SOUTH AFRICAN
COUNCIL FOR SCIENTIFIC
AND INDUSTRIAL RESEARCH

THIRD ANNUAL REPORT

1947-1948

P.O. Box 395, *Pretoria.*
1*st November*, 1948.

Sir,

I have the honour to present to you herewith the Third Annual Report of the Council for Scientific and Industrial Research for the year ended October 5*th*, 1948.

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 31*st March*, 1948.

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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THIRD ANNUAL REPORT.

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
DR. P. J. DU TOIT
PROF. S. F. OOSTHUIZEN
DR. BERNARD PRICE
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, Secretary for Commerce and Industries, at the request of the Council and with the consent of the Government, attended the meetings of the Council as an assessor member, as he did during the previous year.

It is with great regret that the Council records the death during the year of Dr. Bernard Price. Dr. Price had for thirty years been prominently associated with every national body dealing with scientific and industrial research and his wise counsel and careful judgment contributed a great deal to the development of the Council for Scientific and Industrial Research.

Two meetings of the Council, each lasting three days, have been held. One of them took place in Cape Town and gave the Council an opportunity to hold discussions with the research committees of the Universities of Cape Town and Stellenbosch, the Ca pe Chamber of Industries and the Board of Control of the Fishing Industry Research Association. The discussion with the Cape Chamber was made the occasion for a general examination of proposals for research into problems of industrial effluents.

At the invitation of the Board of the Fishing Industry Research Institute, the Council paid a visit to the Institute in its new quarters in Portswood Road and the President of the Council formally opened the Institute.

During the absence of the President for two months on official duty overseas, the Prime Minister appointed Dr. P. J. du Toit to serve as Acting President. The Council wishes to express its thanks to him for undertaking this work, and to Dr. S. H. Haughton for a similar service to it during a previous year.

The Executive Committee, consisting of the President, Dr. S. F. Oosthuizen and Dr. P. J. du Toit, with Dr. Bernard Price and Mr. T. P. Stratten as alternates, has met on eight occasions during the year.

The Council has been honoured by visits from the two successive Prime Ministers of the Union, Field-Marshal Smuts and Dr. Malan, who visited its laboratories in Pretoria on 11th December, 1947 and 14th July, 1948, respectively.

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 and the Liaison Division, are given in later sections of this report. Considerable development of the facilities and the staff of these laboratories has taken place during the year.

The Council is indebted to the Public Works Department for much assistance in making the necessary specialised alterations to the laboratory buildings which it occupies in Pretoria.

In July, 1948, the National Institute of Personnel Research took occupation of a new building for its Johannesburg headquarters on ground kindly placed at the Council's disposal by the University of the Witwatersrand. The University of the Witwatersrand has also assisted the Council by providing accommodation for research work on telecommunications, on water pollution problems and on applied geophysics and lightning protection.

Advisory Committees.

The activities of the Council's laboratories are guided by advisory committees which meet regularly to consider the programmes of work and the progress achieved and to recommend any new developments to the Council. These Committees which at present cover Building Research, Personnel Research, Chemistry, Telecommunications and five separate branches of Physics (Electrotechnics, Heat, Acoustics, Biophysics and General Physics including light, spectroscopy and X-rays) have proved

most valuable, for they enable close co-operation to be maintained between the National Laboratories and all those in the country who can assist them as well as those who can benefit by their services. They include representatives from university departments with interests akin to those of the Council's staff and in this way ensure a measure of co-ordination with university research work. But their most valuable function is that they provide a means of stimulating, guiding and watching over the research work of the Council without too much direct interference with the research worker.

Industrial Research.

As will be seen from the later reports of the various sections, much of the work in the Council's laboratories deals with contracts and enquiries from industry, but the Council is also involved in certain special industrial research activities outside these.

The Industrial Research Associations for the Leather and Footwear, Fish, Paint, and Sugar Milling Industries are reported on elsewhere in some detail. During 1948 the first two of these became corporate bodies under the Companies Act and have had a very successful year. The Paint and Sugar Milling Research Associations have appointed their directors of research and are expected to begin operations very shortly. Discussions on the formation of other research associations are continuing. An illustrated brochure setting out the aims and objects of Industrial Research Associations was prepared by Dr. S. G. Shuttleworth, Director of the Leather Industries Research Institute, Grahamstown, for the Council and for the Federated Chamber of Industries who paid the cost of its publication and arranged for its distribution.

The Research Committee of the Federated Chamber of Industries provides a valuable link between industry and the Council, and has undertaken, with the consent of the Executive of the F.C.I., to issue a questionnaire to all industrialists with the object of learning what is the present demand for various types of research workers in South African industry and what it is likely to become in the future. The Council feels that this information will have an important bearing on university training in research and on the guidance of university students as to their future careers. It is hoped that the questionnaire will also provide a picture of the present state of research in South African industry and give pointers to future development.

In the course of discussions with industrial groups, it has become clear that many South African industries are at too early a stage to justify the formation of rather costly research association laboratories, even when these

are subsidised by the State through the Council, although much research work is required by the industrial groups. To meet this need the Council has agreed to institute a system of industrial research fellowships under which the group guarantees the salaries and special expenses of one or more research workers who will be engaged on their specific problems over a period of years and the Council provides accommodation, general facilities and specialised supervision for the work as an indirect subsidy. One such fellowship has already been established by the Blue Lime Manufacturers' Association and others are under discussion.

For the solution of industrial research problems of a more short-term nature, the Council has continued the system of contracts whereby these problems are attacked by its own staff. During the year it has dealt with 53 such contracts for a total amount of £34,560, of which 17 were carried over from previous years and 36 were new. Thirty-three of these contracts were completed during the year.

Medical Research.

The Council's Medical Research Committee was reconstituted during the year and has given much attention to proposals for developments in medical research other than the support of university workers applying to the Council for assistance in their own researches. These proposals, which are given in greater detail in a later section of this report, envisage the establishment at various universities or in association with the Department of Health, and the South African Institute for Medical Research, of small units specially qualified to attack selected research problems in the fields of preventive and curative medicine. The Council believes that a development of this nature would be of very great benefit to the country.

In order to assist it in the plans which it is formulating in the field of nutrition and in medical research generally, the Council, with the approval of the Government, invited Sir Edward Mellanby, Secretary of the Medical Research Council of Great Britain, to visit South Africa towards the end of the year.

The Council is very much indebted to Dr. S. F. Oosthuizen, one of its members, for undertaking the organisation of medical research in an honorary capacity until a permanent appointment of a Medical Research Secretary is made. During the year, Dr. Oosthuizen has visited Great Britain, Canada and the United States to study medical research organisations in those countries.

Support of Research in the Universities.

Details of the financial support extended to university research workers are given in a later section. The receipt of resolutions of appreciation from

the Senates of the Universities of Stellenbosch and Pretoria has encouraged the Council in its view that its efforts to provide assistance to universities, on a scale and in a manner that had not previously been possible, are likely to prove of value to the nation.

A Committee formed by the Council, in association with the Council for Social Research, has put forward proposals to the Minister for Education for the establishment at the universities of a certain number of permanent posts specifically to provide for research and advanced teaching in subjects where the facilities and the history of the department concerned promise success. The Council is glad to learn that the Minister is considering these proposals favourably.

The Nuffield Foundation of Great Britain has asked the Council to act as a channel for the nomination by South African universities of distinguished men of science who might visit this country at the Foundation's expense, to hold discussions with university and other research workers and so stimulate research development. The Council has accepted this responsibility and during the year arrangements were made for visits by Prof. J. A. Ryle, Professor of Social Medicine in the University of Oxford and Prof. J. Hammond, Professor of Animal Husbandry in the University of Cambridge. The Council understands that the National War Memorial Health Foundation, in the case of Prof. Ryle, and the S.A. Meat Board and the University of Stellenbosch, in the case of Prof. Hammond, shared with the Nuffield Foundation in the expenses of these visits, which proved an outstanding success.

GENERAL CO-ORDINATING AND ADVISORY FUNCTIONS.

External Relations in Science.

In association with the Department of External Affairs and other government departments, the Council has been concerned with the planning of the Conference which is to be held in South Africa towards the end of 1949, at the invitation of the Government, to discuss collaboration in long range research on specialised problems in Africa, south of the Sahara.

The Council was glad to welcome the Research Secretaries of the Central African Council (the Rhodesias and Nyasaland) and the Council of East African Governors (Kenya, Uganda, Tanganyika and Zanzibar), Dr. A. E. Keyston and Dr. E. B. Worthington, who paid a short visit for discussions on matters of common interest during the year.

To provide for proper consideration of scientific matters of an international nature, the Council has formed a number of committees associated

through it with the Council of International Scientific Unions, and the International Unions of Geodesy and Geophysics, Scientific Radio, Pure and Applied Chemistry, Pure and Applied Physics, Geography, Biology and Astronomy. It has also been associated with the formation of an International Union of Crystallography and the International Scientific Film Association.

Defence Science.

The Council has the responsibility of providing staff who are qualified to advise the Union Defence Forces on the application of science to defence problems and has taken steps to provide and train such staff, who are commissioned in the S.A. Corps of Scientists.

Artificial Stimulation of Rain.

Following upon reports of work carried out in the U.S.A. and Australia, arrangements were made through the Council for a series of investigations of the possibilities of the artificial stimulation of rain from clouds which were not in a condition to give precipitation. For this purpose a committee was formed which obtained the full co-operation of the Union Meteorological Division, the South African Air Force and the National Telecommunications and Physical Laboratories of the Council. The investigations proved successful in that a high proportion of the clouds " seeded " with dry ice from aircraft was converted into rain-clouds. The full practical and economic importance of these results requires much further investigation, as does the mechanism of stimulation by this and various other means, but it appears that a noteworthy contribution has been made to a subject which cannot fail to be of some practical importance to South Africa and on which we should be fully informed.

Gravity Survey of the Union.

At the request of the Director of the Trigonometrical Survey the Council has arranged for a gravity survey of the Union and adjacent territories to be made by members of its staff in association with the Bernard Price Institute of Geophysical Research, using equipment kindly lent by the University of Cambridge. No such survey has previously been made in Southern Africa and this work, which is nearly completed, will be of both practical and scientific importance.

Representation on other Bodies.

The Council has continued to be represented on the Boards of Control of the Fuel Research Institute and the Government Metallurgical Laboratory by an assessor member and on the Board of the South African Institute for Medical Research by two members. It is also represented, through its

President, on the Standards Council, the National Council for Social Research and the National Road Safety Committee.

Co-operation with the Standards Council.

The activities of the laboratories of the Standards Bureau and those of the Council impinge on one another in many fields and close co-operation has been maintained between the two. The Council is glad to have been of assistance to the Standards Council and its Bureau in a number of directions during the year and has similarly to thank it for assistance rendered from time to time by its laboratories.

ACKNOWLEDGEMENTS.

The Council wishes to thank its many advisory committees for the considerable help they have given to it during the year.

It acknowledges with thanks the following grants :—

The Administration of South West Africa, £1,000.

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

African Explosives and Chemical Industries (lightning research), £750.

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

The Federated Chamber of Industries (Publication of brochure on Industrial Research Associations), £200.

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

Dr. P. C. Carman, Dr. P. J. du Toit, Mr. R. Kantorowich, Dr. S. M. Naudé, Dr. W. S. Rapson, Dr. W. J. Schiff, Dr. B. F. J. Schonland, Transvaal Museum, Mr. H. G. Treliving, Mr. H. van der Merwe, The United Kingdom Information Office.

The Council expresses its thanks to its staff for their excellent work during the year, including the staff of the Headquarters and Administration section, which serves all parts of the Council's organisation, and which falls under Mr. J. R. Sorrie, the Secretary-Treasurer.

NATIONAL LABORATORIES AND SERVICES.

NATIONAL BUILDING RESEARCH INSTITUTE.

Director : J. E. Jennings, M.SC., A.M.I.C.E.

General.

During the period under review the activities of the Institute have continued on an increasing scale, and the scope of its functions and responsibilities have become more clearly defined.

The different divisions within the Institute have developed in such a way as to form a more balanced unity, and have made good progress towards providing the basic facilities in their respective laboratories.

Besides the work arising from the Institute's extensive research programme, much time during the past year has been spent on the enquiry service which has been made available to outside bodies. Although the number of enquiries is still growing and these requests for information usually involve work which takes considerable time to complete, it is considered that this service is not only of national importance but also provides a useful means of keeping the Institute in constant touch with practical problems.

Building Research Advisory Committee.

The membership of the Building Research Advisory Committee was increased to twenty-two by the addition of Mr. J. M. Jordaan, Design Engineer of the Department of Irrigation. Apart from this addition, a change was effected by the appointment of Mr. A. F. Bruyns-Haylett by the South African Railways and Harbours Administration as its representative in place of Mr. A. Goldstein, who had been promoted to another post.

We learnt with deep regret of the death of Prof. H. L. Reitz, one of the five corresponding members of the Building Research Advisory Committee.

Another year of excellent service has been rendered by the Building Research Advisory Committee in guiding the work of the Institute, particularly in providing a link between the theoretical approach to various problems and the practical application of the research results.

Staff.

The professional staff has been increased by five and the technical staff by twelve. This additional staff has given considerable impetus to the work of the Institute, particularly in the Engineering Division, where a Principal Research Officer was appointed.

Some vacancies still exist in the professional and technical officer grades, but it is anticipated that most of the vacancies will be filled before the end of the year.

Overseas visits.

The Director, Mr. J. E. Jennings, left the country early in June on a six-months' tour through Holland, Sweden, England and the United States of America and, from reports received from him, there is no doubt that his

experience during this tour will prove of great value to the further development of the Institute.

One Assistant Research Officer was in England during the first half of the year studying wind tunnel design and calibration, and to gain experience in ventilation and air flow investigations in general.

A Senior Research Officer who left for England during September of last year to study cements and concrete under Dr. Lea at the Building Research Station, returned at the end of September, 1948.

Divisions.

The original Engineering Division has been subdivided into three separate divisions, so that the Institute is now organised in the following five divisions, in addition to an administrative section :—

Architectural Division
Functional Efficiency Division
Engineering Division
Materials Division
Soil Mechanics Division

Progress in the work of the Architectural Division, though marked, has been handicapped by the difficulty in securing trained architects to fill vacancies on the staff.

The work of the Functional Efficiency Division has developed very satisfactorily during the past year and since the completion of a heat transmission test room a considerable amount of experimental and analytical work has been done.

With the appointment of a Principal Research Officer to the Engineering Division at the beginning of the year, a satisfactory start has been made with the work of this Division.

The Materials Division, which is the oldest in the Institute, is already firmly established. Apart from the research projects, which this division has in hand, much of its time is necessarily spent in answering enquiries which fall within its sphere.

The work in the Soil Mechanics Division has been characterised by a large volume of contract work, and little time has been available for long-range research work.

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 organisation of the laboratories has been greatly improved, though they are not yet fully equipped.

The Field Station has proved very valuable to the Institute. The Heat Transmission Test Room has been built on this site and it is also planned to erect there the housing for a 10 ft. diameter low-velocity wind tunnel for the study and testing of roof ventilators.

Enquiries.

About forty major enquiries were received during the year. In many cases enquiries have developed into research projects and have consequently been taken into the research programme.

Contracts.

The following contracts have been entered into during the year :—

Department of Irrigation.

Selection and control of soils in Rooikrantz Earthfill Dam. This project has been completed except for the field control work, which will continue throughout the construction period.

The South African Railways and Harbours Administration.

To conduct a foundation analysis for the proposed bridge over the combined canals in the Bayshore Reclamation, Durban. (Completed.)

To examine the foundations for the proposed pre-cooling store and cargo shed " T " Jetty, Durban Harbour.

To examine the foundations for the Electrical and Mechanical Workshops, Bayhead, Durban.

Electricity Supply Commission.

To examine the foundations for the Salt River " B " Power Station.

Messrs. Nurcombe, Summerley and Lange.

To determine depth of saturation of soil for the foundations of the proposed Good Hope Textile Factory. (Completed.)

Messrs. Strathmore Investments.

To study autoclave hydration of limes in connection with the manufacture of sand lime bricks. (Completed.)

L. G. Snow.

To carry out tests to compare the warmth of a commercial asphalt tile with that of other flooring materials in common use in South Africa. (Completed.)

S.A. Silica Brick Co.

To carry out weathering and water absorption tests on sand lime and conventional burnt bricks.

Messrs. Nurcombe, Summerley and Lange.

To test soils for use in the manufacture of soil-cement bricks. (Completed.)

Messrs. Kennedy, Furner, Irvine-Smith and Joubert.

To determine daylight illumination intensities in the main line concourse of the new Johannesburg Station. (Completed.)

Messrs. Christianie and Nielsen (Pty.) Ltd.

To conduct shear, consolidation and identification tests on soil samples. (Completed.)

Messrs. Hume Pipe Co.

To develop an abrasion test for concrete pipes.

Research Programme.

The following is a resumé of the research programme, excluding those undertaken on a contract basis for industrial and other sponsors :—

Engineering Division.

The Physical Properties of the Various Elements of Buildings.

The aim of this project is to issue tables listing the various physical properties of the elements of buildings. To this end a considerable amount of existing information has been collected. Great difficulty is being experienced in collating the data, as the test methods and standards of comparison used by various investigators are different in nearly all cases. A considerable amount of investigational work will be required to reduce the data to a comparative basis.

Cost of Buildings.

The work of the research scholar working in the Department of Architecture and Quantity Surveying of the University of Pretoria has continued. Considerable progress has been made and one of the most useful results of the year's work will probably be the elucidation of the relation between artisan time per square foot of building and the cost per square foot. Information, provided mainly by the S.A. Railways and Harbours Administration, has enabled this relation to be studied for the lower priced type of dwelling. A large number of contractors have been circularised with a view to getting information for extending the study into the higher priced type of dwelling. This information still has to be collated.

Costs of different types of elements of a building have been compared (*e.g.*, in roofs: lean-to, ridge and gable types were compared ; in external finishings : face brick, plaster and lime wash, etc.).

Soil Mechanics Division.

Development of a Rational Theory for Small House Foundation Design.

During the year levelling work has been continued on the various structures under observation and the scope has been extended to cover additional areas. The general trend of upward movements on expansive clay soils has continued and spectacular results were recorded in the Odendaalsrus area after the heavy rains in the earlier part of the year.

Investigations have been carried out at Vereeniging to determine the zone of saturation and the required length of cast-in-situ piles. The zone of saturation was found to lie at a considerable depth below the surface and it will probably prove more economical to locate the bases of such piles in a zone of constant moisture content. Tests of the beam and pile foundation by the National Housing and Planning Commission at Vereeniging will be watched with great interest.

Difficulties in sampling have been encountered in these stiff clay soils and, in conjunction with new sampling techniques, experiments are to be carried out to determine whether electrical resistivity measurements will yield information of sufficient accuracy for the location of zones of constant moisture content.

It is encouraging to note that workers in various other countries are tackling the same problem along similar lines and that information from these sources is proving of value in this investigation. Owing to the great pressure of work on the other projects it has not been possible to devote as much time to this problem as was hoped, but staff increases in the new year should alleviate the position considerably.

