 6—19.

*Psychology applied to Engineering*, by S. Biesheuvel. In: *The Journal of the S.A. Institute of Engineers*, 47, 7, February, 1949, 139—156.

*The Selection of Engineers*, by S. Biesheuvel. In: *Engineer and Foundryman*, 14, 3, July 1949, 45–49.

*The Method of Frequency-moments and its Application to Type VII Populations*, by H. S. Sichel. In: *Biometrika*, Part III and IV, London, 1949.

*Mine Valuation and Maximum Likelihood*, by H. S. Sichel. (Unpublished Master's thesis), University of the Witwatersrand.

## 5. NATIONAL PHYSICAL LABORATORY—NATIONALE FISIËSE LABORATORIUM

### *Published Papers/Gepubliseerde Artikels*

*Electronic Measurement and Control in Mechanical Engineering*, a contribution to Prof. Bozzoli's Paper, by O. Brune. In: *The Journal of the South African Institution of Engineers*, 47, May, 1949, 247.

*Measurement of Radioactivity and Temperature in Narrow Bore-holes and the Development of Instruments for this Purpose*, by R. Guelke, J. C. R. Heydenrych and F. Anderson. In: *The Journal of Scientific Instruments and of Physics in Industry*, 26, May, 1949, 150.

*Measurement of Modulus and Damping Capacity in Torsion and in Bending of Wool and other Textile Fibres*, by J. P. A. Lochner. In: *Journal of the Textile Institute*, 40, April, 1949, 220.

*Spurious Counts in Geiger Counters and the Pre-treatment of the Electrodes*, by J. D. Louw and S. M. Naudé. In: *Physical Review*, 76, August 15, 1949, 15.

*Die Rotationsstruktuur des Bandenspektrums des Schwefelmoleküls  $S_2$* , by S. M. Naudé. (Invited paper in the Planck Commemoration Volume.) In: *Annalen der Physik*, 6th Series, 3, October, 1948, 20.

*Radio-Isotope*, by S. M. Naudé. In: *Tydskrif vir Wetenskap en Kuns*, 8, October, 1948, 15.

## 6. TELECOMMUNICATIONS RESEARCH LABORATORY— TELEKOMMUNIKASIES NAVORSINGSLABORATORIUM

### *Published Papers/Gepubliseerde Artikels*

*The amplification of pulses by gating methods*, by J. A. Fejer. In: *Journal of the South African Institute of Electrical Engineers*, 40, 2, February, 1949, 39.

*Research Reports/Navorsingsverslae*

ETR/4 — *Radio Communication through Rock on the Witwatersrand Mines*, by T. L. Wadley.

*Interim Reports/Tussentydse Verslae*

ETI/5 — *A Remote Weather Station (Preliminary Description)*, by J. A. Fejer.

ETI/6 — *Some Preliminary Measurements of Ionospheric Absorption in South Africa*, by F. J. Hewitt and T. L. Wadley.

*Memoranda*

ETM/3 — *Notes on the Study of Precipitation by Radar*, by F. J. Hewitt.

*Monthly Bulletins/Maandelikse Verslae*

Series ET/P — *Basic Radio Propagation Predictions for Southern Africa*.

Series ET/J — *Monthly Bulletin of Ionospheric Characteristics observed at Johannesburg*.

Series ET/C — *Monthly Bulletin of Ionospheric Characteristics observed at Cape Town*.

APPENDIX/BYLAE II—(continued/vervolg)

