

**C. S. I. R.**

**1961**

**SEVENTEENTH ANNUAL REPORT**  
(Afrikaans version obtainable separately)

**Council for Scientific and Industrial Research**

Ann. Rep. S. Afr. C.S.I.R., no. 17, pp. 1-35, i-xxiv, Pretoria, South Africa, 1961

P.O. Box 395  
PRETORIA  
1st Jan., 1962

Sir,

*I have pleasure in presenting to you the Seventeenth Annual Report of the Council for Scientific and Industrial Research. This Report covers the period 1st April, 1961, to the 31st December, 1961. Future reports will cover the period January to December.*

*Balance sheets and statements of income and expenditure for the financial year ended 31st March, 1961, certified by the Controller and Auditor-General, were included in the Sixteenth Annual Report.*

*I have the honour to be,  
Sir,  
Your obedient servant,*

**S. M. NAUDÉ**  
PRESIDENT: COUNCIL FOR SCIENTIFIC  
AND INDUSTRIAL RESEARCH

The Hon. Dr. N. Diederichs  
Minister of Economic Affairs  
Paul Hof  
Minnaar Street  
PRETORIA

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Published in 1962 by the  
South African  
Council for Scientific and Industrial Research  
P.O. Box 395  
PRETORIA

Text set in 10 on 11 pt. Times Roman

Printed in the  
REPUBLIC OF SOUTH AFRICA  
by  
Wallachs Printing & Publishing Co. Ltd.  
67 Paul Kruger Street  
PRETORIA

## PREFACE

This report follows the same pattern as the Council's Fifteenth and Sixteenth Reports. Separate reports are issued on the national research laboratories and institutes. Whereas previous reports were on the financial year, April to March, this report is for the calendar year, 1961. It is hoped that Parliament will find it of value to have before it a report on the immediately preceding year.

In the presentation of this report, attention is directed to the research services provided by the Council for industry, local authorities, provincial administrations and government departments.

Financial statements for the Council's financial year which ended on 31st March, 1961 were included in the Sixteenth Annual Report. Statements for the current financial year, which ends on 31st March, 1962, will appear in the Eighteenth Annual Report.

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## GENERAL REVIEW

The last report referred briefly to the Council's reassessment of all aspects of its policy and operations. This task of consolidation, which has gone on continuously, is leading up to the second stage of Council's development.

When the Council was established in 1945, organized scientific research was virtually unknown in South Africa outside the fields of agriculture, veterinary medicine and geology. Industrial research was in its earliest beginnings. Although scientists in our universities and museums had a proud record, the development of science had been spasmodic. Research schools had grown up around gifted individuals, but there had been no continuity. The first task was to establish science on a satisfactory footing.

The Council's plans were outlined by its first President, Sir Basil Schonland, C.B.E., F.R.S., in a report *Objects and Policy—an initial statement*, which was approved by Parliament. This programme has been followed in broad outline during the past sixteen years and though much remains to be done, the main objectives have been achieved.

Ten national research laboratories and institutes have been established. Technical services for the design and construction of special equipment, instrument-making and repair, have been provided. A central library has been developed in such a way that it can also serve as a national scientific and technical library.

National research  
laboratories and  
services

The Council's policy has been to build up basic research programmes geared to the needs of industries, local authorities, provincial administrations and government departments. As basic research must to some extent anticipate the needs of the country's industries and public services, so that when the actual problems arise the basic knowledge required for their solution is already available, a sound basis of co-operation with the bodies concerned is essential if scientific services are to be developed most effectively in the national interest.

This is particularly true of those laboratories and institutes which are concerned with the basic scientific disciplines such as mathematics, physics and chemistry. The main purpose of these laboratories is to ensure that the Republic has all the services of these sciences at its disposal. As there are few national problems which are purely mathematical, physical or chemical, the Council's policy is to encourage collaborative projects in which its scientists can work as teams with scientists in other fields on common problems. It is encouraging to be able to report that other bodies and government agencies are co-operating in giving effect to this policy. Within the Council's own organization, several inter-laboratory research groups and units have been formally constituted.

It is frequently necessary to examine the economic aspects of certain applied scientific and technical projects while the research is in progress. These investigations are undertaken by industrial economists working in close association with the scientific staff, usually on attachment to the institutes or units concerned. During the year, the main fields in which these industrial

economic sections were active, included building construction, urban Bantu housing, road construction, timber utilization, ceramics, the utilization of surplus potatoes and postal mechanization.

#### Medical research

Medical research has been developed by provision of support for units, groups and projects in existing institutions, in addition to *ad hoc* grants to individuals. The total provision for medical research in 1962 is R325,968 (£162,984), of which R52,680 (£26,340) is for *ad hoc* grants to individuals. All these funds are "passed on", i.e., they are not spent within the C.S.I.R. organization. A list of medical research units and groups appears in Appendix I and a description of their activities can be found in the Sixteenth Annual Report.