Study of Pressures on Dam Walls exerted by Silt in Storage Dams.

As pointed out in the last annual report, this study depends upon the successful development of the soil pressure cell described in the next project. The study of silt pressures has been held over pending the production of sufficient numbers of these cells.

Development of a Satisfactory Soil Pressure Cell.

This project has been temporarily handed over to the Engineering Division which has redesigned the cell and tested the measuring system. A prototype has been constructed and sent to the Soil Mechanics Laboratory at Vicksburg, U.S.A., for their comments.

Materials Division.

Study of the Properties and Uses of Vermiculite.

A fairly complete review of the use of exfoliated vermiculite in building has been drawn up and arrangements for its publication are in hand.

Study of the Uses and Limitations of Soil Cement for Wall Construction.

All the laboratory work was completed several months ago and the final research report has reached an advanced stage. Surveys of buildings in which soil cement has been used, are continuing.

Study of the Uses and Limitations of Pisé-de-Terre for Walling.

With the exception of analyses carried out on two soils, no laboratory work on this project has been undertaken. Literature is being collected and pisé structures are being examined. Regular contact with the National Housing Board in Rhodesia and the Rhodesia Railways, both of which have embarked on extensive pisé housing projects, has been maintained and a good deal of useful information has been exchanged.

Determination of the Efficiency of Commercial Waterproofing Agents.

Considerable difficulty was experienced in finding satisfactory inert test media for use in the permeameter. In view of this difficulty a different test technique involving the establishment of the time/absorption relations of suitable specimens on immersion before and after treatment with the various waterproofers, has been provisionally adopted. This appears to be much more promising and will lend itself to exposure tests for the determination of the permanency of the various waterproofers.

Study of the Uses, Properties and Failures of Bitumastic Materials in Buildings.

This work has been confined to the development of processes for the manufacture of mastic floors.

While the best results have been obtained from imported asphalt, the latest work has been concentrated on the development of a mastic floor using local pitch, sawdust, asbestos and limestone and sufficiently promising results have been obtained to justify the laying of experimental floors.

Study of the Capacity for the Improvement of Portland Cement.

The research officer to whom this work was committed has been engaged during the year on fundamental work at the Building Research Station of the D.S.I.R. in Great Britain, under the direction of Dr. F. M. Lea. The work has taken the form of the investigation of phase-composition-temperature relations within the calcium oxide-silica-alumina-magnesia quaternary and related systems, by the quench method. Fair progress

has been made, and a tentative curve obtained indicating that gehlenite and spinel form a binary system with a eutectic at about 1530°C. of approximate composition 87 per cent. gehlenite and 13 per cent. spinel. Chemical analysis and experimental grinds of cements of various composition have also been undertaken. In addition visits have been paid by this officer to various industrial plants and factories associated with cement production and numerous other visits to places and activities having a direct bearing on the work of the Institute.

Study of Expansive Mortar Failures in Brickwork.

During the past year this work has resolved itself into fundamental work on the calcination characteristics of South African dolomite and magnesite.

Complete chemical analyses on raw materials have been carried out on three representative samples of each material and experimental burnings have been carried out in the laboratory on two dolomites and one magnesite at temperatures of 300°C. to 900°C. in steps of 100°C. for periods of 2, 4, 8, 16, 24, 32, 40 and 48 hours for each temperature. The decomposition characteristics of the various materials for the different times and temperatures of calcination are being studied quantitatively.

Work by the National Physical Laboratory on the X-ray examination of calcined and partially calcined dolomites undertaken at the request of this Institute, has indicated that the materials examined are true dolomites and not magnesian limestones. It is proposed to make further use of X-ray diffraction methods in the course of this work.

Improvements in and Standardisation of Test for Wear of Floors.

The work of evaluating the effect of certain controllable variables on test results, in addition to tests on a wide range of commonly used flooring materials, has been completed and the final report has been drafted.

Study of Termite Damage in South Africa and General Measures for the Protection of Building Timbers.

The work of the Committee is virtually complete and the research report has been written. The practical implications of the findings of this Committee have been embodied in a memorandum proposing various constructional methods of treating foundations to protect buildings from termite action. This has been widely circulated for comment and an encouraging number of replies has been received. A series of tests in connection with this project has been embarked on at a field station at Rustder-Winter in collaboration with the Division of Entomology and the Forest Products Research Institute.

Applications to South African Problems of the Study of the Uses, Properties and Failures of Paints in the Building Industry.

The paint research section has initiated an intensive study of the numerous problems which face the paint consumer in this country. Negotiations with the South African Railways and Harbours Administration for the acquisition of a coastal paint exposure site at Durban, have now reached the final stages and it is anticipated that the first panels will be exposed there within a month or two.

The section has been engaged on an investigation into the painting of galvanised iron and the weather resistance of different types of roof paint under the various conditions encountered in South Africa. The National Housing and Planning Commission, at whose instance this work was started, has placed several houses at the disposal of the paint section. These houses are now being used for large scale field tests and will serve to amplify the research programme in the laboratory. In this respect the use of natural South African iron oxide pigments is being fully surveyed and representative samples from various producers have already been analysed and will be used for further research.

A Satisfactory Standard Sand for Use in South Africa.

This project aims at finding a South African sand satisfactory for use in cement testing, to replace Leighton Buzzard sand which is used at present.

Literature on the subject has been studied and samples of British, American and Swiss standard sands obtained for full examination. Reports on previous work on this subject in South Africa have been studied.

Two promising South African sands have been obtained and these are currently being tested together with Leighton Buzzard and Ottawa sand.

Functional Efficiency Division.

Determination of Standards of Comfort in Buildings and Measurement of the Physical Factors Affecting these Standards.

A report reviewing the various scales of warmth was prepared for the Sub-committee on Heating, Cooling and Ventilation of the Research Committee on Minimum Standards of Accommodation.

It has been recommended that, pending further investigation, the *Corrected Effective Temperature* be adopted as the comfort scale in this country.

The limits between which the *Corrected Effective Temperature* should lie to ensure comfort have been provisionally fixed at 65°F. and 80°F.

Preparations are being made for an extensive series of pilot tests with the object of trying to prescribe closer limits to a comfort zone for South African conditions and also of comparing the various scales of warmth.

The study of available literature on this subject has also been extended to cover the more recent development in the assessment of environmental warmth in terms of the various physiological responses induced, since these have a direct bearing on the feeling of comfort experienced by an individual.

Compilation of Climatological Data for Design Work in Heating and Cooling of Buildings.

A start has been made on the analysis of the available outdoor air temperature records of the Meteorological Office to yield a basis for the selection of outdoor design temperatures. The analysis has so far been limited to the Germiston records over the ten year period 1936 to 1945, and on completion of this, the work will be extended to a further ten or twelve stations representative of the typical climatic zones in the Union.

Development of Tests for Thermal Properties of Building Materials.

The apparatus for the determination of the thermal conductivity of thin slabs has been completed and tests already carried out have shown it to be most reliable and satisfactory. Work is also well in hand with the construction of two other types of thermal conductivity apparatus, one for brick specimens and the other for wall sections, and it is anticipated that both will soon be completed.

In collaboration with the National Physical Laboratory, determinations of both the specific heat and the total normal emissivity of building materials can now be undertaken.

The design of an instrument for measuring the diffuse reflection of building materials over solar wave-lengths has been completed and it is hoped to construct it before the end of the year.

Development of Tests for Assessing Rain Resistance of Building Materials.

An electrical method whereby the penetration of the waterfront through a wall section can be followed and recorded has been developed from a series of pilot tests. This system will be incorporated in a test chamber within which wall sections can be subjected artificially to a variety of rain and wind conditions.

Determination of Heat Transmission Through the Various Elements of Buildings.

The construction of the heat transmission test room has been completed and pratically all the apparatus installed, including six solar radiation measuring instruments, four of which are on loan from the Meteorological Office, and two sol-air thermometers which were manufactured in our workshops. Only a few meteorological instruments have still to arrive to complete the equipment required for this test room.

Two tests have been carried out. The first, in March, lasted over a period of four consecutive days and all measurements except those of the climatological conditions were taken. As a result of this test some modifications to the system of recording temperatures were made which resulted in a considerable shortening of the time taken to make a series of measurements. The second test was carried out over a period of three days in July and this time all measurements were recorded.

The analyses of the results from these tests are well in hand and so far a very satisfactory agreement between measured and calculated values has been obtained.

Studies of Roof Ventilators.

The design of a 10 ft. diameter low velocity wind tunnel has been completed and the tunnel and associated equipment is on order. The design of suitable housing for this plant is in hand.

Study of Ventilation Conditions in Buildings.

The study of the literature on this subject is continuing and a report is now being drafted which is intended to present the existing information with special reference to its applicability to the South African climate and with regard to conditions of natural ventilation in dwellings. In this connection reference should be made to a Report on Ventilation which was prepared for the Sub-committee on Heating, Cooling and Ventilation of the Research Committee on Minimum Standards of Accommodation.

The problem of human needs for the minimum rate of air change will, however, have to be studied in greater detail. This need was also borne out by the investigations of the Legislation Sub-committee of the Research Committee on Minimum Standards of Accommodation, which revealed a great deal of confusion in the various Acts and Regulations as to the minimum desirable volume of air-space per person in habitable rooms. It seems evident that, in order to adopt reasonable minimum rates, consideration should be given to requirements other than those only essential for

bodily combustion. The possible contamination of the air within a space by various sources certainly warrants closer investigation.

On arrival of the necessary instruments, a series of pilot tests in selected buildings will be undertaken to obtain information on actual ventilation conditions.

For the calibration of air flow instruments a 2 ft. octagonal shaped straight through wind tunnel has been designed and is in the course of construction.

The Acoustical Properties of Building Materials.

Until laboratory facilities become available for the practical determination of the acoustical properties of South African building materials, the work in this field must necessarily be confined chiefly to a study of the existing literature. In this respect, considerable assistance was given to the Sub-committee on Noise in the preparation of its Interim Report for the Research Committee on Minimum Standards of Accommodation. In addition, work is progressing on the preparation of a series of illustrated examples of good and bad building practice from the point of view of sound insulation.

Studies of the Lighting of Buildings.

A detailed study has been made of the literature relating to all aspects of daylighting within buildings while particular attention has been given to methods of prediction and design. Much of this work arose out of the need to provide as much information as possible to the Sub-committee on Lighting for its Interim Report to the Research Committee on Minimum Standards of Accommodation.

With a view to obtaining some information on the outdoor illumination intensities in South Africa, an analysis was made of the results of the Solar Radiation Survey carried out over a period of eight years by the Division of Veterinary Services. By reducing the observed total radiation intensities to illumination intensities, using experimentally determined equivalents, it was possible to obtain, for two stations, the average daily variation in outdoor illumination at different times of the year and for cloudless and overcast sky conditions. Since these values cannot be wholly relied upon, it is now proposed to record continuously at the Institute the illumination on horizontal surfaces exposed to the unobstructed sky both exclusive and inclusive of direct sunlight. Designs for suitable instruments are now completed and the recording equipment has been ordered.

The only work done on artificial lighting has been a study of the literature. A report on this subject is now in preparation and, at the same time,

all the available data on artificial light sources and luminaires are being collected and tabulated for easy reference.

Architectural Division.

Study of Housing.

This project has been extended to embrace all forms of housing development. This has been done because of the existence of so many problems which are common to all classes of housing.

Work on this subject has so far been confined to an analysis of certain methods of house-construction specially evolved in South Africa for urban native housing, and to certain theoretical studies concerning the analysis of house plans, in which particular attention was devoted to the problem of the very small dwelling such as is built for non-Europeans in urban areas.

An attempt has been made to study the cost structure of the systems under review, their labour organisation and their use of materials. In association with this study, a theoretical study of the problems of prefabrication has been undertaken.

Research Committee on Minimum Standards of Accommodation.

This project has occupied most of the Division's time and energies. The Interim Reports of the Main Committee and the Sub-committees are now in preparation and will be issued in due course. These cover the general approach to the problem of minimum standards of accommodation in the framing of housing policy, the detailed aspect covering the social and economic trends to be planned for in the housing of the future, the attitudes of householders to their dwellings, the present position regarding legislation governing minimum standards of accommodation, the design and planning of dwellings, the planning of housing estates, and the functional efficiency aspects of ventilation, heating and cooling, lighting and noise.

The work of the Sub-committees dealing with the last four considerations has been carried out jointly for the Research Committee on Minimum Standards of Accommodation and the South African Bureau of Standards, and forms a basis for the establishment, not only of standards of performance for houses sponsored by the Housing Commission, but also for the preparation of Codes of Practice on these matters for more general application.

The Interim Reports are comprehensive documents, the result of a careful consideration of the various aspects by the Committees, which number some 120 members drawn from all affected and interested bodies. They form a rational basis for the establishment of minimum housing standards to cover building operations for the next few years. At the same time, the

investigations have revealed gaps in the fundamental knowledge required to establish minimum standards of accommodation on a firm scientific basis, and to fill these gaps may require full-scale programmes of research.

Work of the Sociological Unit.

The two sociologists in this division have been employed exclusively on work connected with the Research Committee on Minimum Standards of Accommodation. The work was concentrated on the development of a questionnaire and a visiting technique to obtain the views of householders concerning existing dwellings, particularly among Europeans occupying houses of the sub-economic class.

The results of the two trial surveys carried out have shown that whilst useful information on a number of detailed points connected with the planning and equipment of the houses may be gleaned from the tenant's responses, the inhabitants are not able to offer any useful observations on the broader issues of housing as a whole.

A number of purely sociological matters on which further information is needed have emerged from the studies so far undertaken. Perhaps the most important of these concerns the organisation of urban residential areas into planned neighbourhoods, and the distribution within these of the various communal services such as schools, clinics and the community centre. Under South African conditions, having regard to our heterogeneous population, it is not possible to apply directly the methods found satisfactory in the United States of America and in Europe, where homogeneous populations have to be catered for ; new patterns suitable to the conditions of South Africa need to be worked out, and it is proposed to give attention to this problem during the coming year.

General.

Servicing Codes of Practice Committees for the South African Bureau of Standards.

The Institute was represented on a large number of committees of the South African Bureau of Standards which were engaged on drawing up a set of model building regulations and codes of practice.

Publications and Reports.

Publications by the Institute.

Bulletin.

This publication, which will be issued at regular intervals, consists of abridged articles and reports on the results of investigations being conducted in the Institute and likely to be of general interest.

The first number was issued recently and contained the following articles :—

" Cracking in Buildings Associated with Expansive Mortar in the Brickwork," by N. Stutterheim.

" Heat Interchange Between a Roof and its Surroundings," by A. J. A. Roux.

" A Rational Theory of Small House Foundations," by D. J. Henkel.

" Foundation Bearing Tests and Their Interpretation," by J. E. Jennings.

Enquiries Dealt with by the National Building Research Institute.

Information Sheets.

A series of " Information Sheets," in the form of questions and answers, based on the enquiries received by the Institute, is being printed in a form suitable for inserting in a loose leaf folder and distributed as an enclosure by " The S.A. Architectural Record," " Public Works of South Africa " and " The S.A. Builder," who are bearing the cost of printing.

Publications by Members of Staff.

Building Research in South Africa, by J. E. Jennings, *In :* Proceedings of the Natal Institute of Engineers 242nd General Meeting, Durban, June, 1947.

Solar Radiation Survey . . . Preliminary Report on Daylight Illumination Intensities at Onderstepoort and Groot Drakenstein, by S. J. Richards.

Obtainable from the Meteorological Office, Pretoria.

Experiments on the Flow of Water-borne Ash in a 4 in. Diameter Pipe Line, by A. J. A. Roux (with W. J. Walker and S. F. Gimkey). *In :* Journal of the South African Institution of Engineers, vol. 46, No. 9, April, 1948, pp. 206-230.

Small House Foundation Design, by J. E. Jennings and D. J. Henkel. *In :* Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering, Rotterdam, June 21, vol. 30, 1948, pp. 151-153 (Sub-section VI d.).

Duplicated Reports.

The following duplicated reports were prepared in the Institute during the past year :—

" A Brief Review of Vermiculite and its Use in Building," by T. L. Webb and J. H. P. van Aardt.

" Memo on Use and Properties of Sand Lime Bricks," by T. L. Webb.

" Bibliography on Brickmaking," by T. L. Webb.

" Stress Distribution Under a Flexible Footing of Indefinite Length With Uniformly Distributed Load," by D. J. Henkel and B. Kantey.

NATIONAL CHEMICAL RESEARCH LABORATORY.

Director : W. S. Rapson, PH.D., F.R.I.C., F.R.S.S.A.

Alterations to the first section of the laboratory's accommodation were completed in January, 1948, and staff appointments have been made gradually since then as laboratory apparatus and chemicals have become available.

A considerable amount of time and effort has been devoted to fitting up new equipment and apparatus, but work on a number of projects is now well under way and the course of future developments has become clearer.

Physical and Inorganic Chemistry Division.

Clays and Related Materials.

Studies of South African clays of industrial importance by modern techniques are under way. Base exchange characteristics are being followed by electro-dialysis, titration curves and chemical analysis. The effect of base exchange in modifying technical properties will also be considered, *e.g.*, in a proposed search for South African materials to replace imported bentonite. X-ray diagrams and differential thermal analysis are being used to determine the mineralogical constitution of clays and also of changes occurring during firing. An officer has been attached to the Electronics section of the National Physical Laboratory to build an amplifier to be used in making an automatic record of differential temperatures.

Chromium Chemistry.

Considerable attention is being devoted to the chemistry of chromium because of the tremendous deposits of chrome ore which occur in the Transvaal and Southern Rhodesia. The preparation, properties and analytical applications of chromous salts are under examination and work has been initiated on the electrolytic recovery of chromium via chromous salt solutions.

Particle Size Measurements.

By using an equation making proper allowance for molecular flow, it has been shown that a simple measurement of gas permeability gives a quick and accurate value for the surface area of particles down to at least 0.02 μ An apparatus for routine measurement of paint pigments was made and tested for use by the Bureau of Standards.

Gas Adsorption.

An apparatus to measure surface areas by gas adsorption was fitted up and employed on the same samples as the permeability method to provide a check on the latter. Work on gas adsorption is now being extended, however, to its application to pore size and pore structure, with special reference to the fine structure of coals.

In addition to the above activities two officers have been receiving specialised training overseas during the year—the one in corrosion work at the University of Cambridge, and the other in the techniques of colloid chemistry at the Royal Institution. The former will be returning to Pretoria in October to initiate the development of a section on corrosion and surface coatings.

Microbiological Chemistry Division.

Culture Collection of Micro-organisms.

At present there are 239 separate species in the collection, of which 69 are bacterial cultures, 15 yeasts, 8 Actinomycetes, and the rest micro-fungi. In connection with the scheme for the creation of a Commonwealth Culture Collection of Mirco-organisms, the Senior Research Officer in charge of this section has consulted with other leading Union bacteriologists, and circularised all institutes, departments and individuals who might be maintaining culture collections in the Union. As a result many organisations and individuals have sent lists of authenticated micro-organisms maintained in their laboratories.