B.—PUBLICATIONS RECEIVED DURING 1949 FROM HOLDERS OF C.S.I.R. RESEARCH AWARDS

B.—PUBLIKASIES ONTVANG GEDURENDE 1949 VAN HOUEERS VAN W.N.N.R.-NAVORSINGSTOEKENINGS

I.—GENERAL RESEARCH—ALGEMENE NAVORSING

AUTHOR—SKRYWER	TITLE—ONDERWERP	JOURNAL—TYDSKRIF
Ahrens, L. H., B.Sc., D.Sc., A.R.I.C.	Measuring Geologic Time by the Strontium Method	Bulletin of the Geological Society of America, Vol. 60, February, 1949.
Boden, B. P., Ph.D.	The Diatoms collected by the U.S.S. Cacopan in the Antarctic in 1947.	Sears Foundation: Journal of Marine Research, Vol. VIII, No. 1, May 30, 1949. Pages 6-13, Figs. 1-3.
	A new diatom from South Africa — <i>Chaeroceros Paralelis</i> .	Transactions of the Royal Society of South Africa, Vol. XXXII, Part III.
Botha, P. J., M.Sc., Ph.D.	Die ontkiemingsfisiologie van <i>Striga Lutea Lour.</i>	M.Sc. Tesis deur S. V. Hefer, Universiteit van Suid-Afrika.
Christie, S. M. H., B.Sc., M.Sc. Kropman, M., B.Sc. Leisegang, E. C. (Non-Bursar) Warren, F. L., B.Sc., Ph.D.	The Senecio Alkaloids, Part III. The Structure of Retrosine and Isatidine, and the Isomerism of Retronecic Acid and Isatinecic Acid.	Journal of the Chemical Society, July, 1949, pages 1700-1702.
Christie, S. M. H., B.Sc., M.Sc. Novellie, L. (Non-Bursar) Kropman, M., B.Sc. Warren, F. L., B.Sc., Ph.D.	The Senecio Alkaloids, Part IV. The Structure of Retronecic and Isatinecic Acids.	Journal of the Chemical Society, July, 1949, pages 1703-1705.
de Villiers, C. G. S., Ph.D.	The Relations of the Vomer and Palatoquadrate Bar to the Cranial Rostrum in the Tinamou ( <i>Crypturellus</i> Species).	Annals of the University of Stellenbosch, Vol. XXIV, Section A, Nos. 1-4 (1946).
Fair, T. J. D., M.A.	Slope Form and Development in the Interior of Natal, S.A.	The Transactions of the Geological Society of S.A., Vol. L, 1947.
	Hillslopes and Pediments of the Semi-Arid Karroo.	The S.A. Geological Journal, Vol. XXX, April, 1948.
	Slope Form and Development in the Coastal Hinterland of Natal.	The Transactions of the Geological Society of S.A., Vol. LI, 1948.

APPENDIX/BYLAE II—(continued/vervolg)

AUTHOR—SKRYWER	TITLE—ONDERWERP	JOURNAL—TYDSKRIF
Fockema, R. A. P. B.Sc.	The Geology South-East of the confluence of the Pienaars and Crocodile Rivers.	M.Sc. Thesis. University of Pretoria. ( <i>Typescript</i> )
Haines, D. W., B.Sc. Warren, F. L., B.Sc., Ph.D.	The Euphorbia Resins, Part II. The Isolation of Taraxasterol and a new Triterpene, Tirucallol from <i>E. Tirucalli</i> .	Journal of the Chemical Society, Oct., 1949, pages 2554-2556.
Horn, R. P. S., B.Sc.	A 3-cm. Pulsed Transmitter and Receiver for use in the Experimental Study of Propagation Phenomena.	M.Sc. Thesis. University of South Africa. ( <i>Typescript</i> )
Hudson, G. P. B. B.Sc., M.Sc., F.R.E.L.	Studies in the comparative anatomy and systematic importance of the hexapod tentorium. III. Odonata and Plecoptera.	Journal Ent. Soc. S. Africa, Vol. XI, 30th September, 1948.
Janse, A. J. T.	The Moths of South Africa — Vol. V., Part I.	Published by the Transvaal Museum, 1949.
	Plates to Volume V of "The Moths of South Africa", Vol. V, Part I, Plates 1-32.	Published by the Transvaal Museum, 1949.
Kropman, M., B.Sc. Warren, F. L., B.Sc., Ph.D.	The Senecio Alkaloids, Part V. The Structure of Senecic Acid.	The Journal of the Chemical Society, Nov. 1949, pages 2852-2854.
Lawrence, R. F., B.A., Ph.D.	The Larval Trombiculid Mites of South African Vertebrates.	Annals of the Natal Museum, Vol. XI, part 3, Oct., 1949.
Levyns, M. R. B. (Mrs.), B.Sc., D.Sc.	Notes on Polygalaceae and some new species of Muraltia.	The Journal of South African Botany, January, 1949.
	Floral Morphology of some South African Members of Polygalaceae.	The Journal of South African Botany, July, 1949.
McDonald, A. D., B.Sc. Warren, F. L., B.Sc., Ph.D. Williams, J. M., B.Sc., M. Sc.	The Euphorbia Resins, Part I. Euphol.	Journal of the Chemical Society, Supplementary Issue No. 1 1949.
Munro, H. K., B.Sc., D.Sc.	African Trypetidea (Diptera). A Review of the Transition Genera between Tephritinae and Trypetinae, with a Preliminary Study of the Male Terminalia.	Memoirs of the Entomological Society of Southern Africa, No. 1, Nov. 30th, 1947.