The Citric Acid Fermentation of Molasses.

In view of the possibility which exists of manufacturing citric acid economically in the Union, the citric acid fermentation of cane molasses has been studied in some detail during the past year. It has been found that despite adverse experience with cane molasses overseas, citric acid can be produced from both mill and refinery molasses in reasonable yields under the appropriate conditions, and the extension of this work on a larger scale is contemplated.

Various aspects of this fermentation reaction have also been under investigation, such as the effects of salts on oxalic acid production, the use of deep culture media and the relationships between morphology of *A. Niger* and its citric acid producing ability. In connection with this project a method of citric acid determination has also been worked out.

The Micro-organisms of Rock Salts and Brines from the Cape Cross Area of South West Africa.

Preliminary studies of the above halophilic micro-organisms have been carried out. They have been propagated on sterile salt fish, but determination of their exact nature must await the discovery of a simpler cell-free medium in which they will grow.

The Fermentation of Glucosamine by Moulds.

In view of the potential availability of glucosamine from chitin from crawfish waste, preliminary studies of the growth of moulds on solutions of glucosamine hydrochloride have been carried out and the most profitable lines for future studies to follow have been defined.

The Microbiological Assay of Amino Acids and Vitamins.

The microbiological assay of tryptophane and of other amino acids in food yeast has been attempted and these studies are still in progress.

Investigations Under Contract.

Investigations under contract during the year have included studies of the deterioration of grenadilla juice in storage, a preliminary study of the deterioration of timber in cooling towers, and an investigation relating to gelatin production.

Organic Chemistry Division.

Owing to lack of chemicals it has not been possible to develop this section at all rapidly during the current year.

Coal Tar Investigations.

The basic fraction from the high temperature tar as obtained at the works of the S.A. Iron and Steel Corporation is at present under investigation. In this connection the opportunity is being taken to train staff in the building and operation of precise fractional distillation assemblies.

Various extensions of this work are in progress. Thus the oxidation of quinolines is being explored under various conditions, and the separation of methyl quinolines by various techniques is being undertaken.

Wool Wax.

Preliminary studies in this field have been concerned with the elaboration of analytical methods. A much improved technique for the estimation of unsaponifiable components in wool wax and other waxes has been evolved, and methods for estimation of wool wax in wool scouring liquors are being explored and assessed.

Acetylenes.

An officer has been working on the reactions of acetylenic compounds at the Imperial College of Science and Technology during the past year and is returning to start work in this field in Pretoria in the near future.

Forest Products.

The general outlines of the structure of a phenolic component (chlorophorol) of the timber of *Chlorophora excelsa* have been determined. This timber has attracted attention because of its resistance to insect attack, its occasional irritant properties and the difficulty with which varnishes dry when applied to it.

Process Development Division.

Up to the present no accommodation has been available in Pretoria for the development of this section of the laboratory. A senior appointment to the staff of this section has now been made and accommodation provided. The officer concerned will be taking up duty before the end of the year.

Fats, Waxes and Proteins Unit (University of Cape Town).

This unit has continued its investigations of a variety of marine products.

Crawfish Waste.

A number of samples of hepatopancreas and gonad oils have been isolated and examined. In addition crawfish wastes and crawfish meals have been studied as potential sources of chitin and a method developed for the quantitative determination of chitin and chitin nitrogen in crude chitin preparations and in crawfish meals.

Determination of Vitamin A in Liver Oils.

Corrections for irrelevant absorption which reduces the accuracy of vitamin A determinations by the spectrophotometric method, have been determined on a large number of samples of commercial fish liver oils and the results have been summarised for publication.

Pilchard Investigations.

Studies of the seasonal changes in the yields and compositions of pilchard oils have been continued. In addition full component acid analyses of pilchard oils from fish in fat, medium and thin condition have been carried out.

During the present year, the commercial production of pilchard oil and meal has developed on a considerable scale and fundamental studies of the course of the heat bodying of pilchard oils have been begun with the

aid of such techniques as solvent extraction, chromatography and short path distillation.

Similar studies of other commercially important oils such as those from the maasbanker and the mackerel are planned and the necessary preparatory work is being done. It is expected that these studies will materially assist the development of the use of these marine oils in paint and varnish compositions.

Nutrition Unit (S.A. Institute for Medical Research).

The unit has gradually widened the scope of its activities.

(*a*) Metabolism Studies on Humans—European Adults.

During the current year investigations have been completed on the absorption of fat and on the digestibility of crude fibre during the consumption of diets rich in whole grain and white breads. In addition observations on the water balance of healthy European adults have been carried out. These observations are almost the longest on record and will provide a basis for comparison of analogous data from Bantu subjects.

(*b*) Metabolism Studies on Humans—Bantu Subjects.

Mineral salt metabolism studies of Bantu subjects while consuming their indigenous diet have revealed a high efficiency in the utilisation of calcium even in the presence of large amounts of phytate phosphorous. Fat metabolism studies have also been carried out under similar conditions and have revealed an " absorption " of fat which for European subjects would be so low as normally to indicate a pathological condition. Water balance studies and studies of the digestibility of crude fibre by Bantu subjects are also in progress.

(*c*) Nutritional Consideration in Sulphonamide Therapy and

(*d*) The Dietetic Theory of the Causation of Appendicitis.

Arising out of the metabolism studies described under (*a*) and (*b*), papers on the above two topics have been submitted for publication during the current year.

Water Treatment Unit (University of the Witwatersrand).

The Principal Research Officer in charge of this unit has paid a brief visit to Great Britain during the current year in order to make contact with recent developments. Considerable time has been spent in assembling equipment and fitting out new accommodation, both at the Klipspruit Laboratories of the Johannesburg City Council and at the University of the Witwatersrand.

Methane Fermentation Process.

A study of the purification of effluents from fermentation processes by anaerobic (methane) fermentation processes has been carried out, and the possible application of such a process to the purification of effluents from a number of industries is being explored.

Efficiency of Sand Filters.

The efficiency of sand filters in the final purification of sewage effluents has been studied.

Investigations Under Contract.

Two investigations under contract have been carried out during the current year.

Publications.

" Some Problems Associated with the Use of Marine Oils in Industry." H. M. Schwartz. S.A. Ind. Chem., 1948, 2, 197.

" S.A. Fish Products, Part XXV. The Recovery of Unsaponifiable Matter from Marine Oils by the Society of Public Analysts Method." M. L. Karnovsky and W. S. Rapson. J. Soc. Chem. Ind. 1947, 66, 95.

" S.A. Fish Products, Part XXVI. Application of the Fitelson Method of ' Squalene ' Determination to Some Marine Oils." M. L. Karnovsky and W. S. Rapson. J. Soc. Chem. Ind. 1947, 66, 124.

" S.A. Fish Products, Part XXVII. The Composition of the Liver Oils of the Basking Shark (*Cetorhinus maximus*, Gunner) and the Spiny Shark (*Echinorhinus spinosus*, Gmelin)." M. L. Karnovsky, W. S. Rapson, H. M. Schwartz, M. Black and N. J. van Rensburg. J. Soc. Chem. Ind. 1948, 67, 104.

" S.A. Fish Products, Part XXVIII. The Composition of the Liver Oil of the Seven Gilled Shark (*Heptranchias pectorosus*, Garman)." M. L. Karnovsky, W. S. Rapson and H. M. Schwartz. J. Soc. Chem. Ind. 1948, 67, 144.

" The Transesterification and Chromatographic Treatment of Fish Liver Oils as a Means of Concentrating Vitamin A." M. L. Karnovsky, W. S. Rapson and N. J. van Rensburg. J. Amer. Oil Chem. Soc., 1948, 25, 36.

" Synthesis of Cyclic Conjugated Polyenes." D. H. S. Horn, J. R. Nunn, W. S. Rapson. Nature 1947, 160, 829.

" Nutritional Considerations in Sulphonamide Therapy." A. R. P. Walker. S.A. Med. J., 1948, 22, 326.

" The Effect of Bread Rich in Phytate Phosphorous on the Metabolism of Certain Mineral Salts with Special Reference to Calcium."

A. R. P. Walker, F. W. Fox, J. T. Irving. Biochem. J., 1948, 42, 452.

" Molecular Distillation and Sublimation." P. C. Carman. Trans. Farad. Soc., 1948, 44, 529.

" Some Physical Aspects of Water Flow in Porous Media." P. C. Carman. Contribution to a discussion on " Interaction of Water and Porous Materials " held by the Faraday Society on 31st March, 1948.

" Surface Area Measurements of Fine Powders, Using Modified Permeability Equations." P. C. Carman and J. C. Arnell. Canadian J. Research, 1948, 26A, 128 (Joint publication from National Chemical Research Laboratory, Pretoria, South Africa and Defence Research Chemical Laboratories, Ottawa, Canada).

" Evolution of Hydrogen from Ferrous Hydroxide." U. R. Evans and J. N. Wanklyn. Nature 1948, 162, 27.

" The Relation Between Corrected and Observed E Values of Some S.A. Marine Animal Oils." H. M. Schwartz. S.A. Ind. Chem., 1948, 2, 197.

" S.A. Fish Products, Part XXIX. The Composition of the Liver Oil of the Soupfin Shark (*Galeorhinus canis* Rond.)." M. L. Karnovsky, A. W. Lategan, W. S. Rapson and H. M. Schwartz. J. Soc. Chem. Ind., 1948, 67, 193.

" Secondary Mechanical Filtration of Sewage Effluent." H. Wilson, Inst. Sew. Purif., Proc. Ann. Summer Conference, 1948.

" The Nutritional Implications of Low Fat Content Diets." A. R. P. Walker, Lancet, 1948, ii, 476.

NATIONAL INSTITUTE FOR PERSONNEL RESEARCH.

Director : S. Biesheuvel, M.B.E., M.A., PH.D.

General.

Although the shortage of male staff and of experienced research workers set a limit to both the type and volume of new work which could be undertaken, the work of the Institute has expanded considerably. The number of enquiries received and the increase in work undertaken both for industry (under contract) and for Government Departments, shows that interest in personnel research has been well maintained.

Experience of personnel research in industry has led to some general conclusions which have a bearing on the formulation of policy for the future :—

(*a*) For a number of reasons, personnel research for industry is rather costly. The request is nearly always for selection or classification tests.

At the best of times, test construction is a long term affair, as it takes time for follow-up results to come in. As the experimental tests have to be applied to workers already on the job, a good deal of time is lost for which employers have to pay. This and the inevitable dislocation which it causes in the production process may amount, in the case of individual employers, to a quite considerable sum.

(*b*) It is preferable to carry out personnel research work for individual firms, rather than for representative bodies. In practice, it has been found that unless a firm is wholeheartedly identified with a research project, understands its purpose and is able to take a long view, the degree of co-operation which is essential both to cope effectively with the problem and to keep the costs within reasonable bounds, is not always forthcoming.

It is our experience that even a specific job such as the construction of a battery of selection tests, cannot be performed without incursions into the operational field, which may involve changes in organisation. The keen sponsor will accept this as part of the job, whereas the firm which has a less immediate appreciation of the value and purpose of the work tends to become unco-operative when it is realised what the project involves.

(*c*) Experience has shown that aptitude tests can only be profitably undertaken :—

When candidates are being selected for a well organised training scheme, from which the necessary criteria for test validation can be obtained ;

When the operational situation is such that the introduction of classification tests is feasible ;

When the production problem which the employers intend to meet by means of aptitude tests can be solved by this means ;

When facilities for the routine application of aptitude tests are or can be made available.

We have come to the conclusion that aptitude testing represents a fairly advanced stage of personnel research, to be undertaken only after preliminary studies have revealed its practicability.

(*d*) Personnel research deals with people and for most projects these people must be subjected to experiment. Without bodies to work on, therefore, personnel research cannot progress. Such experimental material is difficult to obtain in industrial work, as it is costly to take people away from their desks or machines. Consequently, the minimum amount of testing may be done, consistent with the completion of a particular re-

search project. This means that little opportunity may present itself for the development of new techniques or for the study of phenomena which enter into personnel research in a general way, without being relevant to the specific project under investigation.

Attempts to collect data for statistical analysis by making tests available to people working in the field of personnel research on their own account, have not been very successful. Only a small proportion of the material is ever returned. The fact that the N.I.P.R. is losing control over its tests is causing concern, and may compel a discontinuation of this policy except in such cases where security is guaranteed and there is certainty that results will be returned.

(*e*) The need for laboratory investigation into certain problems encountered in field research projects has become urgent. The diversion of some of our effort to laboratory, clinical or theoretical studies is desirable, and provision has been made for expansion in this field.

Progress Reports on Current Research Projects.

Defence Research Project.

This project systematically covers personnel selection and classification for the U.D.F. All entrants to the U.D.F. are now screened by means of a series of tests which, though not yet finally validated, appear to be working satisfactorily. Classification tests are also given at the conclusion of basic military training to determine for which unit, or for which further training course, the trainee is most suitable. Job analyses for various units are necessary to do this job effectively. These are being carried out in a systematic manner. A number of test batteries for the selection of artisan-trainees, clerks, signallers, gunners, photographers, aircrew, etc. are already in operation. Follow-up results on basic trainees and gunner trainees are very satisfactory. As numbers are small on the whole and training courses long, most of these projects will run for some years before final test validation can be attempted.

More elaborate tests for the selection of officer cadets and instructors were given this year, on which follow-up reports will not be available for some time. A member of the N.I.P.R. staff sits as adviser on the boards which have the final responsibility for selection. For the first time this year, the Women's Defence Corps was included in the project, selection of both officers and other ranks being involved. Selection for the A.C.F. was also extended to include trainees for technical duties. The fact that the scope of personnel research in the U.D.F. has been steadily extended is adequate proof that results of value are being produced.

The Selection of Apprentices for the G.P.O. and Other Government Departments.

There are no additional data to report on these projects. The validity of the batteries for mechanicians and electricians having been established in last year's report, there is no point in further statistical treatment until a sufficient number of candidates has completed the four year training course. A preliminary validation of the screening test can be attempted next year, when three groups will have been tested and first year results will be available on two of these.

A Study of the Factors Determining Fatigue and Output Amon peratives in the Clothing Industry.

Field work on this project, undertaken on behalf of the Mayfair Clothing Manufacturing Co., has now been completed. Satisfactory results were obtained for the study of absenteeism which it involved. A number of the determinants of absenteeism has been isolated, the findings being in keeping with overseas results. A technique has also been developed to diagnose the absentee-prone, which marks an advance on the methods which have hitherto been in use. To this study, the statistical section made a significant contribution, which, when further experience has been gained of its use, will merit separate publication. The establishment of daily, weekly, monthly and seasonal output curves was handicapped throughout the year by shortage of material as a result of which operatives could not be kept for sufficiently long periods on the same tasks. Reliable curves could therefore only be calculated for daily periods. Individual variations from these daily output curves are being studied.

Construction of Selection and Classification Tests for Operatives in the Clothing Industry.

By the end of 1947, the preliminary standardisation of the classification battery had been completed. Very promising results were obtained. The tests proved valid both for European and for Non-European operatives. These results were obtained from operatives already employed in the Clothing Industry. Before the tests can be looked upon as valid, it is necessary to show that they correctly forecast the occupational ceiling of new starts, without any experience of the clothing industry.

We are convinced that we have developed a very useful testing procedure, which only requires final corroboration and standardisation before it can be put into operation, and which would probably be found useful by overseas manufacturers. Whenever an opportunity presents itself to test new starts with some assurance that follow-up results will be forthcoming,

this will be done. Like the Defence and G.P.O. projects, this one therefore also becomes a long term investigation.

The Construction of Selection and Classification Tests for Native Mine-workers and Boss Boys.

The development of these tests continues.

Standardisation of the Wechsler-Bellevue Test.

This test was first used to determine the level of intelligence and achievement of ex-volunteers in sheltered employment. After the completion of this task, an intensive study of the test itself, starting with the standardisation of the test for use in South Africa, was taken in hand. This has not yet been completed, as the construction of an Afrikaans version has proved a major undertaking. To verify the diagnostic capacity of the test, it has been applied to inmates of the Rand Aid's institutions for alcoholics and to the patients at the Rand Epileptic Employment Association's farm. Further clinical and normal groups will be tested during this and the following years. No other clinical researches were attempted during the past 12 months, nor could any laboratory studies be started as no suitable space was available.

The Construction of Artisan Selection Tests for Use on the Mines.

All artisan apprentices employed on certain properties on the Rand were tested :—

(i) To give some basis for the selection and classification of new intakes ;

(ii) To determine the degree of agreement with efficiency assessments made by the supervisors of the apprentices.

Personnel Research for the Iron and Steel Industry.

This project was started at the beginning of August.

Miscellaneous Test Standardisations.

The standardisation o Test AG, a mental alertness test used in all our artisan batteries, as well as the P.F.T.C. Screening Test and Clerical Selection Tests is almost complete. Alternate forms were found to be of equivalent difficulty, though a significant difference was found between Afrikaans and English forms, which is being investigated further.

A bilingual language achievement test, for use in clerical selection, has been constructed and is now being subjected to item analysis. The Incomplete Sentences Test, a test of the projection type used in the majority of our selection batteries, is being studied to determine its value as a predictor of occupational or personal maladjustment.

Reliability studies of the Progressive Matrices Tests are also under way, but have not yet been completed.

Studies of the Value of Social Interaction Tests and Practical Projects for Personnel Selection.

These devices, used effectively by the War Office and Civil Service Selection Boards, are still being tried out whenever an opportunity presents itself. Candidates for appointments in the C.S.I.R., at the Scientific Assistant, Research Officer or Senior Clerical level, are being tested on this basis, and should in due course provide excellent follow-up material.

Statistical Research Projects.

This section has dealt with a number of questions arising from field research projects. First of all, statistical quality control methods were applied to the clothing industry tests, to maintain constancy of test conditions. Faults in apparatus which might otherwise not have been discovered were brought to the notice of testers at an early stage. These methods were next applied to the mine research tests and thereafter to the screening tests used for the U.D.F. The application of these methods marks an important advance in the control of testing techniques.

The section also established statistical routines for test validation, which will serve as a pattern for all field research projects. Fundamental research was carried out on the statistics applicable to absentee rates, and a new method of diagnosing absentee-proneness was evolved.

The section dealt with a number of industrial problems of a purely statistical kind, referred to it by the Liaison Division and by the Bureau of Standards. For the latter, strict statistical methods of sampling were set out, and sampling specifications were worked out for a number of commodities. It is likely that the section will be frequently consulted for similar problems in the future. In addition, the section has been at work on a number of theoretical research projects :—

(i) The Method of Frequency Moments, which will facilitate the fitting of data on growth phenomena ;

(ii) Estimation of the Mean by the Maximum Likelihood Method, which substitutes the Maximum Likelihood Estimator for the Arithmetic Mean in extremely skew populations ;

(iii) Life Characteristics of Industrial Property, a theoretical study arising from the research project on the life of cigarette tapes, which was referred to the Statistical Section by the Liaison Division. Apart from their considerable theoretical value, these studies will have important applications to industrial problems.

Workshop.

The N.I.P.R. Departmental Workshop has done outstanding work in designing new equipment and constructing prototypes. As apparatus has to be moved about for field research projects, portability and compactness are important factors.

Publications and Reports.

Reports and Memoranda.

The following reports have been issued on research projects for the information of those for whom the work was undertaken :—

A further study of the transfer rate of Native underground labour on some Witwatersrand Gold Mines, and its effect on lashing efficiency, by S. Biesheuvel and W. Hudson. Second Interim Report issued to the Transvaal Chamber of Mines (Confidential).

Selection and Classification Tests for Operatives in the Clothing Industry, by S. Biesheuvel. Progress Report issued to the Transvaal Clothing Manufacturers' Association (Confidential).

Report on a Survey of the Abilities of Ex-Volunteers in Sheltered Employment, by Miss M. J. Goldstein. Issued to the Directorate of Demobilisation.

Report on the Intelligence Level and Personality of Patients at Northlea Institution for Alcoholics, by Miss E. du Toit. Issued to the Rand Aid Association.

Report on the Intelligence Level and Personality of Patients at Rand Epileptic Employment Association's Flower Farm, by Miss M. J. Goldstein. Issued to the Rand Epileptic Employment Association.

Reports on the Intelligence Level of Personnel in the 11th Armoured Brigade, by R. V. Sutton. Issued to the Adjutant General.

Report on the Aptitude of D. grade applicants for admission to the P.F.T.C. and on the desirability of establishing a rehabilitative training course for them, by S. Biesheuvel. Issued to the D.C.G.S.

Report on a Study of the Duties of Technical Instructors at 68 Air School, by S. Biesheuvel and D. J. Vorster. Issued to the Commanding Officer, 68 Air School.

Report on the Efficiency of Bradley Wash Fountains, by S. Biesheuvel and J. H. Deacon.

A Study of Absenteeism and Output among Operatives in a Clothing Factory, by Miss M. E. Fleminger.

The Mathematical Analysis of Absentee Rates, by H. S. Sichel. Issued to the Mining and Industrial Department of the S.A. Red Cross Society.

Report on Factors Affecting the Life of Cigarette Machine Tapes, by H. S. Sichel. Issued to the Liaison Division, C.S.I.R.

Memorandum on Sampling Clauses to be Applied to the Sampling of Navy Blue Serge, by H. S. Sichel. Issued to the S.A. Bureau of Standards.

Memorandum on a Sampling Plan for Navy Blue Serge, based on Mathematical Statistics, by H. S. Sichel. Issued to the S.A. Bureau of Standards.

An Investigation into Sampling Specifications of Black Nuts and Bolts, by H. S. Sichel. Issued to the S.A. Bureau of Standards.

In addition to the above, numerous reports were written on candidates tested for a variety of occupations, and dealt with on a consultative basis. A wide variety of minor enquiries was also dealt with.

Published Papers.

The following is a list of papers which have appeared in print or which have been read, and will be printed in due course :—

S. Biesheuvel :—

" The Psychologist and Selection "—" The Leech," October, 1947.

" Aptitude Testing of Military Personnel "—South African Air Force Journal, vol. 1, No. 1, 1948.

H. S. Sichel :—

" An Experimental and Theoretical Investigation of Bias Error in Mine Sampling with Special Reference to Narrow Gold Reefs ; Author's Reply to Discussion and Contributed Remarks "—Bulletin No. 502, Institution of Mining and Metallurgy, London, September, 1948.

" Fitting Growth and Frequency Curves by the Method of Frequency Moments "—Journal of the Royal Statistical Society, London, vol. CX, Part IV, 1947.

" The Application of Statistical Quality Control to Aptitude Testing "—Read to the S.A. Association for the Advancement of Science, Lourenço Marques, June, 1948.

" The Practical Application of Statistical Quality Control "—S.A. Engineer and Foundryman, October, 1948.

NATIONAL PHYSICAL LABORATORY.

Director : S. M. Naudé, M.SC., PH.D., F.R.S.S.A.

General.

Most of the alterations to laboratory accommodation were completed during the year and it was possible to shift work, previously carried out

under primitive conditions, to specially prepared rooms. Apparatus, in some cases ordered over two years ago, has been arriving steadily and a good selection of high quality equipment has already been installed. Much time has been taken up in testing new equipment and putting it into commission, but with adequate apparatus becoming available in most sections, the year has been marked by a gradual change from continual improvisation to planned work.

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.

All 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.

Staff.

The officers in charge of the Nuclear Physics and Acoustics Sections are at present working overseas, the former at the University of Birmingham and the latter in the Acoustics School at Harvard University.

The appointment of a most competent glass blower from Holland has made possible research of a kind which formerly was hardly contemplated in South Africa.

Programme of Work.

Electrotechnology and Electronics Division.

Electrical Standards Section.

Standard of Voltage for South Africa.

A thermostatically controlled box has been built to house 24 reference standards of voltage and maintain them at a constant temperature with variations of less than ·01°C. for room temperature fluctuations of ±1°C.

Pointer Instrument Testing Station.

The transfer instruments (to be calibrated on d.c. and used on a.c.) have been received. They have been mounted, together with their scale, in a rigid framework so that calibration can be retained if the instruments are moved to another site.

Testing and Certification of Special Instruments.

Some work of this nature has been done for the South African Bureau of Standards, as well as for other organisations.

Measurement of Electrical Properties of Materials.

A small amount of work has been done (*e.g.*, measurements on conductivity of concrete and asbestos cement pipes ; measurement of surface conductivity of photographic film under varying conditions of humidity) but all the equipment required for carrying on a full programme in this field has not yet become available.

Electronics Section.

Borehole Logging.

American instruments for "logging" temperature and radioactivity in boreholes could not be adapted for similar purposes in South Africa. These instruments are made for boreholes 5 in. in diameter and are very expensive, the initial costs being offset by the rapidity with which large numbers of observations can be made (one American oil company logging as many as 25,000 boreholes in one year). In South Africa, boreholes sunk for prospecting purposes are only 2 in. in diameter, and only about 12 boreholes can be expected to reach completion in any one year. Thus for South African conditions a cheap instrument was required, even if highly skilled personnel were needed to operate it.

One of the most expensive items in the available equipment was the heavy shielded cable (weighing about 350 lbs. per 1,000 feet or nearly one ton per 6,000 feet) and the special power operated winch for handling it. This was eliminated by using a single, light cable (steel wire 0·036 in. in diameter covered by 0·036 in. of tough rubber insulation) and taking the return current through earth. For this system it was necessary to design self-contained instruments capable of transmitting a signal up a single cable in such a way that the information would be accurately received at the surface, regardless of fluctuations in signal strength, and which could be fitted into a brass tube with an internal diameter of only 1 1/16 in.

These requirements were met by a temperature measuring instrument consisting of a valve-maintained "vibrating string" (steel wire). The tension on the steel wire, and thus the frequency of the oscillator, is controlled by the temperature of the instrument ; increased sensitivity is achieved by using brass with a high coefficient of expansion in the construction of the chassis and invar steel for the vibrating string. The frequency of the signal transmitted up the cable thus provides a measure of the temperature

in the borehole at the level of the instrument, and the accuracy is not affected by fluctuations in signal strength.

The radioactivity measuring instrument transmits (up the same single cable) a continuous signal of 16 Kc/s which is modulated by the impulses received from a Geiger-Muller tube ; by de-modulation at the surface the original impulses are used to actuate a conventional type of counter. The Geiger-Muller tube is maintained at a high tension voltage of 800 volts with a current drain of less than 3 milliamperes from three small 22½ volt hearing aid batteries.

The instrument has been developed to include an integrating circuit at the surface, giving counts per minute directly on a six inch scale. An alternative recorder, coupled to the winding gear, gives an automatic record of radioactivity plotted against depth below surface.

Electronic Sine-wave Generator.

The first model of this apparatus, for supplying voltages of power frequency with a very pure wave form and constant amplitude for testing pointer instruments, has been completed and is undergoing tests.

Saturated Diode Transfer Standard.

Work on the development of a diode for comparing an a.c. current or voltage with the equivalent d.c. value, is still in progress.

Acoustics Section.

Electrical Manometer.

Preliminary experiments were carried out on the design and construction of a heart pressure meter and plathysmograph, consisting of a diaphragm condenser whose capacity change, due to pressure on the diaphragm, is measured electrically.

Micromanometer.

The principles used in the above instrument were further developed to produce a micromanometer for the measurement of low air velocities in conjunction with a Pitot tube. This work was done at the request of the Building Research Institute.

Temperature Regulator.

An electronic " bridge " circuit was designed and built to maintain the temperatures of the " hot plate " and surrounding " guard ring " of a conductivity apparatus for poor conductors (building material) as nearly equal as possible. It was found possible to keep the temperatures within 0·25°C. of one another.

Elastic Properties of Wool (In conjunction with the Wool Research Laboratory, Onderstepoort).

A method has been developed for rapidly determining the elastic properties of wool and other textile fibres, under dynamic conditions involving no permanent " set."

Two types of measurement are made in a sound field. In the first a disc suspended from a fibre is allowed to make torsional oscillations and the period and rate of decay of these oscillations is observed. In the second a short length of fibre is made to vibrate flexurally under resonant conditions and the sharpness of this resonance is observed. From either method the corresponding elasticity and internal friction can be deduced.

Advice Given to Deaf and Dumb School, Worcester.

Acoustical tests were made in several rooms and halls of this school. In addition experiments conducted in the National Physical Laboratory on the absorption coefficients of various materials led to the satisfactory design of sound-proof rooms for the school. It was found that a mixture of wool and vermiculite was the best compromise between low price and high absorption coefficient for sound absorbing material.

Raleigh Disc Tube (for absolute calibration of microphones).

This is the second instrument of this type to be built in the C.S.I.R. shops. Its dimensions are much larger than those of the previous one, enabling the low frequency range of measurements to be greatly extended.

Physics Division.

Nuclear Physics Section.

Geiger-Muller Counter Construction.

Several thin wall tubes were constructed for users requiring them for beta ray assay purposes.

Tubes were constructed to fit into the radioactivity borehole logging apparatus which was designed by the Electronics Section.

Experiments were carried out with different cathodes. It was found that tubes with an evaporated gold cathode had the best properties.

The Mechanism of Counters.

Certain aspects of the discharge mechanism of self-quenching Geiger-Muller counters were studied. It was found that accepted theory has certain defects. Alcohol and argon was found to be a better filling for counters than the other gas fillings which are sometimes used.

Eight-fold Instrument for Measuring Radioactivity.

A suitable lead screen for eight Geiger-Muller counters of a beta counting unit required for testing eight radioactive samples simultaneously was designed. This was constructed in the C.S.I.R. workshops and the screen and the eight counting units were erected in the Government laboratory which ordered them.

Anti-coincidence Apparatus for the Determination of Radioactivity.

An apparatus has been developed for the determination of very low concentrations of radioactive substances. In this apparatus a central counting tube is surrounded by an annular container filled with the radioactive material and is then surrounded by about 20 other gamma-ray sensitive tubes all connected in parallel. These tubes and the central tube are connected to an electronic circuit which will record the impluse from the central tube only if it is unaccompanied by an impluse from one of the outer tubes. Thus a beta ray from the radioactive material is recorded because it passes through the central tube only ; a cosmic ray, however, passing through one of the outer tubes and the central tube, produces a coincidence which is not recorded. With this apparatus the background is reduced by fifty per cent. ; it is sixty times more sensitive than the apparatus usually employed and measurements of radioactivity can be made about twice as quickly as before.

Biophysics Section.

Protection and X-ray Dosimetry.

Some time was spent on planning and setting up the 200 K.V. X-ray unit. The power supply had been intended for use in a Villard circuit ; as the experimental realisation of the roentgen demands constant potential, considerable rearrangement and adaptation was necessary. The unit is now on the point of being put into operation for use in calibrating X-ray dosimeters and in radio-biological research, including the use of X-rays in vaccine making. A start has been made with a film badge service. Dental X-ray films have been worn by members of a government laboratory and some members of the N.P.L. staff. The films were processed and compared with standards.

Two " radiation meters " have been standardised, one for the W.N.L.A. and one for the Bureau of Standards. One or two surveys were carried out with a radiation meter.

Radio-elements.

Routine Work in Connection with Measurements.

Plateaux and backgrounds of Geiger counters were checked. Two " quench circuit probe units " were constructed to flatten the plateaux of

the G.E.C. counters. Attempts were made to measure the efficiency of a thin windowed counter and to compare the results of absolute measurements with P^{32} with the Harwell assays on P^{32} sent to us. Measurements were made of various statistical errors involved in our counting methods. A high pressure ionisation chamber was made by the workshop and a thin walled ionisation chamber by the section, in preparation for ionisation measurements with small quantities of radium and other gamma-rayers.

Biological Work with P^{32}.

Research was undertaken in collaboration with Dr. A. J. Clement, of the Dental Hospital, Johannesburg, on the rate of secretion of P^{32} in the saliva of volunteers who had had P^{32} injected into the bloodstream, or who had taken it in organic form as a meal.

The route of material injected into developing hen's eggs was followed by means of P^{32}.

An attempt was made to discover whether up to 25 micro-curies of P^{32} injected into fertile eggs would affect the development of the embryo. No abnormalities were discovered.

An attempt was made to enhance the growth of heartwater virus in eggs by exposing the embryos to the radiation from P^{32}. No effect was found.

Chick embryos containing P^{32} were used to develop and improve autoradiograph technique.

On various occasions P^{32} was put into suitable form for injection of a patient who is receiving P^{32} therapy for lymphatic leukaemia.

Radiobiological Research.

Experiments have been made on the effect of H_2O_2 on bacteriophage in dilute suspension, as this has a bearing on the " indirect effect " of ionising radiation on living cells. The results were very informative and showed that some of the current views on radiobiological action on such organisms as enzymes and bacteriophage may be incorrect. Radiation experiments have also been made using beta-rays from P^{32}, the only source of ionising radiation currently available in the laboratory.

Heat Section.

Establishment and Maintenance of International Temperature Scale.

Uniform temperature baths, using acetone, ice, water, steam, oil and salt were set up for use over various temperature ranges in calibration of temperature measuring instruments according to the International Temperature Scale. Use has been made of these intercomparison baths in calibrating thermometers and thermocouples, chiefly for other divisions of the C.S.I.R.

Determination of Thermal Conductivity of Building Materials.

The design and construction of an apparatus for the measurement of thermal conductivity of materials in the form of slabs one foot square, was undertaken jointly with the National Building Research Institute. The apparatus has been used to test vermiculite for an industrial concern.

Determination of Emissivity of Building Materials at Moderate Temperatures.

At the request of the National Building Research Institute an apparatus for this purpose has been constructed.

Determination of Specific Heat of Building Materials.

An adiabatic calorimeter has been made and used for measurement of the specific heat of materials used in the construction of the N.B.R.I. Test Room.

Determination of Thermal Conductivity of Rocks.

An apparatus for this purpose has been built and is being tested. Another apparatus of similar design was tested on behalf of the Chamber of Mines Research Laboratory.

Artificial Stimulation of Precipitation from Clouds (ASPIC).

For this project accurate measurements of air temperature were required. An electronically operated Thermistor bridge, with the Thermistor temperature sensitive element exposed in a radiation shield attached to the astrodome, was designed and constructed, and operated on all flights. Significant variations in temperature were recorded during horizontal flight at high altitudes and this phenomenon is being investigated further.

All arrangements for crushing, transporting and storing dry-ice used on these flights were made by the laboratory. A machine for releasing dry-ice at controlled rates was designed and constructed and operated on all flights.

Miscellaneous Tests for Industrial Concerns.

The thermal conductivity at high temperatures of two types of firebrick was measured.

Tests were made of the lowering of temperature produced inside two coolers of the evaporation type.

Optics Section.

Much time was taken in planning and equipping this section (started in February, 1948) and the Optics Workshop. Difficulty has been experienced in obtaining simple basic elements such as lenses, optical glass, collimators, etc. With the available instruments and with equipment which has been built, the following items of interest have been undertaken :—

An interferometer, completely constructed in our Workshop, was used to test the validity of a method used at Onderstepoort to determine the surface quality of microscope slides. It was found that the Onderstepoort method was unsatisfactory and an alternate method, based on interference of light, was suggested and is now being used with satisfactory results.

Interferometric work was done to search for changes in flatness of a steel disc over a period of months for the Building Research Institute.

At the request of the Civil Aviation Board apparatus is being designed and constructed for projecting light-beams, to represent bearings from D/F stations on a plotting board.

Work has been started on the design and construction of a direct reading transmissometer-reflectometer and focussing bench, as well as a heavy duty electromagnet for the mass spectrometer.

A new pressure plate was fitted to a Williamson aerial survey camera of the Trigonometrical Survey. A method of making the adjustments was devised so that the principal point would be within a circle having a radius of 0·01 mm., whose centre coincided with a small cross marked on the pressure plate.

Spectrochemistry Section.

In March, 1948, this section moved into new quarters. The organisation of the department, the installation of special electrical fittings and connections, and the adjustment of newly acquired instruments took up a lot of the time of the staff.

Various samples were analysed spectrochemically for industry, the Bureau of Standards and Onderstepoort.

Research on the spectrochemical determination of Uranium Ores is almost completed.

A start has been made with the spectrochemical determination of trace elements in battery lead and copper tubing.

X-ray Section.

The X-ray Section was started in March, 1948, with the installation of a Geiger counter X-ray spectrometer. After calibration, using known standard substances, the instrument has been put to the following uses :—

An extensive survey of particle size determinaton has been undertaken. For this purpose MgO, obtained by decomposing $MgCO^3$ was used. Results were found to be consistent, particularly for particles in the range 30—800 A units. This work was done with a view to the study of carbon blacks, catalysts, etc., where the properties of such substances are known to be largely dependent on the size of the ultimate crystalline particles.

A survey of the quantitative analysis of quartz was also undertaken. The purpose of this study was to determine to what extent this instrument could be used to obtain quantitative estimations of compounds in mixtures, particularly when identifying the various compounds making up the sample under investigation.

In conjunction with the N.C.R.L. the kaolin content of various clay samples was investigated. This instrument is proving to be particularly useful for problems in connection with clay minerals and probably provides the only method that will give both reliable and consistent results.

An investigation on heat treated dolomite was undertaken for the Building Research Institute. The X-ray spectrometer proved to be a powerful instrument for following up the changes that occur under the various conditions of heat treatment.

A start was made in the design of special apparatus to adapt the X-ray spectrometer for the study of metals. Here the various phases of alloys will be of particular interest, as also a recent method of plotting " pole figures " for sheets of rolled aluminium, steel, etc. The pole figures of such rolled plates reveal in a very neat and compact form the physical properties of the sheets of steel, aluminium, etc.