APPENDIX/BYLAE II—(continued/vervolg)

AUTHOR—SKRYWER	TITLE—ONDERWERP	JOURNAL—TYDSKRIF
Ogle, J. F., B.Sc.	A Barometer for Use in the Experimental Study of the Fine Structure of the Earth's Atmosphere.	M.Sc. Thesis, University of South Africa.
Pillans, H. S., B.Sc.	The Genus <i>Phyllica</i> , Linn.	Journal of S.A. Botany, Vol. VIII, Part I, Jan., 1942.
Ripley, S. H., B.Sc. Leisegang, E. C. (Non-Bursar)	A New Electrical Discharge Circuit for Neuro-Muscular Studies.	South African Journal of Science, Nov., 1949.
Schwellnus, I. S. J., B.Sc.	The Bushveld Complex and adjoining metamorphic Rocks around M'Phatlele's Location.	M.Sc. Thesis. University of Pretoria.
Smith, J. L. B., B.A., M.Sc., F.R.S.S.A.. Ph.D.	A New Aracnid Fish from South Africa.	Annals and Magazine of Natural History, Ser. 12, Vol. ii, May, 1949.
	Interesting Fishes of Three Genera new to South Africa.	Annals and Magazine of Natural History, Ser. 12, Vol. ii, May, 1949.
van Pletzen, R., M.Sc.	The Cranial Morphology of <i>Cordylus</i> with special reference to the Cranial Kinesis.	Annals of the University of Stellenbosch, Vol. XXIV, Section A, Nos. 1-4 (1946).
Warren, F. L., B.Sc., Ph.D. Leisegang, E. C. (Non-Bursar)	The <i>Senecio</i> Alkaloids, Part II. Isatinecine.	Journal of the Chemical Society, Feb., 1949.

2.—MEDICAL, DENTAL AND NUTRITIONAL RESEARCH  
2.—MEDIESE, TANDHEELKUNDIGE EN VOEDINGS-NAVORSING

Brenner, S., B.Sc.	The demonstration by supra-vital dyes of oxidation-reduction systems on the mitochondria of the intact rat lymphocyte.	South African Journal of Medical Science (1949) 14, 13-19.
Bull, G. M., M.B., Ch.B. Joekes, A. M. (Non-Bursar) Lowe, K. G. (Non-Bursar) Evans, B. (Technical Assistant)	Conservative Treatment of Anuric Uraemia.	The Lancet, August 6, 1949, p. 229.



APPENDIX/BYLAE II—(continued/vervolg)

AUTHOR—SKRYWER	TITLE—ONDERWERP	JOURNAL—TYDSKRIF
Irving, J. T., B.A., M.A., Ph.D., M.D.	Change in the Incisor Teeth and Incisal Alveolar Bone of Rats in Hypervitaminosis A and Avitaminosis A.	Nature, Vol. 162, September 4, 1948, p. 377.
	The Effects of Avitaminosis and Hypervitaminosis A upon the Incisor teeth and incisal alveolar bone of Rats.	Journal of Physiology, 1949, Vol. 108, No. 1, p. 92.
	Changes in the Metaphysis of the long bones during the development of Rickets.	The British Journal of Experimental Pathology, 1948, Vol. XXIX, p. 539.
	The Action of Fluorine upon the Calcification of the Dentin in Rats with low calcium Rickets.	Journal of Dental Research, Vol. 28, No. 1, Feb., 1949, pp. 17-25.
	The influence of the Blood Calcium Level upon the Action of Fluorine in Pre-dentin and Dentin Formation.	Journal of Dental Research, Vol. 28, No. 2, pp. 144-150, April, 1949.
Ockerse, T. D.M.D., D.D.S.	Dental Caries. Clinical and Experimental Investigations.	D.Sc. Thesis, issued by the Department of Health, 1949.
Popper, B., M.B., Ch.B., F.R.C.S.	Fenestration of the Labyrinth.	Journal of Laryngology and Otology, Vol. LXI, No. 1, Jan., 1946.
	Fenestration pour Lotosclerose —la Voie Transtympanique Fenestration for Otosclerosis—The Transtympanic approach.	La Presse Medicale, 2 Oct. 1946, p. 648. South African Medical Journal, March, 23, 1946.
Schulenburg, C. A. R., M.B., Ch.B., M.R.I.S., L.R.C.P.	Vasomotor Changes in Peripheral Nerve Injuries.	Surgery, St. Louis, Vol. 25, No. 2, February, 1949, pp. 191-217.
Merskey, C., M.B., Ch.B.	The Relationship between Polycythaemia Vera and Myeloid Leukaemia.	Clinical Proceedings, Vol. 8, No. 3, Sept., 1949.
	Chronic Nonleukemic Myelosis	Archives of Internal Medicine, August, 1949, Vol. 84.
	Red Cell Fragility, Endogenous Uric Acid and Red Cell Survival in <i>Polycythemia Vera</i> .	S. Afr. J. Med. Sci. (1949), 14.
	Human Bone Marrow—The Clinical Assessment of its Cellularity during Life with a description of Femur Marrow Aspiration Biopsy.	S.A. Medical Journal, Vol. 23, No. 10, March 5th, 1949.