During July a second X-ray diffraction unit was installed. This instrument has been tested and calibrated and will be used mainly for the structural analysis of single crystals. The various cameras to be used with this unit, plus other accessories, are expected to arrive soon.

Applied Geophysics Section.

The work done by this section during the year falls under four heads :—

Gravimetric Survey of Southern Africa.

This work is being done by C.S.I.R. staff with, and under the direction of Dr. A. L. Hales of the Bernard Price Institute. Tables have been prepared giving the gravity effect of the topography and compensation in the Hayford zones over the whole of Southern Africa. This has been done for five different possible hypotheses of isostatic compensation.

The first three legs of the field survey have been successfully completed. The areas already covered are the Cape Province, excluding Namaqualand ; Natal and Zululand ; the Free State ; and the Southern Transvaal.

The values of g for these stations are being computed.

Re-design and Modification of a Seismic Prospecting Unit.

A three-channel seismic prospecting unit of obsolete design has been modified to provide a simple six-channel unit of improved sensitivity and stability for the Geological Survey. Six new seismometers were obtained from the Heiland Corporation. A set of six new galvanometers was installed in the recording unit, which was suitably modified to take these and six amplifiers were designed and constructed by this section at the Bernard Price Institute.

Examination and Calibration of an Eotvos Torsion Balance.

An Askania Z-beam torsion balance of the Eotvos type was overhauled and its constants were determined. Torsion wires which were supplied with the instrument, were tested and found to be unserviceable.

Investigation of the Variation with Depth of the Earth's Magnetic Field in a Witwatersrand Mine.

A series of measurements was made at Blyvooruitzicht Gold Mine in order to determine the manner of variation with depth of the horizontal and vertical components of the terrestrial magnetic field. This work was done in association with Dr. A. L. Hales of the Bernard Price Institute, and Mr. A. M. van Wijk of the Magnetic Observatory, Hermanus. The results are in course of preparation for publication.

Publications.

The following publications have appeared :—

Alper, T.	" Hydrogen Peroxide and the Indirect Effect of Ionizing Radiations." Nature, vol. 162, p. 615 (1948).
de Waal, D. M. and Naudé, S. M.	" Sample Electrode Vapour Contamination of the Graphite Electrode in the Flat Surface Sparking Technique of Spectrochemical Analysis," Spectrochimica Acta, vol. 3, pp. 127—140 (1948).
de Waal, D. M. and Strasheim, A.	" An Investigation of Spectrochemical Sparking-off Effects in the Flat Surface Sparking of Steels," Spectrochimica Acta, vol. 3, pp. 141—158 (1948).
du Toit, S. J.	" The Effect of the Composition of the Gas Mixture in Self-quenching Geiger-Muller Tubes on Their Plateau Characteristics," Physical Review, vol. 73, p. 1473 (1948).

Marais, E. J. — "Perturbations in the Ultraviolet Spectrum of P^2," Physical Review, vol. 70, pp. 499—510 (1947).

Guelke, R. W., Heydenrych, J. C. R. and Anderson, F. — "Instruments for Measuring Radioactivity and Temperature in Boreholes," South African Science, vol. 2, No. 3, pp. 68—70 (1948).

Mossop, S. C. — Comment on the paper "Mining at Depth in the Kolar Gold Fields, Mysore," by A. W. T. Barenburg, Journal of the Chemical, Metallurgical and Mining Society of South Africa, vol. 49, No. 1, pp. 13—16 (July, 1948).

TELECOMMUNICATIONS RESEARCH LABORATORY.

Officer-in-Charge : F. J. Hewitt, M.SC.

General.

Work has been in progress in the following fields :—
Radio communication and navigational aids
Radio aids to meteorology
Radio aids to aerial survey
Unclassified research and development
A library and information service has also been provided

Radio Communication and Navigational Aids.

The Ionosphere and its Effect on High Frequency Radio Communication.

Regular measurements of the characteristics of the ionosphere made in Johannesburg were published monthly and sent to interested organisations overseas.

A second "single-band" ionosphere recorder has been built in the Laboratory and installed at the Post Office radio station at Slangkop, Cape Town, to replace the recorder installed by the Royal Navy towards the end of the war. Data from the Cape are now being published in the same way as those obtained at Johannesburg.

A third recorder is being constructed for possible use north of the Union, where information is needed for communication circuits from the Union to the United States of America and the United Kingdom.

Predictions of High Frequency radio propagation conditions for Southern Africa are prepared monthly by the Laboratory and issued in the form of a bulletin with graphs of "optimum frequency vs. time of day" for various transmission distances and latitudes. These predictions are distributed to interested organisations in South Africa including the Post Office, the Civil Aviation Council, the South African Broadcasting Corporation, the South African Air Force, the South African Naval Forces, the South African Railways and the South African Police. They are also available to the public for a small fee.

A specimen bulletin of predictions, in a form particularly suitable for use by aircraft, has been produced at the request of an airline operator.

A study of ionospheric data in connection with geo-magnetic and solar data has been made in connection with short-term predictions of abnormal ionospheric conditions.

Radio Noise Levels.

A wide-band, low noise preamplifier has been built to form part of an automatic noise recorder which will be of the single band type, involving no band-switching but covering the band 100 Kc/s to 30 Mc/s.

This project will be combined with the development of a high stability, high sensitivity single-band receiver.

Equipment operating on a fixed frequency of 100 Kc/s has been built for measuring radio noise levels in the band proposed for long range navigation aids. This equipment has been designed to measure the average value of the noise over a period of about one second. The first set has satisfactorily completed three tests in S.A.A.F. aircraft on around-the-Union flights and has been operated at the S.A.B.C. receiving station at Panorama.

It is the intention to instal a number of these sets on aircraft flying regularly between Johannesburg and Cairo. As the performance of radio navigational aids depends not only on the average value of the noise but also on the wave form, by which the various systems are differently affected, a start has been made on recording the wave form of atmospherics over the appropriate band-width.

Ground Constants.

A panel of the Telecommunications Advisory Committee has drawn up recommendations for conducting a survey of ground constants in Southern Africa.

Underground Communications.

Previous work on this subject, carried out at the request of the Chamber of Mines, resulted in the construction of two small sets with frame aerials which were demonstrated underground. As a result of these demonstrations the Rescue Committee of the Chamber of Mines drew up a specification of the equipment required for rescue purposes and the laboratory has designed

and built equipment to meet these specifications as nearly as possible. The forward set to be worn by a member of the rescue team weighs about 10 lbs., including batteries, and is designed to fit on to the " Proto " respirator apparatus. The equipment for the " fresh-air-base " can be carried by one man and operates from a 6 volt accumulator. Initial tests have been carried out but, as the present facepiece precludes the use of a microphone even of the throat type, the tests were carried out without the mouthpiece in place.

The range obtained from fresh-air base to the mobile set meets the specification of 2,000 feet without difficulty but from mobile to base link reliable ranges of 1,500 feet and 1,000 feet only could be obtained, using a 20 ft. wire and a small built-in frame aerial, respectively, at the mobile set.

With the existing equipment modified to C.W. a range of well over the 2,000 feet specified should be realised.

Radio Aids to Meteorology.

Radar Weather Observations.

The detection and tracking of thunderstorms by radar, referred to in the last progress report, has been in operation throughout the 1947/48 thunderstorm season. Photographic records at 10 minute intervals have been taken automatically and observations at certain hours were passed regularly to the Meteorological Forecast Office. By arrangement with the Meteorological Office, a large amount of information on rainfall was obtained by their lay-observers. These data were analysed to show the correlation between radar echoes and actual rainfall.

The radar set used for the above observations was also used to observe the results of the experiments conducted jointly by the Meteorological Office, the S.A.A.F. and the C.S.I.R. on the artificial stimulation of rain (ASPIC).

The primary purpose of the radar was to detect and record the precipitation occurring during and shortly after the various flights for study in conjunction with the records of the dry-ice dispensing aircraft.

In order that an accurate record of the aircraft's course should also be available, it was arranged that it should be indicated directly on the display of the radar. As this radar, on account of its high frequency and low power, was incapable of detecting aircraft at useful ranges, it was necessary to provide a separate interrogator responder system to achieve this.

A radio-telephone was also provided between the ground and the aircraft and a wire recorder was used to record important messages and commentaries given by the Meteorologist in the aircraft.

Automatic Weather Station.

The design of an automatic weather station, capable of operating for several months without attention, has been undertaken as a new project. It was first suggested by the Meteorological Office with a view to installing such a station on top of the mountain at Marion Island. It seems probable, however, that if the experimental model is a success, a number of such stations may be constructed for use in various parts of the Union.

In designing this equipment special attention has been given to reliability and stability of calibration. The information to be transmitted by radio involves temperature, wind velocity and direction. As the equipment is operated from dry batteries and will be in continuous operation, no regular switching is involved. Four valves are used and, in the event of failure, a set of stand-by valves is automatically switched in.

The equipment has been designed to make use of the recorder at present used with the radio sonde, with certain additional ground equipment.

Radio Aids to Aerial Survey.

Narrow-beam Altimeter.

The narrow beam radio altimeter, described in the last progress report, has been built in a more suitable form, the main portion of the equipment being on top of the parabolic reflector. Flight trials are being arranged with the South African Air Force.

Unclassified Research and Developments.

Short Range Radar Receivers.

Work carried out in 1946/47 on the possibility of detecting underground water by pulsed radio waves emphasised the need for a highly sensitive receiver capable of full sensitivity as soon after the end of the transmitted pulse as possible. As conventional wide band receivers proved inadequate, a double-gated amplifier was designed and constructed. It was shown that with this equipment very large effective bandwidths, the elimination of ringing, and substantial improvement in signal to noise ratio would be achieved. As the improvement in signal to noise ratio is achieved at the expense of the rate at which information can be received, the principle is limited to those applications where the rate of receipt of information is not important.

Standards of Radio Frequency.

Three British Post Office crystals have been installed in the Laboratory as a standard of frequency. The auxiliary equipment for rating and monitoring the crystals has been built in the Laboratory and the installation is practically complete.

Lightning Research Fellowship.

The holder of this Fellowship, established by Messrs. African Explosives and Chemical Industries, is on the Telecommunications Research Laboratory staff, but is accommodated at the Bernard Price Institute of Geophysics. The programme is under the control of a Panel on which the T.R.L. is represented. The work on which the holder of the Fellowship is engaged includes the study and improvement of lightning warning devices and lightning counters (ceraunometers) developed by the Institute, the sound-ranging of lightning from thunder and the use of microwave radar for giving a picture of thunderstorm activity which might be of concern to power companies and explosives factories. Arrangements have also been made for studies of lightning protection systems, particularly earthing resistances, and for the special examination of cases of fire and damage caused by lightning.

Receiving Station.

On account of the high level of man-made radio interference which exists throughout the day and most of the night, the situation of the Laboratory is unsuitable for recording atmospheric noise levels or for detecting weak radio signals. In an attempt to improve matters a whip aerial has been installed as far as possible from the sources of noise, together with a low-noise wide-band preamplifier. Although it has not yet been definitely established for what period of the day the noise received by this system is predominantly atmospheric and not man-made, a definite improvement has been achieved.

Detonation by Radio in Blasting Operations.

A simple radio fuzehead was developed for an enquirer on a contract basis, from an electrical fuzehead, and a suitable transmitter constructed and successfully tested to show the feasibility of detonation by radio in blasting operations.

Library and Information Service.

Information on radio developments overseas is being received either directly from the laboratories or organisations concerned, or via the C.S.I.R. overseas liaison officers. The services of this library are available to other

organisations through the medium of the main C.S.I.R. Library and Information Division.

Publications.

The following reports, memoranda, etc., have been produced during the year :—

C.S.I.R. Research Reports.

ETR/2—A single Band Ionosphere Recorder covering the Range 0·1 to 20 Mc/sec. By T. L. Wadley.

ETR/3—Amplification of Periodically Recurring Pulses by Gating Methods. By J. A. Fejer.

Interim Reports.

ETI/2—A Narrow Beam for Aerial Survey by J. A. Fejer.

ETI/3—Detonation by Radio in Blasting Operations by P. Meerholz and F. J. Hewitt (Confidential).

ETI/4—Radar Weather Observations in the Vicinity of Johannesburg by P. Meerholz.

Memoranda.

ETM/2—Notes on Long Range Radio Navigational Aids in Relation to Aviation in Southern Africa by F. J. Hewitt.

Reprints.

A reprint of the paper "A Frequency Prediction Service for Southern Africa" by F. J. Hewitt, Miss J. Hewitt and T. L. Wadley was issued by the South African Institute of Electrical Engineers. (The paper was read in July, 1947.)

Monthly Bulletins.

The following monthly bulletins are published :—

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. (Since July, 1948, only.)

WORKSHOP.

Officer-in-Charge : E. O. Garnett.

General.

The activities and work programme of the Workshop are controlled by a committee consisting of the Secretary/Treasurer, the directors of the laboratories and the manager 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 has been organised in five sections, *viz.*, precision, engineering, pattern making and woodworking, optical and electrical. Although the growth of the Workshop has kept pace with the development of the laboratories, it has been necessary to place some work with outside firms.

Production.

The following is a list of major items of equipment produced during the year :—

National Physical Laboratory.

- Low frequency Raleigh disc tube.
- Borehole logging devices.
- Two heart pressure microphones.
- Two high tension selector switches.
- Thysson (for producing coagulation of dust particles).
- Beta-ray apparatus (lead shield for 8 Geiger counters).
- Apparatus for " operation ASPIC " (dispenser for dry-ice).
- Parts for Geiger-Muller counters.
- High pressure ionisation chamber.
- A 65 litre ionisation chamber.
- Lamp house for ultra violet apparatus.
- Thermal emissivity apparatus.
- Constant temperature box for standard cells.
- Spectroscopic lamp house.
- Rock conductivity apparatus.

National Building Research Institute.

- Tri-axial machine.
- Thermal conductivity apparatus for small sections.
- Thermal conductivity apparatus for bricks.
- Micro-manometer.
- Three horizontal shear-boxes.
- Two sol-air thermometers.
- Experimental pressure cell.

National Institute for Personnel Research.

- Wiggley blocks.
- Form boards.
- Two mechanical aptitude tests.
- Twenty tripods.

National Chemical Research Laboratory.

- Extraction apparatus.
- Copper sampling baths.
- Electrometer tube compartment.
- Electrolysis tank.
- Two thermostat baths.

Workshop.

- Angle Dekkor.
- Electric oven for setting optical parts.
- Interferometer.
- Rack for storing timber.
- Lannishing machine.
- Gantry and hoist.

LIBRARY AND INFORMATION DIVISION.

Officer-in-Charge : Hazel Mews, M.A., F.L.A.

Bookstock and Issues.

The stock of bound books has increased by 2,500 during the year under review, the total number of volumes received since the formation of the Division being 4,500. This does not include the many thousands of scientific and technical pamphlets and papers which arrive regularly from the overseas Liaison Offices (and other sources) and which receive the same classification and cataloguing treatment as the books.

The number of books and pamphlets fully classified and catalogued during the year was about 3,000, compared with 1,500 dealt with in the previous year. This still leaves a time-lag in dealing with incoming material, due to the difficulty of obtaining trained staff.

The use made of the loan service has increased considerably during the year, as shown by the figures of issues given below :

Loans and Inter-Library Loans.

Note : Figures in brackets give number of loans during the corresponding period of the previous year.

	Issued from C.S.I.R. Library Stock.				Inter-library loans, *i.e.* borrowed from other libraries.
	To C.S.I.R. staff.	To Govt. Depts.	To Industrial firms.	To institutions and individuals.	
1947					
October... ...	842(191)	22	44	13	56(38)
November ...	389(162)	15	14	34	60(58)
December ...	469(165)	27	77	21	32(37)
1948					
January ...	529(171)	37(24)	34(14)	37(3)	70(30)
February ...	392(66)	13(21)	48(35)	30(5)	61(42)
March	353(114)	43(29)	61(28)	54(3)	69(47)
April	540(140)	34(14)	328(17)	62(10)	85(49)
May	599(160)	30(8)	44(21)	23(8)	83(63)
June	647(325)	12(15)	38(23)	32(6)	135(52)
July	509(335)	26(15)	39(14)	26(9)	101(59)
August	547(211)	19(25)	54(45)	27(13)	109(44)
September ...	623(202)	18(17)	41(29)	50(2)	91(31)
	6439(2242)	296(168)	822(226)	409(59)	952(550)

Total loans 8,918 (3,245).

It will be seen that the loans to individuals and institutions have increased over six-fold and the loans to industry nearly four-fold, while the total loans have considerably more than doubled in the past twelve months. The last column of the table indicates that loans from other libraries, for issue to C.S.I.R. staff, have again been very heavy. Although these figures do not represent all the work of the Division, they give some indication of the way that work is increasing as the library becomes more widely known.

Journals.

Six hundred and nine scientific and technical periodicals are at present being received. The number received last year was 250.

C.S.I.R. Information.

The monthly list of accessions to the Library, *C.S.I.R. Information*, has continued to appear regularly. It has increased slightly in bulk, in line with the increase in the rate of handling publications. The demand for it increases steadily, 104 new requests having been received during the year. The total number on the mailing list is now 755.

Microfilms.

The microfilm service which was instituted a year ago has been used regularly. 58 microfilm copies of papers published in journals which are not available in South Africa have been obtained through the Liaison Offices in London and Washington, and 48 microfilm or photostat copies have been made in the Union. A microfilm reader arrived recently and is in use in the library ; it will take both 35 mm. and 16 mm. films.

Enquiries for Information.

Enquiries on 53 different subjects were dealt with during the year. This figure does not include the very large number of enquiries which could be answered without much investigation.

Reports.

A large number of copies of the Council's reports and of offprints of papers by staff members published in scientific journals have been distributed. A few abstracts of papers published by South African scientific and technical societies have been distributed to overseas abstracting agencies.

Overseas Gifts and Exchanges.

The Division has been in communication with the Canadian National Research Council and the Australian Council for Scientific and Industrial Research and receives copies regularly of their numerous publications. Material is also sent to the Division, on an exchange basis, by many British, Continental and American institutions.

Royal Society Scientific Information Conference.

The Head of the Division attended the Royal Society Scientific Information Conference which was held in London from the 21st June to the 2nd July, 1948. She also spent some time at the Scientific Liaison Offices in London and Washington, visiting many British and American libraries.

International Federation of Documentation.

The Head of the Division and Mr. Hutton attended two further meetings of the South African National Committee for the Universal Decimal Classification and the International Federation of Documentation.

South African Library Association.

The Division has been represented at all general and committee meetings of the Northern Transvaal branch of the South African Library Association. At the request of the Library Association, and with the permission of the Council, Miss Mews, in collaboration with Miss Krige of the Witwatersrand Medical Library, is editing a directory of scientific, technical and medical libraries in the Union.

School for Industrial Librarians.