RESEARCH BURSARIES and ASSISTANTSHIPS awarded by the C.S.I.R. during 1949  
 NAVORSINGSBEURSE en ASSISTENTSKAPPE wat deur die W.N.N.R. gedurende 1949 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.
HENKEL, J. S., Diploma of Forestry, D.Sc. Pensioner, Union and Southern Rhodesian Forest Services.	1947 & 1948	University of Natal.	Growth forms of all indigenous grasses and preparation of a key for their identification based on vegetative characters.
KOCH, C., D.Sc. Hon. Coleopterologist at Transvaal Museum.	—	Transvaal Museum.	Monographic revision of the Tenebrionidae of Southern Africa.
LAWRENCE, R. F., B.A., Ph.D. Director, Natal Museum.	1948	Natal Museum.	1. The study of South African Acarina; 2. The completion, for publication, of book entitled "The Cryptozoa of the forest floor of South Africa".
LEVYNS, Mrs. M. R. B., B.A., D.Sc. Retired Lecturer.	1947 & 1948	University of Cape Town.	Cyto-taxonomy of Ficinia, Tetraria and related genera. Similar study of members of the family Polygalaceae.
POCOCK, M. A. (Miss), M.A., Ph.D. Senior Lecturer in Botany (Retired).	1948	Rhodes University College.	1. Collection and observation of American species of <i>Volvox</i> in the living state; 2. Work on marine algae (seaweeds) collected in Southern Africa during the past ten years.

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
POLDEVAART, A., B.Sc., M.Sc., Ph.D. Research Worker.	1947 & 1948	University of Cape Town. (Field work in collaboration with the Geological Survey.)	The petrology and petrogenesis of granitisation and metamorphic phenomena in the Orange River Basin below Upington.
SMITH, J. L. B., B.A., M.Sc., Ph.D., F.R.S.S.A. Professor in Ichthyology, Rhodes University College.	1946, 1947 & 1948	Rhodes University College.	Fishes of South Africa.

## (ii) STUDENT BURSARIES—STUDENTE BEURSE (£100-£200)

<i>Botany/Plantkunde.</i> KILLICK, D. J. B., B.Sc.	—	University of Natal.	The plant ecology of the Table Mountain (Natal) Area.
MEIDNER, H. A., B.Sc.	—	University of Natal.	Studies in turgor changes in plant leaves.
SCOTT, Miss E. J., B.Sc., M.Sc.	1946, 1947 & 1948	University of Pretoria.	Koolhidraat metabolisme in plante met spesiale nadruk op die ensiem-sisteme wat verantwoordelik is vir sintese.
WARD, C. J., B.Sc.	—	University of Natal.	Plant ecology of Isipingo Beach and adjoining areas of the Natal Coast.
<i>Chemistry/Skeikunde.</i> ARNOLD, R., M.Sc., A.R.I.C.	—	University of the Witwatersrand.	The electrical double layer in lyophobic colloids.
BENNETT, R. N. E., B.Sc., M.Sc.	1948	University of Natal.	Euphorbia resins.

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
BURNETT, R. E., B.Sc.	—	University of Natal.	Construction of a mass spectrometer and a theoretical study of some aspects of isotopy.
CANHAM, P. A. S., B.Sc.	1948	University of Natal.	Investigation into the active principle of <i>Cestrum Lavigatum</i> .
DRY, L. J., B.Sc.	1948	Rhodes University College.	Toxic principles (probably an alkaloid) of the Cape Blue Tulp. ( <i>Morea Polytachya</i> .)
ENGLAND, W. B., B.Sc.	—	University of Natal.	Kinetic studies of acidities in acetic anhydride solvents.
FERGUSON, I. R., B.Sc.	—	Rhodes University College.	The determination of Trace Elements in soil extracts, viz. Fe, Mn, Al, Zn, Co, Ni, I, Cl <sub>2</sub> , Ti, by the polarographic method.
GROSBURG, P., B.Sc.	1948	University of the Witwatersrand	Effects on oils and greases of the addition of vermiculite. Examination of the effect of the so-called Extreme Pressure Compounds in the light of the theory deduced.
HAINES, D. W., B.Sc., M.Sc.	1947 & 1948	University of Natal.	Euphorbia Resins.
KOEKMOER, M. S., B.Sc.	1948	University of Natal.	Alkaloids from South African plants.
KROPMAN, M., B.Sc., M.Sc.	1948	University of Natal.	The natural occurring hydroxy acids.
LOUW, D. F., B.Sc., M.Sc.	1948	Universiteit van Pretoria.	Indeenchemie (koolteer produkte).
MALAN, G. M., B.Sc.	—	Rhodes University College.	The determination of the solubility of certain slightly soluble salts by conductimetric and potentiometric methods.

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
MALHERBE, P. N., B.Sc.	—	University of Natal.	Enrichment of $O_{18}$ in water.
POCOCK, T. N., B.Sc.	—	University of Natal.	Research on South African natural products with special reference to— (a) flavones; and (b) nitrogen bases.
SERFONTEIN, W. J., B.Sc., M.Sc.	—	Universiteit van Pretoria.	Suid-Afrikaanse plantgifstowwe, veral die strukture van die nestensure.
STEPHEN, Mrs. T., B.Sc., M.Sc.	1948	University of the Witwatersrand.	Synthesis of quinazolines with special reference to vasicine.
VAN ROOY, P. J., B.Sc.	—	Potchefstroomse Universiteitskollege vir C.H.O.	Kromotografie van aminosuur mengsels en eiwit hidrolisate.
WILLIAMS, J. M., B.Sc., M.Sc. <i>Geology/Geologie.</i>	1948	King's College, London.	Synthesis of peridyl-quinolines and iso-quinolines.
KRUGER, P. E., B.Sc.	—	Universiteit van Pretoria.	Die geologie van die Drakensberg en aangrensende Ou-Graniet suid-oos van Haenertsburg.
KUSCHKE, O. H., B.Sc.	—	University of Pretoria.	1. Petrofabric analyses of the acid rocks belonging to the Bushveld Complex north of Brits; 2. The geology of the mountains south of Pretoria.
POTGIETER, C. T., B.Sc., M.Sc.	1946, 1947 & 1948	University of Stellenbosch	The petrology and structure of the George Granite Plutons and the invaded pre-Cape sedimentary rocks.
STEYN, J. G. D., B.Sc.	—	Universiteit van Pretoria	Die Bosveld-kompleks in die omgewing van Magneteeshoogte.

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
TREGIDGA, J. A., B.Sc., M.Sc.	1948	University of Cape Town	Petrology of Marble Delta, Port Shepstone.
VERMAAS, F. H. S., B.Sc.	—	University of Pretoria.	The Bushveld complex and metamorphosed sediments of Northern Sekukuniland to west of the Lulu Mountains.
<i>Physics/Fisika.</i> AARTS, W. H., B.Sc., M.Sc.	—	University of the Witwatersrand.	The physics of solids with special reference to magnetism.
ALTMAN, C., B.Sc.	1948	University of the Witwatersrand.	Investigation into the method of plotting long-distance thunderstorms.
CORMACK, A. M., B.Sc., M.Sc.	—	Cambridge University.	Experiments on gaseous radio-active substances.
DU PREEZ, Miss M. L., B.Sc.	—	University of Stellenbosch.	The effect of ionizing radiations on certain fluorescent substances.
MEYER, M. A., B.Sc., M.Sc.	—	University of Amsterdam.	The angular correlation of electrons with recoil nuclei in the process of $\beta$ decay.
PIENAAR, W. J.	—	Universiteit van Stellenbosch	Ondersoek na 'n metode om molibdenum spektrochemies te bepaal in gronde, plante en water.
SCHONLAND, D. S., B.A., B.Sc.	—	University of Birmingham.	Applied mathematics of atomic physics.
V. D. MERWE, J. HENDRIK, B.Sc., M.Sc.	1948	University of Bristol	1. One dimensional dislocations; 2. Intercrystalline boundaries.
V. D. MERWE, J. HERMANUS, B.Sc., M.Sc.	—	Ryks Universiteit, Leiden.	Kernfisika: Navorsing oor die kragte tussen kern-deeltjies.