On 3rd February, 1948, the Division held a one-day school for industrial librarians and intelligence officers. This was designed to help those in charge of small industrial libraries to get a sound idea of what is involved in modern scientific and technical library organisation. In the morning the C.S.I.R. library staff gave lectures on elementary library routines, order methods, classification, cataloguing, basic reference books and ways of finding information, and, in the afternoon, the equipment and methods used in C.S.I.R. library were demonstrated. The attendance of 32 at this experimental school was most encouraging.

Publications.

The following was printed during 1948 :—

" Scientific Information : An International Affair," by Hazel Mews. *In :* Aspects of Library work in South Africa. Published by Balkema, Cape Town.

LIAISON DIVISION.

Officer-in-Charge : D. G. Kingwill, M.SC.

The Division, with a small scientific and clerical staff, has assisted the President and the directors of the laboratories in matters involving public relations. Its activities have included :—

The promotion of co-operative research by industry, including assistance with the establishment of industrial research associations and their incorporation as non-profit companies.

Representation of the C.S.I.R. on the Boards of Control of the Paint Industries Research Institute and the Sugar Milling Research Institute.

Arranging industrial participation in investigations undertaken by the C.S.I.R. laboratories.

Dealing with enquiries for scientific and technical information which could not conveniently be handled by the Library and Information Division or the laboratories ; 62 such enquiries were dealt with.

Organisation of research projects involving the co-operation of more than one C.S.I.R. laboratory and other research institutes ; such investigations included experiments on the artificial stimulation of precipitation in clouds, a contract investigation for the United Tobacco Companies (South) Limited and experiments on the rot-proofing of grain bags.

University research grants.

Matters arising out of South Africa's membership of the International Scientific Unions.

Co-operation with the Head of the Library and Information Division in connection with publications and publicity.

Keeping the Scientific Liaison Offices overseas informed of the activities of the C.S.I.R. laboratories and, as far as possible, of research developments in South Africa generally.

SCIENTIFIC LIAISON OFFICES IN LONDON AND WASHINGTON.

These offices have continued to provide a valuable service in keeping South African research organisations informed of scientific and technical developments overseas. Information is provided either in response to specific enquiries or as the result of contact with overseas research organisations. A large number of reports has been transmitted to the C.S.I.R. Liaison Officers have also represented South Africa on a number of international committees and conferences and distributed information on scientific activities in South Africa.

In addition, these Liaison Offices have been of great value to visiting South African scientists, both from the C.S.I.R. and other research organisations. In many cases office facilities have been provided and itineraries arranged so as to make the fullest use of the time available. The C.S.I.R. laboratories have also made considerable use of these offices in placing orders for specialised scientific equipment.

London Office.
Chief Scientific Liaison Officer : E. Boden, M.SC.
Address : S.A. Scientific Liaison Office,
Africa House,
Kingsway,
London, W.C.2.

Washington Office.
Chief Scientific Liaison Officer : E. P. Phillips, D.SC.
Address : S.A. Scientific Liaison Office,
1785 Massachusetts Avenue, N.W.,
Washington 6, D.C.

INDUSTRIAL RESEARCH ASSOCIATIONS.

THE LEATHER INDUSTRIES RESEARCH INSTITUTE, Rhodes University College, Grahamstown.

The Institute was incorporated as a non-profit company on 3rd August, 1948. Its research and other services have maintained a high level of

achievement and, as the result of increased stability provided by the C.S.I.R. scheme of subsidisation, its financial position has continued to improve.

THE FISHING INDUSTRY RESEARCH INSTITUTE, Cape Town.

The Institute was incorporated as a non-profit company on 3rd September, 1948. Since moving to new premises in Portswood Road, the Institute has made excellent progress.

THE PAINT INDUSTRIES RESEARCH INSTITUTE, Natal University College, Durban.

Dr. J. O. Cutter, whose appointment as director was mentioned in the last Annual Report, was unable to take up the appointment, but the Institute will commence operations at the beginning of 1949 under the direction of Dr. L. Whitby.

SUGAR MILLING RESEARCH INSTITUTE, Natal University College, Durban.

Dr. Douwes Dekker, formerly Assistant Director of the Sugar Experiment Station at Pasuruan (Java), has been appointed as director of the Institute, which will commence operations early in 1949.

UNIVERSITY RESEARCH.

(Excluding Medical Research).

The Council's scheme for supporting research at universities has continued to function satisfactorily. Revised regulations are given in Appendix I.

Reports on the progress of holders of bursaries, assistantships and other grants have been encouraging and a list of publications is included in Appendix II.

A summary of all bursaries and assistantships granted in 1946, 1947 and 1948 is presented in Appendix III. This list does not include details of 39 grants for specialised major equipment or of 136 grants for the running expenses of research, which were made over the same period. It refers to holders of bursaries and assistantships only.

The following awards were made in 1948 :—

Senior Research Bursaries (£400-800 p.a.)	6
Student Research Bursaries	
Post–M.Sc. (£200 p.a.)	28
Post–B.Sc. (£100 p.a.)	11
Research Assistantships	
Skilled (£350-450 p.a.)	1
Unskilled (£120-240 p.a.)	3
Specialised Major Items of Equipment (Total sum granted)	£274
Running expenses of research, including publication in scientific journals or monographs (Total sum granted)	£6,183

MEDICAL RESEARCH.

The Medical and Dental Research Committee, which was previously appointed on a nominated basis, has been replaced by one appointed on a selected basis with the following membership :—

Professor S. F. Oosthuizen, Professor of Radiology, University of Pretoria. *Chairman.*

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 of the Transvaal Hospitals Advisory Council.

Dr. E. H. Cluver, Director, South African Institute for Medical Research.

Professor G. A. Elliott, Professor of Medicine, University of the Witwatersrand.

Professor J. F. Brock, Professor of Medicine, University of Cape Town.

Professor M. van den Ende, Professor of Pathology, University of Cape Town.

Dr. J. H. S. Gear, South African Institute for Medical Research.

Professor J. C. Middleton-Shaw, Professor of Dentistry and Dean of the Dental School, University of the Witwatersrand.

Professor A. Sutherland Strachan, Professor of Pathology, University of the Witwatersrand.

Professors Brock, Elliot, van den Ende, Middleton-Shaw and Drs. Cluver and Gear were selected by the previous Committee, mainly on the basis of their scientific qualifications. They retire in regular rotation and are not eligible for re-election until one year has elapsed.

Most of these members served on the Medical and Dental Research Committee during the previous year, as also did :—

Professor A. Pijper, Professor of Pathology, University of Pretoria.

Professor J. T. Irving, Professor of Physiology, University of Cape Town.

Professor R. A. Dart, Professor of Anatomy, University of the Witwatersrand.

Brigadier D. du Plessis, Director General of Medical Services, U.D.F.

The Council wishes to thank the retiring members for their valuable services.

During the year, Dr. S. F. Oosthuizen, the Chairman of the Medical Research Committee, has acted as temporary honorary secretary for medical research, pending the appointment of a permanent secretary.

The terms of reference of this Committee are to survey the field of medical and dental research and to advise the Council on how best to ensure their proper development in this country.

The Medical Research Committee relies on the advice of specially appointed sub-committees of specialists in particular fields, such as nutrition, applied physiology, social medicine, bilharziasis, amoebiasis, dental diseases, radio-active isotopes, therapeutic trials, virus diseases. Of special interest are the activities of the radio-isotope sub-committee, which handles an important commitment of the Council in arranging for the importation of these isotopes. A number of biologists and medical men have already availed themselves of the opportunity of procuring radio-active materials through the Council for the purpose of conducting research and treating patients.

The Chairman of the Medical Research Committee visited Great Britain, Switzerland, Canada and the United States early this year to study the organisation of medical research in those countries. He had discussions with many eminent scientists including officials and research workers of the Medical Research Council of Great Britain, the National Research Council of Canada and the National Research Council of the United States of America. Experts who were consulted about the projected plans for the development of medical research in this country have been unanimous in their approval.

Honorary medical liaison officers have been appointed in England and the U.S.A. Acting through the Scientific Liaison Offices in London and Washington they will provide a valuable link with research organisations and individuals overseas, from whom they have already received valuable assistance. Liaison has also been established with those in charge of the development of medical research in adjoining African territories. Arrangements for a medical research information service are being worked out at present, and the Head of the Library and Information Division considered this matter during her recent visit to medical and other libraries abroad.

Sir Edward Mellanby, F.R.S., Secretary of the Medical Research Council of Great Britain, was invited to visit South Africa during November of this year to advise the Council on the establishment of a Nutrition Unit and on medical research in general.

The provision of financial aid to medical research workers at universities and other approved organisations has been the main channel into which the support from the Council has been directed. But for this help, many workers throughout the country would have found it very difficult to continue with their research. Cordial relations continue to exist between the Council, the various universities and other organisations and research workers, and there is appreciation in most quarters for the generous help given by the Council.

The Council has two representatives on the newly constituted Board of the South African Institute for Medical Research, *viz.*, Dr. B. F. J. Schonland and Professor S. F. Oosthuizen, with Dr. P. J. du Toit and Professor J. F. Brock as floating alternates. The Council has agreed to contribute £7,500 per annum to the research division of the S.A.I.M.R. in addition to the costs of one existing unit and possible future research units at this Institute.

In addition to continuing the research award system, the subsidisation of the research division of the S.A.I.M.R. and the development of effective medical liaison in Africa and abroad, the Council, on the advice of its Medical Research Committee, has formulated detailed plans for developing a medical information service and the development of small research units and teams. In these units the best available personnel will be assembled to tackle problems of national importance with due regard to the scientific freedom of the individual. They will be established at the most appropriate place after full consultation with interested bodies, and will be controlled and guided by specially appointed panels. It is hoped to make a start in 1949 with the units in Applied Physiology, Social Medicine, Virus Diseases, Tuberculosis, Amoebiasis, Bilharzia and Cardio-pulmonary disease. In the main these units will be an extension of university research activities.

Publications by holders of C.S.I.R. medical research grants are listed in Appendix IV. Research bursaries and assistantships awarded in 1947 and 1948 are listed in Appendix V ; this list does not include 12 grants for specialised major equipment or 40 grants for running expenses made during the same period ; it is a list of research bursaries and assistantships only.

APPENDIX I.

SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

REGULATIONS GOVERNING THE AWARD OF RESEARCH BURSARIES, ASSISTANTSHIPS AND GRANTS.

(A) GENERAL REGULATIONS.

1. The Council provides assistance to research workers in the form of :—

(i) bursaries and senior bursaries ;
(ii) laboratory assistants ;
(iii) grants for running expenses ;
(iv) grants for major or specialised equipment.

2. Bursaries are provided for the encouragement of research work and not for the support of study for a higher degree, without research work. They will be awarded only to those candidates who have shown distinct evidence of capacity for original research or (in the case of B.Sc. graduates) who have at least won distinction during their undergraduate studies. Evidence of this capacity, which is the main qualification, must be provided, preferably by the presentation of a report on research already performed.

3. The fields covered by the awards are the mathematical and experimental sciences, medicine, engineering, architecture and applied psychology.

4. Awards can only be made to candidates who are already graduates of an approved university.

5. As a general rule awards will only be made for investigations which will be conducted in established laboratories which possess the fundamental apparatus and facilities necessary for research of the nature proposed, and where the normal overhead charges are provided for. They will not be made for the provision of services or for the purchase of standard apparatus which a properly equipped laboratory should possess.

6. As a general rule awards are made for research in the Union of South Africa by persons resident in this country. Other applications must be regarded as exceptional and requiring special supporting information.

7. The C.S.I.R. will not award bursaries or grants for purposes of advanced study without research or for informative visits to overseas

research institutions. An exception can only be made in the case of an applicant who can comply with the terms of paragraph 29.

8. When a bursary, assistantship or grant is awarded for a specific purpose, it shall be used for that purpose only. If the holder desires to change the subject of research, a new application shall be submitted.

9. The bursaries, assistantships and grants may be renewed, on application, if reports received on the quality of the work are satisfactory. *The holder of any C.S.I.R. award who has finished his work under the award, must submit to the Council not later than the 1st April in the year succeeding the year for which the award was made, a full typewritten report in duplicate on the work done.* If the award is held under a consolidated university research grant, the university concerned will be responsible for furnishing the report. (For regulations governing renewal of bursaries and assistantships refer to sections concerned.)

10. A bursary, assistantship or grant may at any time be withdrawn by the C.S.I.R. (or in the case of consolidated grants, by the organisation administering the award) if the work or conduct of the holder is considered unsatisfactory.

11. The C.S.I.R. shall be notified of the lapse of a bursary, assistantship or grant within one month. If the award is held under a consolidated university research grant, the university concerned will be responsible for notifying the C.S.I.R.

12. *Acknowledgement of the assistance received from the C.S.I.R. must be made in all publications by holders of awards* and three copies of such publications must be forwarded to the C.S.I.R. as soon as they are available.

13. The Council will not consider applications from organisations sponsoring applications, for financial assistance for the administration of research awards.

14. The regulations which apply to university consolidated grants will apply to organisations other than universities sponsoring applications.

(B) ROUTING OF APPLICATIONS, REPORTS AND ENQUIRIES.

15. Applications for research awards must be made in duplicate, providing the information set out on the Council's specimen form of application.

16. Applications must be submitted through a university if possible. In special circumstances applications may be made through recognised

organisations such as technical colleges, independent institutes, and museums. Applications made directly to the Council by individuals will be considered only in exceptional circumstances.

17. The Council will not normally deal direct with individual applicants. All correspondence and enquiries about awards, and applications for them, should pass through the sponsoring organisations.

18. C.S.I.R. research bursaries, assistantships and grants will be awarded only with the knowledge and consent of the executive head of the institution at which they are to be held. Applications must therefore be forwarded to the C.S.I.R. through the executive of the applicant's institution, and as evidence of consent should be countersigned by or on behalf of the executive head.

(C) CONSOLIDATED UNIVERSITY RESEARCH GRANTS.

19. Each university will submit a consolidated statement of the total amount applied for through the university in respect of C.S.I.R. research bursaries, assistantships and grants, supported by the individual applications. This will be considered as an application from the university for a *C.S.I.R. Consolidated University Research Grant.* The amount approved by the C.S.I.R. will be paid to the university as a block grant which will be administered by the university. Applications for the support of research in the clinical aspects of medicine and dentistry should for convenience be separated from the others.

20. Applications as above must be submitted by the university on or before November 1st of each year for award in the following year. These should include provisional applications for post-B.Sc. bursaries. Final applications for post-B.Sc. bursaries will be accepted up to December 31st and not later.

21. Universities will assist the Council by screening applications, reports and enquiries, and by using their normal administrative machinery for :—

(i) obtaining estimates of the cost of major equipment applied for;
(ii) purchase, marking and control of major equipment provided by the Council;
(iii) the appointment and control of research assistants;
(iv) ensuring that grants for running expenditure are properly used.

22. If any portion of a consolidated university research grant remains unexpended, the university may apply to the C.S.I.R. to have the unexpended amount carried over to the succeeding year.

(D) SPECIAL REGULATIONS GOVERNING BURSARIES.

23. Bursaries are of three types :—

Post-B.Sc.	£100
Post-M.Sc.	£200
Senior Bursaries	£200—£1,000

Senior Bursars must be persons of high standing and experience in research but possession of a doctor's degree is not essential. The essential qualification is proved ability to conduct independent research.

Holders of degrees which involve four or more years of study are eligible for the same type of bursaries as holders of the degrees of B.Sc. (Hons.) or M.Sc.

24. The holders of C.S.I.R. bursaries and senior bursaries will be designated C.S.I.R. Bursars and C.S.I.R. Senior Bursars.

25. The maximum amount of teaching allowed to the holder of a bursary will be six hours per week, and only in exceptional cases will this be extended to nine hours per week. The university in question will be asked to provide assurances that this will be observed. (Teaching is defined in paragraph No. 38.)

26. Normally the research will cover the whole academic year for which the bursary is awarded, and assurances will be required that this condition will be observed. In certain special cases a bursary may be held for part of a year only, the amount of the award being adjusted accordingly.

27. *Applications for renewals of bursaries* together with supporting typewritten progress reports on the work done under the award, *must be submitted in duplicate not later than the 1st November of the year for which the bursaries were awarded.* If the award is held under a consolidated university research grant the university in question will be responsible for furnishing such reports.

28. In certain special cases recommendations for awards of bursaries to persons not domiciled in the Union of South Africa who will work in the Union may be considered. Such recommendations are to be regarded as exceptional, and the Council reserves the right to decide on the institution at which work under such an award will be conducted.

29. The holder of a bursary who wishes to work in a laboratory overseas must submit a programme indicating that he will devote at least six months

to full-time research at one particular institution and stating the nature of the research.

30. Holders of C.S.I.R. research awards overseas will be required to sign an undertaking that they will return to South Africa or otherwise will repay the whole or such part of the bursaries as the C.S.I.R. may determine.

31. The Council may make awards to cover the passages from and to South Africa of bursars working overseas. Each case will be dealt with on its merits, and payment will not be made in full until satisfactory reports have been received on the research conducted by the bursar.

32. If any inventions, discoveries or improvements which may be, or have been, covered by patent applications or patents, arise as a result of work carried out by the holder of a C.S.I.R. bursary, the C.S.I.R. in terms of its Act shall be deemed to have an interest in any patent rights covered by such patent applications or patents.

33. For purposes of continuing titular control and administration of any patent rights covering inventions, discoveries or improvements arising as mentioned in paragraph No. 32, such patent rights shall be assigned to the C.S.I.R. and the parties, comprising the C.S.I.R., the inventors and the sponsor, if any, of facilities used by the inventors, shall together determine the respective interests of the parties in the said patent rights or in the net proceeds, if any, of exploitation of the said rights.

34. It is the intention of the C.S.I.R. to use any proceeds which the Council may acquire, by reason or in consequence of its interests (as defined in paragraphs Nos. 32 and 33) for the furtherance of extramural research.

35. Grants to supplement research scholarships or to supplement grants from other sources may be awarded by the Council if it is fully informed of the circumstances of the applicant. Before such applications can be considered the body which awarded the original scholarship or grant must have been approached for further assistance, and its reply must be placed before the Council.

(E) SPECIAL REGULATIONS GOVERNING ASSISTANTSHIPS.

36. C.S.I.R. grants for research assistants will be made only to persons of proved research standing who have adequate time for research and who need technical or specialised help to carry out their research.

37. The assistantships provided for are :—
Skilled laboratory assistants—salary scale £350—£450.
General laboratory assistants—salary scale £120—£240.

An application for an assistantship must be supported by a full statement of the reasons for the employment of a research assistant and of the proposed salary.

38. *Research assistants appointed under C.S.I.R. grants can be used only for the particular work detailed in the application.* They must be full-time research assistants and do no teaching or laboratory preparation work at all. In these regulations, teaching is defined as lecturing or practical demonstration, including preparation time and marking exercises. The institutions at which assistantships are held will be asked to provide assurances that this condition will be observed.

39. The institutions at which such grants are held will provide details of the qualifications and experience of the persons appointed and give assurances that they are appropriate to the salaries approved.

40. *Applications for renewals of assistantships together with supporting typewritten progress reports on the work done under the award, must be submitted in duplicate not later than 1st November of the year for which the award was made.* In order to ensure continuity in the services of assistants awarded for more than one year, it is advisable that these applications be made, if possible, by 1st July rather than 1st November of the year in which the award was made. If the award is held under a consolidated university research grant, the university in question will be responsible for furnishing the necessary reports.

(F) SPECIAL REGULATIONS GOVERNING GRANTS FOR RUNNING EXPENSES.

41. Running expenses for laboratory materials can only be considered in the case of applicants who are not actual full-time members of the teaching staff of the university or similar institution unless the items concerned are of an unusual nature and not normally supplied by a laboratory. Details of such items must be given.

42. Holders of bursaries who are not members of the university staff and who apply for renewal of bursaries must also apply for renewal of running expense grants.

(G) SPECIAL REGULATIONS GOVERNING GRANTS FOR PUBLICATION.

43. Financial support for the publication of the results of all types of research which fall within the Council's scope will be considered, whether these results have been achieved through its assistance or not. The Council may also support publication in suitable form of monographs of outstanding merit.

44. Application may be made for a grant towards the total or partial cost of publication.

45. C.S.I.R. grants for publication will be made only for publication in approved scientific journals and not in publications which are issued by Government Departments or universities. The C.S.I.R. will make grants in aid of publication of abstracts only if their form has been approved by the Council.

46. C.S.I.R. grants will not be awarded to defray expenses incurred in the preparation of a thesis for a degree.

47. In considering the provision of support for publication, the Council will be guided chiefly by :—

(i) the scientific value of the subject ;
(ii) the originality or previous inaccessibility to South African research workers of the subject ;
(iii) conciseness and accuracy of expression.

48. Where the Council pays the whole cost of publication it reserves the right :—

(i) to require at least three estimates of the cost of publication ;
(ii) to approve the publisher selected ;
(iii) to approve the sale price ;
(iv) to require a statement of cost of publication ;
(v) to decide the number of copies to be given free to the applicant ;
(vi) to reimburse itself from profits on sale up to the amount which it has spent ;
(vii) to pay publication costs direct to the publisher.

49. *Publications assisted by C.S.I.R. grants must acknowledge the support received.*

(H) SPECIAL REGULATIONS GOVERNING MAJOR EQUIPMENT.

50. The C.S.I.R. will not provide funds for standard apparatus, normally part of a properly equipped laboratory. Under this head applications for equipment of a major and specialised character only will be considered.

51. In special cases small items of equipment ancillary and essential to an approved item of major equipment may be treated as one major item.

52. All major equipment purchased with C.S.I.R. grants will remain the property of the C.S.I.R., and holders of such grants will be required to furnish the C.S.I.R. with originals of invoices and receipt vouchers or

statements of cost certified by the organisation administering the award. They will also be asked to certify that the equipment is clearly marked with the letters "C.S.I.R." in appropriate paint or engraving, unless the equipment already bears permanent numbers and marks by which it can easily be identified.

(I) SPECIAL REGULATIONS GOVERNING AWARDS TO PUBLIC SERVANTS.

53. A C.S.I.R. grant may be considered in the case of a Public Servant, provided that :—

(*a*) prior approval has been received from the Head of the Department concerned, together with a statement as to why the Department is not prepared to support the work at its own expense ;
(*b*) the grant is not required for the purposes of the ordinary work of the applicant in the Department.

(J) SPECIAL REGULATIONS GOVERNING GRANTS TO C.S.I.R. OFFICERS FOR NON-ESSENTIAL STUDY OVERSEAS.

54. Where an officer wishes to go overseas to study under conditions valuable but not essential to the Council, he may be granted unpaid leave and be considered for a bursary ; in such case he will be required to sign an undertaking to return to the Council's service, and the Council will undertake to protect his contributions to the University Teachers' Provident Fund.

APPENDIX II.

BYLAE II.

PUBLICATIONS received from holders of grants awarded by the C.S.I.R. in 1946, 1947 and 1948 (excluding awards for medical research).

PUBLIKASIES ontvang van houers van toelaes wat die W.N.N.R. gedurende 1946, 1947 en 1948 toegeken het (uitsluitende toekennings vir mediese navorsing).

SKRYWER/AUTHOR.	ONDERWERP/TITLE.	TYDSKRIF/JOURNAL.
Barnard, K. H., M.A., D.Sc.	The Blepharoceridae (diptera) of the S.W. Cape.	Entomological Society of S.A., Pretoria. Vol. X, August, 1947.
Botha, P. J., M.Sc., Ph.D.	The Parasitism of Alectra Vogelii with special reference to the germination of its seeds.	Journal of S.A. Botany, 14, 1948, 63–80.
Coblans, H., Ph.D.	A Bibliography of Chemical Research in S.A., 1910–1939.	Published by Natal University College, 1947.
Davis, P. C., B.Sc., M.Sc.	Nadere Ondersoek van die twee vorme van 2-nitro-indeen.	Journal of the S.A. Chemical Institute, Augustus, 1947.
du Toit, S. J., B.Sc., M.Sc.	On the Production of Penetrating Ionizing Particles by the non-ionizing component of Cosmic Radiation.	The Physical Review, Vol. 70, Nos. 3 and 4.
	An Improvement on the Copper Evaporation, Geiger-Müller Counter.	The Review of Scientific Instruments, Vol. 17, No. 11.
	A One-Shot Multi-vibrator Anti-coincidence and Recording Circuit.	The Review of Scientific Instruments, Vol. 18, No. 1.
Eloff, F. C., B.Sc., M.Sc.	The early development of the skull of Otomys Tropicalis.	Annals of the Transvaal Museum, Vol. XXI, Part 1, April 6, 1948.
Jackson, S. P., B.A., M.A., D.I.C.	Air Masses and the Circulation over the Plateau and Coasts of Southern Africa.	Published by the Geographical Society of S.A., Vol. XXIX, April, '47, pp. 1–15.
Munro, H. K., B.Sc., D.Sc.	African Trypetidae (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, November 30, 1947
Smith, J. L. B., Ph.D.	Brief Revisions and New Records of South African Marine Fishes.	Annals and Magazine of Natural History, Ser. 11, Vol. xiv, May, 1947.

SKRYWER/AUTHOR.	ONDERWERP/TITLE.	TYDSKRIF/JOURNAL.
Smith, J. L. B., Ph.D. (*Contd.*)	A Neutral Solution of Formaldehyde for Biological Purposes.	Transactions of the Royal Society of South Africa, 1947.
	New Species and New Records of Fishes from South Africa.	Annals and Magazine of Natural History, Ser. 11, Vol. xiii.
	New Clinid Fishes from the South-Western Cape with Notes on other Fishes.	Annals and Magazine of Natural History, Ser. 11, Vol. xiv, October, 1947.
	A Generic Revision of the Mugilid Fishes of South Africa.	Annals and Magazine of Natural History, Ser. 11, Vol. xiv, December, 1947.

APPENDIX III.

BYLAE III.

RESEARCH BURSARIES and ASSISTANTSHIPS awarded by the C.S.I.R. in 1946, 1947 and 1948 (excluding awards for medical research).
NAVORSINGSBEURSE en ASSISTENTSKAPPE wat die W.N.N.R. gedurende 1946, 1947 en 1948 toegeken het (uitsluitende toekennings vir mediese navorsing).

A. BURSARIES/BEURSE.

1. SENIOR BURSARIES/SENIOR BEURSE (£200—£1000).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
AHRENS, L. H., B.Sc., D.Sc., F.R.I.C. Research Officer, Government Metallurgical Laboratory.	1946	Two years. Taken up in September, 1946; renewed 1947 and extended to end of 1948.	Massachusetts Institute of Technology, U.S.A.	Geochemical Studies of Rocks and Minerals.
DU TOIT, C. A., B.Sc., M.Sc., Ph.D. Professor in Zoologie, Universiteit van Stellenbosch.	1947	Een jaar.	University College, London; University Museum of Zoology, Cambridge, Engeland, en Harvard University, V.S.A.	Skedel morphologie van lewende en uitgestorwe visse.
HENKEL, J. S., Hon. D.Sc. (S.A.). Pensioner, Union and Southern Rhodesia Forest Service.	1947	Two years, renewed 1948.	Natal University College.	Study of Indigenous grasses and preparation of a key based on vegetative characters.
LAWRENCE, R. D., B.A., Ph.D. (Cape). Director, Natal Museum, Pietermaritzburg (resigned 31st January, 1948).	1948	Extendable for a second year.		1. Study of Acarina (Mites). 2. Study of the Cryptozoa of the forest floor in South Africa.
LEVYNS, Mrs. M. R., B.Sc. (Hons.) (Cape of Good Hope,) D.Sc. (Cape). Retired University Lecturer.	1947	Two years. Renewed 1948.	University of Cape Town.	1. Cyto-taxonomy of Ficinia, Tetraria, and allied genera of Cyperaceae. 2. Cyto-taxonomy of Muraltia, Mundia and Polyala.

APPENDIX III—(*continued*).

BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
LÜTJEHARMS, W. J., Nat.Phil.Cand. (Amsterdam), Nat.Phil.Drs. (Amsterdam), Nat.Phil.D. (Leiden). Professor of Botany and Head of Department, U.C.O.F.S.	1946	One year.	United Kingdom (Rothamsted); Sweden (Lantbrükshogskolen and Skogshogskolen); U.S.A. (Iowa State Experiment Station).	Soil microbiology, with special reference to the decomposition of organic residues and the investigation of humus.
MES, Mej. M. G. B.Sc. (T.U.K.), Doktoraal (Utrecht), Doktor in Wis- en Natuurkunde (Utrecht). Professor in Plantkunde, Universiteit van Pretoria.	1947	Een jaar.	Harvard University, Cambridge, Mass., and California Institute of Technology, Pasadena.	Die invloed van klimaatsfaktore op die groei van plante met spesiale verwysing na: (1) Die ekstraksie van hormone (auxine) uit plante; (2) Die invloed van lig op die vernietiging van auxine.
POCOCK, Miss. M. A., Ph.D. (Cape) 1932. Senior Lecturer in Botany, Rhodes University College (Retired).	1948	Extendable for second year.	University of California.	1. American species of Volvox in the living state. 2. Marine algae collected in South Africa.
POLDEVAART, A., M.Sc., Ph.D. (Cape)	1947	Renewed for 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. (Cape), M.Sc. (Stellenbosch), Ph.D. (Cantab.), F.R.S.S.A. Professor of Ichthyology, Rhodes University College.	1947	Renewed for 1948—extendable for a third year.	Rhodes University College, Grahamstown.	The sea fishes of Southern Africa.

APPENDIX III—(*continued*).

BYLAE III—(*vervolg*).

2. STUDENT BURSARIES/STUDENTE BEURSE (£100—£200).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
(i) *Plantkundige Onderwerpe/Botanical Subjects.* BRAIN, Miss M. E., M.Sc. 1945.	1946	Renewed for 1947.	University of Cape Town.	Investigation of the morphology of " petals " and " scales " in the Thymelasacea, with particular reference to tropical genera.
BODEN, B. P., M.Sc.	1948	One year.	University of California.	Studies of marine plankton.
BORWEIN, Mrs. B., B.Sc. 1946, B.Sc. (Hons.) 1947.	1948	One year.	University of the Witwatersrand.	The chromosome numbers and embryosac development in several members of the South African Restionaceae.
COETSEE, Miss M. L., B.Sc. 1946, B.Sc. (Hons.) 1947.	1948	One year.	University of the Witwatersrand.	Embryosac and pollen grain development in Loranthus species.
COHEN, C., M.Sc.	1947	One year.	Iowa State College, U.S.A.	Soil Fungi and Bacteriology.
GOLDSMITH, Miss E. P., B.Sc.	1947	One year.	University of the Witwatersrand.	Cytology of Senecio Isatideus.
HURCOMBE, Miss R. E., B.Sc.	1946	One year.	University of the Witwatersrand.	Cytological and morphological studies of Cynodon species.
SCOTT, Miss E. J., B.Sc.	1946	One year.	University of Pretoria.	Factors affecting growth and root formation of different citrus varieties.

APPENDIX III.—(*continued*).
BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
SMUTS, Miss P. L., M.Sc.	1947	Renewed for 1948.	University of Cape Town.	1. Seasonal changes in the Algae of rock pool at Strandfontein. 2. The life cycles of Colpomenia Sinuosa and Iyengaria Stellata.
(ii) *Skeikunde/Chemistry.* BENNETT, R. N. E., B.Sc.	1948	One year.	Natal University College.	Study of Euphorbia Resins.
CHRISTIE, S. M. H., B.Sc.	1948	One year.	Natal University College.	The construction of naturally occurring Hydroxy Acids.
COHEN, M. D., B.Sc.	1948	One year.	Natal University College.	Rate of hydrogen exchange in Heavy Water—Sodium Formate system.
CANHAM, P. A. S., B.Sc.	1948	One year.	Natal University College.	Toxic material of Cestrum Laevigatum which is the cause of Chase Valley Disease at Pietermaritzburg.
DAVIS, P. C., B.Sc., M.Sc.	1946	Renewed 1947 and 1948.	University of Pretoria, 1946; Zurich University, 1947 and 1948.	1. Structure and synthesis of new indene (ex coal tar) derivatives. 2. The action of sodium iodide on 5, 6-ditosyl-1·2, 3·4-diacetone d-mannitol and 1, 2, 5, 6-tetratosyl-3·4-monoacetone d-mannitol.
FAURE, A., B.Sc., M.Sc. (Part I).	1947	Renewed for 1948.	Rhodes University College.	The behaviour of typical electrolytes in cells of the conductivity titration type.
FESTENSTEIN, G. N., M Sc.	1946	Renewed for 1947.	Rhodes University College.	The determination of ionic mobilities from conductivity titration data.

APPENDIX III—(*continued*).
BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
GODDARD, E. D., M.Sc. (Part I) 1946	1947	Renewed for 1948.	Rhodes University College.	Investigation of some complex chromium ions.
GROSBERG, P., B.Sc.	1948	One year.	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.	1947	Renewed for 1948.	Natal University College.	Investigation of the constitution of Euphol and related triterpenes from the Euphorbia species.
IMPEY, N. R. M., M.Sc.	1948	One year.	Rhodes University College.	Electrolysis of lactate solutions.
JAMES, G. S., B.Sc.	1948	One year.	University of the Witwatersrand	Methods of analysis of sewage and effluents.
KROPMAN, M., B.Sc.	1948	One year.	Natal University College.	Naturally occurring Hydroxy Acids.
KILROE-SMITH, T. A., B.Sc.	1948	One year.	University of the Witwatersrand.	Chemistry of the Quinazolones.
LOUW, D. F., M.Sc.	1948	Een jaar.	Universiteit van Pretoria.	Plant Gifstowwe (alkoloïede, sure, ens.)
MARKUS, J., B.Sc.	1948	One year.	Rhodes University College.	The Kinetics of the oxidation of certain organic acids.
MROST, M., B.Sc.	1948	One year.	University of the Witwatersrand.	Electrometric methods for the estimation of Magnesium and Calcium with special reference to water analysis.

APPENDIX III—(*continued*).
BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
PIENAAR, D. J., M.Sc.	1946	One year.	Rhodes University College.	A comparative examination of methods for the determination of the base exchange capacity of soils.
STEYN, W. J. A., M.Sc.	1946	One year.	Rhodes University College.	Soil sampling analysis.
(iii) *Geologie/Geology.* DE VILLIERS, P. R., B.Sc.	1946	Een jaar.	Universiteit van Pretoria.	1. Kristallografiese en optiese eienskappe van die senecio-alkaloiede. 2. Die hidrologie van die fonteine suid van Pretoria.
FOCKEMA, R. A. P., B.Sc.	1946	One year.	University of Pretoria.	Geology of the Transvaal system near the confluence of the Crocodile and Pienaars Rivers.
GROENEVELD, D., B.Sc.	1947	Een jaar.	Universiteit van Pretoria.	„Geology North-West of the confluence of the Crocodile and Pienaars Rivers".
JOUBERT, P., B.Sc.	1948	One year.	University of the Witwatersrand.	The old Granites and Associated Rocks (Charnokites) of Southern Natal, North of the Impengali River—Study of Phetonic Metamorphism (granitisation, palingenesis syntexis, etc., and origin of the charnokites.)
KOEN, G. M., B.Sc.	1946	Een jaar.	Universiteit van Pretoria.	Die „Fig-Tree" serie naby Sheba in die Barberton Distrik.
MATTHYSEN, J. L., B.Sc.	1948	Een jaar.	Universiteit van Pretoria.	Voor-Transvaalse gesteentes van die distrikte van Taungs en Christiana.

APPENDIX III—(*continued*).
BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
POTGIETER, C. T., M.Sc.	1946	Hernuwe vir 1947 en 1948.	Universiteit van Stellenbosch.	„The lithology and structure of the George Granite Plutons and the invaded Malmesbury sediments".
SCHWELLNUS, I. S. J., B.Sc.	1947	One year.	University of Pretoria.	Geology of a portion of M'Phatlele's Location.
SCHMIDT, E. R., B.Sc.	1946	One year.	University of Pretoria.	Merensky Reef near Rustenburg.
SWART, B., B.Sc.	1947	Een jaar.	Universiteit van Stellenbosch.	Die kaartering van die Tafelberg-Witteberg serie in die Wupperthal omgewing (24 vierkante myl) asook 'n palaeontologiese en petrologies-mikroskopiese ondersoek van die Bokkeveld serie.
Tregidga, J. A., B.Sc.	1948	One year.	University of Cape Town.	Petrology of the Marble Delta, Port Shepstone, Natal.
(iv) *Wiskunde/Mathematics.* SUMNER, D. B., B.A., M.A., M.Sc. Senior Lecturer in Mathematics at University of the Witwatersrand. (On study leave.)	1946	Renewed for 1947.	Cambridge University, England.	Inversion of improper integrals and the study of singular integral equations.
(v) *Fisika/Physics.* ALTMAN, C., B.Sc. (Hons.)	1948	One year.	University of the Witwatersrand.	Investigation into methods of plotting long distance thunderstorms.
COOKE, H. M., B.Sc.	1947	One year.	Natal University College.	Investigation into the electric fields associated with atmospheric discharges including the night form of atmospherics.

APPENDIX III—(*continued*).

BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
KLUG, A., M.Sc.	1947	Renewed for 1948.	University of Cape Town.	Investigation of crystal structure by means of X-Rays with special reference to the structure of— (*a*) P-Bromochlorobenzene; (*b*) Triphenylene.
V. D. MERWE, J. HERMANUS, M.Sc.	1946	Een jaar.	Universiteit van Stellenbosch.	Die spektrochemiese bepaling van sink in baie klein hoeveelhede in plante materiaal.
V. D. MERWE, J. HENDRIK, M.Sc. Assistent Navorsingsbeampte, W.N.N.R. — Houer van Koningin Victoria Beurs.	1948	Verlengbaar vir twee jaar.	Bristol University, Engeland.	Toeretiese Fisika.
(vi) *Sielkunde/Psychology.* FLEMINGER, Miss M. E., M.A.	1946	Renewed for 1948.	University of Cape Town in collaboration with the National Institute for Personnel Research.	Studies of fatigue and output of industrial operatives.
DU TOIT, Miss E. C. M., M.A.	1948	One year.	University of Pretoria.	Abstract reasoning ability as tested through the progressive-matrices test in various clinical syndromes.
LUNDIE, Miss C. F., M.A. Junior Lecturer in Psychology, University of the Witwatersrand and H. B. Webb Gift Research Scholar.	1947	Renewed for 1948.	University of Chicago.	Factor analysis of primary mental abilities and application of this technique to construction of scholastic intelligence and personnel selection tests.