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
V. D. PLAAT, S., B.Sc.	—	Universiteit van Stellenbosch.	Deurdringende ioniserende kosmiese straal deeltjies voortgebring in paraffien-was deur 'n neutrale komponent van die strale.
VAN WYK, C. B., B.Sc., M.Sc.	—	University of Birmingham.	The study of mathematical methods and procedures and their application to problems in atomic and nuclear physics.
WILES, G. G., B.Sc., M.Sc., D.Ph.	—	University of Bristol.	Physics of solids, with special reference to molecular structure.
<i>Psychology/Stielkunde.</i> DU TOIT, Miss E. C. M., B.Sc., M.A.	1948	University of Pretoria.	Abstract reasoning ability as tested through the Progressive Matrices Test in various clinical syndromes.
<i>Zoology/Dierkunde.</i> BODEN, B. P., M.Sc.	1948	University of California.	The distribution of the Euphausiaceae correlated with the physical oceanography of the Californian waters.
CRASS, R. S., B.Sc.	1947 & 1948	University of Natal.	Study of aquatic insects in Natal.
CROMPTON, A. W., B.Sc.	—	Universiteit van Stellenbosch.	Ontogenese van die pikkewyn skedel.
RIPLEY, S. H., B.Sc.	—	University of Natal.	Neuro-muscular physiology of the locust.
VAN EEDEN, J. A., M.Sc.	1946 & 1947	Potchefstroomse Universiteitskollege vir C.H.O.	Die ontwikkeling van die skedel van <i>Ascapthus truci Snydes</i> van die orde Anura wat beskou word as die primitiefste lewende verteenwoordiger van genoemde orde.

2. GRANTS FOR THE EMPLOYMENT OF RESEARCH ASSISTANTS  
TOEKENNINGS VIR DIE INDIENING VAN NOVORSINGSASSISTENTE

(i) SKILLED ASSISTANTSHIPS—GESKOOLDE ASSISTENTSKAPPE (£350-£450)

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
GANE, P. G., M.Sc., Ph.D. Deputy Director, Bernard Price Institute.	—	University of the Witwatersrand.	Seismic Travel-times in the Transvaal.
WARREN, F. L., A.R.C.S., B.Sc., D.J.C., Ph.D., F.R.I.C. Professor of Chemistry, University of Natal.	1946	University of Natal.	Natural products—Euphorbia resins; Alkaloids; Saponins.

(ii) UNSKILLED ASSISTANTSHIPS—ONGESKOOLDE ASSISTENTSKAPPE (£120-£240)

Name and Qualifications. Naam en Kwalifikasies.	1947 & 1948	Potchefstroomse Universiteitskollege.	Die lewensgeskiedenis, anatomie, ekonomiese belangrikheid en ontkiemings-fisiologie van 'n aantal Suid-Afrikaanse wortelparasiete.
BOTHA, P. J., M.Sc., Ph.D. Senior Lektor in Plantkunde, Potchefstroomse Universiteitskollege.	1947 & 1948	Potchefstroomse Universiteitskollege.	Die lewensgeskiedenis, anatomie, ekonomiese belangrikheid en ontkiemings-fisiologie van 'n aantal Suid-Afrikaanse wortelparasiete.
GANE, P. G., M.Sc., Ph.D. Deputy Director, Bernard Price Institute.	—	University of the Witwatersrand.	Seismic travel-times in the Transvaal.



## 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.
ELSDON-DEW, R., M.B., Ch.B., M.D. Consulting Pathologist.	—	University of Tulane, U.S.A.	Amoebiasis in Natal.
GOETZ, R. H., M.B., Ch.B., M.D. Research Professor, Medical School, Cape Town.	1947	University of Cape Town.	To get acquainted with the methods of the London Post-graduate Medical School in the field of cardiovascular research.
ODENDAAL, W. A., M.Sc., D.Sc. Senior Lektor, Universiteit van Pretoria.	—	Universiteit van Pretoria.	Die verband tussen nutrisie endokrinologie en siekte-toestande.
V. D. ENDE, M., M.B., Ch.B., M.D. Professor of Bacteriology.	1948	University of Cape Town.	Cultivation of viruses (mumps, influenza and lumpy skin disease) in the egg.
WYNDHAM, C. H., M.B., Ch.B., M.R.C.P. Clinical and Applied Physiologist.	1948	Oxford University.	Climatic physiology.