APPENDIX III—(*continued*).
BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
(vii) *Dierkunde/Zoology.*				
ALBRECHT, Miss E. R., B.Sc.	1947	Renewed for 1948.	University of Cape Town.	The development stages of the Cape Brachyura.
BURSELL, E., B.Sc. (Hons.)	1947	Renewed for 1948.	Natal University College.	The humidity reactions of Peripatopsis Moseleyi Wood-Mason.
COHEN, C., B.Sc.	1947	Renewed for 1948.	University of Cape Town.	The breeding seasons of S.A. intertidal animals.
CRASS, R. S., B.Sc.	1947	Renewed for 1948.	Natal University College.	Systematics, life-histories, habits and ecology of insects inhabiting Natal rivers and streams and the part they play in the food of the trout.
MJI, D. J., B.Sc.	1946	One year.	S.A. Native College, Fort Hare.	Parasites and diet of Ardea Melanocephala.
MOKHEHLE, C. N. C., B.Sc.	1946	One year.	S.A. Native College, Fort Hare.	Ecto- and endo-parasites of the Swift, Caffrapus Caffer Caffer.
(viii) *Ingenieurswese/Engineering Subjects.*				
HORN, R. P. S., B.Sc. (Eng.).	1948	One year.	Natal University College.	Study of the fine structure of the lower atmosphere and phenomena of super-refraction of 3 c.m. pulses; Design, construction, testing and calibration of pressure indicator and hygrometer to produce a continuous F.M. U.H.F. radio signal, suitable for use with captive balloon; Design and construction, testing and calibration of automatic recorder; Design, construction and alignment of radio frequency circuits of a 3 c.m. pulse transmitter.
MCCULLOUGH, S. G., B.Sc. (Eng.).	1948	One year.	do.	
ODENDAAL, M. W., B.Sc. (Eng.).	1948	One year.	do.	
OGLE, J. F., B.Sc. (Eng.).	1948	One year.	do.	

APPENDIX III—(*continued*).
BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
SEMMELINK, A.	1946	One year.	University of Cape Town.	Research on Anti-Submarine Instruments.
VILJOEN, J. T. B., B.Sc. (Q.S.).	1947	Extendable for a second year.	University of Pretoria in collaboration with the National Building Research Institute.	Analysis of Housing Costs.

B. NAVORSINGS-ASSISTENTSKAPPE/RESEARCH ASSISTANTSHIPS.

1. GESKOOLDE ASSISTENTSKAPPE/SKILLED ASSISTANTSHIPS (£350–£450).

DAY, J. H., B.Sc., Ph.D. Professor of Zoology, University of Cape Town.	1948	Extendable for two years.	University of Cape Town.	Ecological survey of South African Estuaries.

2. ONGESKOOLDE ASSISTENTESKAPPE/UNSKILLED ASSISTANTSSHIP (£120–200).

BOTHA, P. J., M.Sc., Ph.D. Senior Lektor in plantkunde, Potchefstroomse Universiteitskollege.	1947	Hernuwe vir 1948.	Potchefstroomse Universiteitskollege.	Die lewensgeskiedenis, anatomie, ekonomiese belangrikheid en ontkiemings fisiologie van 'n aantal Suid-Afrikaanse wortelparasiete, nl. Alectra Vogelii, A.Melampyroides, Striga Lutea en Orobanche Ramosa.
DAY, J. H., Ph.D., F.L.S. Professor of Zoology.	1946	Renewed for 1947.	University of Cape Town.	Survey of the sublittoral fauna of Table Bay and False Bay.
DE VILLIERS, C. G. S., M.A., Ph.D. Professor in Soölogie.	1946	Een jaar.	Universiteit van Stellenbosch.	Navorsings katalogus vir Departement van Soölogie.

APPENDIX III—(*continued*).

BYLAE III—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
FREER, P., B.A. (Hons.), F.L.A. Librarian, University of the Witwatersrand.	1946	Renewed for 1947.	University of the Witwatersrand.	Compilation and preparation for publication of a supplement to the "Catalogue of Union Periodicals".
JACKSON, S. P., M.A., D.I.C. (London) Senior Lecturer in Geography, University of the Witwatersrand.	1946	Renewed for 1948	University of the Witwatersrand.	Meteorology of the Plateau regions of Southern Africa.
ROHWER, E. F. G. H., Ph.D. Senior Lektor in Skeikunde. SCHEFFLER, T. B., D.Sc. Lektor in Fisika.	1947	Een jaar.	Universiteit van Stellenbosch.	Disperse verspreiding van soute in nie-isomorfe kristalle deur middel van 'n X-straal-vakuum-spektrograaf.

APPENDIX IV.

BYLAE IV.

PUBLICATIONS received from holders of grants awarded by the C.S.I.R. in 1946, 1947 and 1948.
(*Medical, Dental and Nutritional Research.*)

PUBLIKASIES ontvang van houers van toelaes wat die W.N.N.R. gedurende 1946, 1947 en 1948 toegeken het.
(*Mediese, Tandheelkundige en Voedings Navorsing.*)

SKRYWER/AUTHOR.	ONDERWERP/TITLE.	TYDSKRIF/JOURNAL.
Abrahams, Dr. L. C.	The Masticatory Apparatus of the People of Calvinia and Namaqualand in the North-West Cape of the Union of S.A.	Journal of S.A. Dental Association, Vol. 1, No. 4, pp. 1–51, December, 1946.
Allison, A. C., B.Sc.	The Structure of the Stomach of the South African Aardvark-Orycteropus Afer.	The S.A. Journal of Science Vol. XLIII, July, 1947.
Brenner, S., B.Sc.	The Identity of the Microsomal Lipoprotein Ribonucleic acid complexes with cytologically observable chromidial substance (Cytoplasmic ribonucleoprotein) in the hepatic cell.	S.A. Journal of Medical Science (1947) 12, 53–60.
	Non-Specificity of the Nadi-reaction for the cytochromo oxidase cytochrome C System.	S.A. Journal of Medical Science, July, 1947.
Bull, G. M., M.B., Ch.B.	Postural Proteinuria.	Clinical Science, Vol. 7, No. 1, July, 1948.
Cassirer, Miss M.	A Preliminary Report on Difference in coloration of Adipose Tissue in the Bantu.	S.A. Journal of Science, Vol. XLIII, July, 1947.
Gillman, J., M.B., Ch.B., D.Sc.	A Quantitative Study of the Nature of the Inhibition of Oestradiol by Testosterone Propionate as assessed by the reaction in the Perineum of the male and female castrated baboon.	S.A. Journal of Medical Science, 1947, 12. (Co-Author: Miss C. Gilbert.)
	Rupture of the Uterus of Nutritional Origin.	S.A. Journal of Medical Science, 1947, 12. (Co-Authors: T. Gillman and C. Gilbert.)
	Puerperal Inversion of the Uterus of Nutritional Origin: An experimental study of the Albino Rat.	S.A. Journal of Medical Science, 1947, 12. (Co-Authors: T. Gillman and C. Gilbert.)

SKRYWER/AUTHOR.	ONDERWERP/TITLE.	TYDSKRIF/JOURNAL.
Gillman, J.—(*continued*).	Anoxia and the Liver with special reference to shock and chronic malnutrition.	S.A. Journal of Medical Science, 1948, 13. (Co-Author: T. Gillman.)
	The Importance of the time factor in assessing the Oestrogenic and other effects of Testosterone propionate on the perineum of male and female castrated baboons.	S.A. Journal of Medical Science, 1947, 12. (Co-Author: C. Gilbert.)
	The Bantu Salivary Glands in chronic malnutrition with a brief consideration of the Parenchyma-Interstitial Tissue Relationship.	S.A. Journal of Medical Science, 1947, 12. (Co-Authors: T. Gillman and C. Gilbert.)
	Cytosiderosis and the Genesis of arteriosclerosis and other fibrous tissue reaction.	Nature, 1947, 159. (Co-Authors: T. Gillman, J. Mandelstam and C. Gilbert.)
	The Pathogenesis of cytosiderosis as evidenced in malnourished Africans.	Gastroenterology, 1947, 8. (Co-Author: T. Gillman.)
	Malnutrition and Pellagra in South Africa.	Nutritional Reviews, 1947, 5. (Co-Author: T. Gillman.)
	Liver Disease in Johannesburg in relation to Pellagra.	Lancet, 1, 1948. (Co-Author: T. Gillman.)
	Congenital abnormalities in the rat.	S.A. Journal of Medical Science, 1948, 2. (Co-Authors: C. Gilbert and Spence.)
	Differential Reactions in the reproductive tract of baboons having different physiological backgrounds evoked by prolonged oestrogen stimulation.	S.A. Journal of Medical Science, 1948, 13. (Co-Author: C. Gilbert.)
Goldberg, L., M.Sc., D.Phil., A.R.I.C.	A Survey of Vitamins in African foodstuffs: Part V Part VI Part VII	S.A. Journal of Medical Science: 1946, 11. 1946, 11. 1947, 12. (Co-Authors: J. M. Thorp, Sheila Sussman and M. Kropman.)

SKRYWER/AUTHOR.	ONDERWERP/TITLE.	TYDSKRIF/JOURNAL.
Irving, J. T., B.A., M.A., Ph.D., M.D.	Enamel formation in the Rat's Incisor Tooth.	Nature, 5/10/1946.
	Action of Fluorine on the teeth of Rachitic Rats.	Nature, Volume 28/12/1946.
Kincaid-Smith, P., B.Sc.	A Preliminary Report on the Histological Modification in the Adrenal Cortex of Rats subjected to cold.	S.A. Journal of Medical Science, Vol. XLIII, July, 1947.
Odendaal, W. A.	Nutritional value of Food Yeast (Torula Utilis).	Clinical Proceedings, Vol. 7, No. 2, Feb. 1948. (Co-Author: J. J. Theron.)
	Dental Caries—Aetiology and Prevention.	S.A. Dental Journal, Vol. XXI, No. 5, 1947.
Sapeika, N., M.B., Ch.B., Ph.D.	The effect of stilboestrol on the blood pressure of the Albino Rat.	Arch. Int. Pharmacodyn., Vol. LXXVI, 1948, No. 3.
Schepers, G. W. H., M.Sc., M.B., B.Ch., D.Sc.	Evolution of the Forebrain.	Published by Messrs. Maskew Miller, Cape Town, 1948.
Stein, I., L.D.S., R.C.S., M.D.S.	Oral Sepsis as a Source of Focal Irritation.	Journal of the Dental Association of S.A.
Tobias, P.V., B.Sc.	The Characterization of the Spermatogenial Chromosomes of the Albino Rat.	S.A. Journal of Medical Science, July, 1947.

APPENDIX V.
BYLAE V.

RESEARCH BURSARIES and ASSISTANTSHIPS awarded by the C.S.I.R. in 1946, 1947 and 1948.
(*Medical, Dental and Nutritional Research.*)

NAVORSINGSBEURSE en ASSISTENTSKAPPE wat die W.N.N.R. gedurende 1946, 1947 en 1948 toegeken het.
(*Mediese, Tandheelkundige en Voedings Navorsing.*)

A. BURSARIES/BEURSE.

1. SENIOR BURSARIES/SENIOR BEURSE (£200–£1,000).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
BULL, G. M., M.B., Ch.B., 1939. Former Assistant to Professor of Clinical Medicine, University of Cape Town.	1947	One year.	Post-Graduate Medical School, London.	Investigation into the benign proteinurias and the question of the renal disturbance accompanying cardiac failure and certain related problems.
BUDTZ-OLSEN, O. E., M.B., Ch.B., 1942. Assistant to Professor of Clinical Medicine, University of Cape Town.	1947	Two years. Renewed 1948.	1. University of Cape Town; 2. The Radcliffe Infirmary, Oxford.	The coagulation of the blood and haemorrhagic diseases.
GILLMAN, J., M.B., Ch.B. 1932, D.Sc. 1939. Senior Lecturer in Anatomy, University of the Witwatersrand.	1948	Extendable for a Second year.	University of the Witwatersrand.	1. Reproductive Physiology in the Baboon. 2. Nutritional Research in man and animals. 3. Relation between macromolecules, arteriosclerosis and carcinoma.
WYNDHAM, C. H., M.B., Ch.B. 1940, M.R.C.P. 1945.	1948	One year.	Oxford University.	Industrial Clinical Physiology under high temperature conditions.
ERASMUS, J. F. P., M.B., Ch.B. 1933, Ch.M. 1940. Senior Surgeon and Lecturer in Surgery, University of the Witwatersrand.	1947	One year.	University of the Witwatersrand.	1. The application of surgery in the treatment of psychic disorders and epilepsy. 2. A study of the problem of intractable pain.

APPENDIX V—(*continued*).
BYLAE V—(*vervolg*).

2. STUDENT BURSARIES/STUDENTE BEURSE (£100–£200).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
HERMAN, J. B., B.Sc. 1938, M.B., Ch.B. 1941. Student.	1947	One year.	University of Cape Town.	Carbohydrate metabolism in Diabetes—an investigation of nicotinic acid in the blood sugar of diabetic patients.
KATZ, A., M.B., Ch.B. 1942, Ch.M. 1946. Student.	1947	One year.	University of Cape Town.	Regeneration of Autonomic pathways with special reference to cases who have undergone denervating operations on the sympathetic nervous system.
DELPORT, H. L., B.Sc. 1945. Student.	1947	Twee jaar. Hernuwe vir 1948.	Universiteit van Pretoria.	Die waarde van Rumen-inhoud van beeste as 'n bron van Riboflavine in Pluimveerantsoene.

B. RESEARCH ASSISTANTSHIPS/NAVORSINGS-ASSISTENTSKAPPE.

1. SKILLED Assistantships/GESKOOLDE Assistentskappe (£350–£450).

IRVING, J. T., B.A. (Cantab.) 1923, M.A., Ph.D. (Oxon.) 1927, M.D. (Cantab.) 1931, M.R.C.S., L.R.C.P. 1931. Professor of Physiology, University of Cape Town.	1947	Two years. Renewed 1948.	University of Cape Town.	1. The Influence Fluorine and other factors upon dentin and enamel formation. 2. The assay of foodstuffs for Vitamin A.
CROCKER, Mej. C. G., M.Sc. (Rand.) 1931, Ph.D. (S.A.) 1946. Lektrise in Bakteriologie aan die Universiteit van Pretoria.	1947	Twee jaar. Hernuwe vir 1948.	Universiteit van Pretoria.	Tipering van Suid-Afrikaanse stamme van typhoide basille deur middel van bakteriofage.

APPENDIX V—(*continued*).
BYLAE V—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
JANSSEN, E., M.D. (Leyden) 1937, B.M., Ch.B. 1944. Professor in Kindergeneeskunde, Universiteit van Pretoria.	1947	Twee jaar. Hernuwe vir 1948.	Universiteit van Pretoria.	1. Rooiselle in die bloed by wanvoeding. 2. Aangebore gebreke van die Neonatus.
BREMER, J. K., M.B., Ch.B. 1935, F.R.C.S. (Eng.) 1938. Senior Lektor in Snykunde, aan die Universiteit van Pretoria.	1947	Twee jaar. Hernuwe vir 1948.	Universiteit van Pretoria.	Spatare.
KLOPPERS, P. J., M.B., Ch.B. 1939, M.D. 1944, F.C.C.P. 1944. Professor of Clinical Medicine, University of Pretoria.	1947	Two years. Renewed 1948.	University of Pretoria.	The dynamics of the circulation of blood.
PIJPER, A., M.D. (Leyden) 1912. Professor in Siektekunde aan die Universiteit van Pretoria.	1948	Een jaar. Verlengbaar vir nog 'n jaar.	Universiteit van Pretoria.	Sigbaarmaking van sogenaamde flagella van bakterieë met „phase contrast" mikroskopie.
HEYNS, O. S., D.Sc. 1945, M.R.C.O.G. 1937. Professor of Obstetrics and Gynaecology, University of the Witwatersrand.	1947	One year.	University of the Witwatersrand.	Obstetrical and gynaecological problems.
ELLIOTT, G. A., M.R.C.P. 1932, M.B. 1939, M.D. 1941, F.R.C.P. 1943. Professor of Medicine, University of the Witwatersrand.	1948	One year.	University of the Witwatersrand.	Investigation of the anæmias of pregnancy to be carried out at the Alexandra Health Centre.
GILLMAN, J., M.B., B.Ch. 1932, D.Sc. 1939. Senior Lecturer in Anatomy, University of the Witwatersrand.	1947	Two years. Renewed 1948.	University of the Witwatersrand.	Primate reproduction and Nutrition.

APPENDIX V—(*continued*).
BYLAE V—(*vervolg*).

Naam en Kwalifikasies. Name and Qualifications.	Jaar waarvoor Toegeken. Year of Award.	Duurte van Toekenning. Tenure of Award.	Waar Geldig. Where Tenable.	Onderwerp van Navorsing. Subject of Research.
GOETZ, R. J., M.D. (Frankfurt) 1935, M.D. (Berne) 1936, M.B., Ch.B. 1944. Research Associate Professor, University of Cape Town.	1947	One year.	University of Cape Town.	1. The anatomy and physiology of arterio-venous anastomosis. 2. The histology and pathological physiology of Glomus tumours. 3. Progressive systemic sclerosis.
JORDAAN, J. C., M.B., Ch.B. 1939, M.Ch. 1942. Senior Lektor in Urologie, Universiteit van Pretoria.	1947	Een jaar.	Universiteit van Pretoria.	Bilharzia.

2. UNSKILLED Assistantships/ONGESKOOLDE Assistentskappe (£120–£240).

ODENDAAL, W. A., M.Sc. 1937, D.Sc. 1942. Senior Lektor in Physiologie.	1947	Twee jaar. Hernuwe vir 1948.	Universiteit van Pretoria.	Die verband tussen Nutrisie, Endokrinologie en Siektetoestande.
EPSTEIN, E., M.B., B.Ch. 1935, D.O.M.S. 1940. Ophthalmic Surgeon and part-time Lecturer in Pharmacology, University of the Witwatersrand.	1947	One year.	University of the Witwatersrand.	Corneal grafting in rabbits. Influence of blood groups and correlation with successful grafts.
WATT, J. M., M.B., Ch.B. 1916, M.R.C.P.E. 1934. Dean of Faculty of Medicine, University of the Witwatersrand.	1947	One year.	University of the Witwatersrand	Allergic Diseases in South Africa.