## (ii) STUDENT BURSARIES—STUDENTE BEURSE (£100-£200)

DIDCOTT, C. C., B.Sc. Student.	—	University of the Witwatersrand.	Factors regulating the formation and discharge of lymphocytes from the lymph gland.
FOX, E., B.Sc., M.B., Ch.B. Advanced student.	—	University of Cape Town.	The effect of hormones and other factors on bone formation, especially that of <i>Xenopus laevis</i> .

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
LAUBSCHER, C. L. v. N., M.B., Ch.B. M.Ch. Kliniese Assistent, Pretoria Hospitaal.	1948	Universiteit van Pretoria.	1. Tering van bene en gewrigte; 2. Laat behandeling van poliomyelitis.
MACGILLIVRAY, B. C., B.Sc. Student.	—	University of the Witwatersrand.	(a) The anatomy of the thalamus of the baboon studied in histological sections stained for fibre systems and cell mass; (b) Thalamo-cortical projections as revealed by degeneration experiments and electro-physiological methods.
MULLER, Mej. T., M.B., Ch.B. Lektriess, Dept. van Anatomie, Universiteit van Pretoria.	—	Universiteit van Toronto, Kanada.	'n Embryologiese en vergelykende studie van die outonoomiese innervasie van die uterus.
2.—GRANTS FOR THE EMPLOYMENT OF RESEARCH ASSISTANTS TOEKENNINGS VIR DIE INDIENSNEMING VAN NAVORSINGASSISTENTE			
(i) SKILLED ASSISTANTSHIPS—GESKOOLEDE ASSISTENTSKAPPE (£350—£450)			
CROCKER, Mej. C. G., M.Sc., Ph.D. Lektriess in Bakteriologie, Universiteit van Pretoria.	1947 & 1948	Universiteit van Pretoria.	Tipering van Suid-Afrikaanse stamme van typhoïde basille deur middel van bakteriofage.
GILLMAN, J., M.B., B.Ch., D.Sc. Senior Lecturer in Anatomy, University of the Witwatersrand.	1947 & 1948	University of the Witwatersrand.	Primate reproduction and nutrition.
GOETZ, R. H., M.B., Ch.B., M.D. Research Associate Professor, University of Cape Town.	1947	University of Cape Town.	To get acquainted with the methods of the London Post-Graduate Medical School in the field of cardio-vascular research.

Name and Qualifications. Naam en Kwalifikasies.	Previous Awards. Vorige Toekennings.	Where Tenable. Waar Geldig.	Subject of Research. Onderwerp van Navorsing.
HELFFET, A. J., B.Sc., M.B., Ch.B., M.Ch., M.D., F.R.C.S. Honorary Assistant Orthopaedic Surgeon, Groote Schuur Hospital.	—	University of Cape Town.	Bone Softening Diseases.
IRVING, J. T., B.A., M.A., Ph.D., M.D., M.R.S.C. Professor of Physiology.	1946, 1947 & 1948	University of Cape Town.	Influence of various factors upon bone and tooth formation.
JANSSEN, E., M.D., B.M., Ch.B. Professor in Kindergeneeskunde, Universiteit van Pretoria.	1947 & 1948	Universiteit van Pretoria.	1. Rooiselle in die bloed by wanvoeding; 2. Aangebore gebreke van die Neonatus.
PIPER, A., M.D. Professor in Siektekunde, Universiteit van Pretoria.	1948	Universiteit van Pretoria.	Sigbaarmaking van sogenaamde flagella van bakterieë met „phase contrast” mikroskopies.

(ii) UNSKILLED ASSISTANTS—ONGESKOOLTE ASSISTENTSKAPPE (£120-£240)

ODENDAAL, W. A., M.Sc., D.Sc. Senior Lektor in Fisiologie, Universiteit van Pretoria.	1947 & 1948	Universiteit van Pretoria.	Die verband tussen nutrisie endokrinologie en siekte-toestande.
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