#### University research

Support for university research has been provided through senior and student bursaries, as well as grants for assistantships, general running expenses, equipment and publication. In 1946 the total amount provided for all these purposes was R27,800 (£13,900). The universities and other institutions applied for only R16,526 (£8,263). In 1962 the allocation for research grants in fields other than medicine is R299,754 (£149,877). Applications amounted to R537,338 (£268,669). This provides some measure of the extent to which research in the natural sciences has been stimulated at our universities. The Council regards these grants as supplements to the universities' research funds and is becoming increasingly concerned at the evident inability of the universities to make adequate provision for research from their own resources. This is a matter which is receiving attention.

#### Keeping in touch

Contact with scientists in other countries is maintained through the South African Scientific Liaison Offices in London, Washington and Cologne, through membership of the International Council of Scientific Unions and its affiliated unions, and through participation in the programmes of these and other international scientific organizations. In this respect, the Council serves as a clearing house for information on South African science and for the dissemination of information received from abroad.

The effective participation of South African scientists in international scientific programmes requires the services of a central organization and special arrangements to this end have been made by the Council. For example, the sum of R64,500 (£32,250) provided by the Government for participation in the International Indian Ocean Expedition 1962/63, will go mainly to workers at universities and museums. They will all be taking part in a well co-ordinated national programme which forms part of an international programme. In this way the funds provided can be used most effectively in the interests of the individual scientists, as well as in the national interest and for the advancement of knowledge.

Information on attendance at international scientific conferences is given in Appendix 2.



While the primary purpose of the Library is to serve scientists in the Council's national research laboratories and institutes, industrial and other organizations are making increasing use of the Library's services for the location and procurement of publications. The development of these services has been limited by the lack of funds and staff, but good progress has been made with the compilation of *Periodicals in South African Libraries*, the union list of holdings of serial titles in 131 co-operating libraries. This is being produced in collaboration with the University of South Africa, which is responsible for the humanities under a grant from the National Council for Social Research.

## Documentation

Attention has been given to the development of services for the more effective dissemination in South Africa of both local and overseas research findings. Towards this end, a start has been made with the further development of the translation, editorial and publishing services. The co-ordination and widespread dissemination of scientific and technical information with a view to practical application in particular fields of technology, requires the collaboration of research workers in the fields concerned. A pattern for this type of service which is being evolved in the National Building Research Institute, includes active collaboration with international groups, with building research organizations in neighbouring and overseas countries, and with South African industry, local authorities, provincial administrations, government departments and the professions concerned with building.

Progress has been made with the patenting and licensing of inventions as a means of promoting industrial development and encouraging the application of research results. The total value of inventions manufactured under licence from the C.S.I.R. has exceeded R6,000,000 (£3,000,000) and has earned royalties to the value of R450,000 (£225,000). The Council is now giving positive support to the further development of inventions which may arise from its national research programmes.

## Inventions

From the outset, research work at the C.S.I.R. gave rise to a demand for the design and manufacture of special research instruments and apparatus. The Technical Services Department was instituted to meet these requirements and it has successfully produced a great variety of equipment, ranging from the most delicate and sensitive instruments to heavy machinery.

## Technical services

Because of the geographical isolation of South Africa, it is necessary that we should be self-sufficient as far as possible and, because of this, the skill of the artisan and his equipment is taxed to the utmost.

In addition to prescribed basic training, apprentices undergo advanced instruction to equip them for the special problems encountered in the development of research apparatus. A planned course in scientific instrument-making, which provides for the training of artisans as development technicians, is being continued with great success. Through this, a valuable contribution is made towards alleviating the shortage of skilled workers in this field, not only within the C.S.I.R., but in a wider sphere as well.

Design and construction of apparatus is not undertaken without good reason, as it is not the policy of the Department to make instruments and other

equipment that can be bought ready-made. The cost of most prototypes is extremely high; to duplicate articles already available would be wasteful. However, should an urgent research project be held up because the necessary apparatus has to be imported from overseas, suitable equipment may be constructed. The services of this department are also utilized for the manufacture and development of certain prototype instruments which might eventually be manufactured commercially.

Work commissioned by industries and government departments is also undertaken in cases where these services cannot be provided by private firms. The C.S.I.R. has been able to repair certain instruments and testing apparatus which would otherwise have had to be sent to the manufacturers overseas.

The unique assignments given to the Technical Services Department have yielded a wealth of knowledge and experience. This is now made available to technicians elsewhere through *C.S.I.R. Research Review*, in which the section INSTRUMENTATION AND TECHNIQUES carries information on workshop practice and techniques, and on completed instruments and apparatus.

#### Changes in organization

The demand for the services of the National Physical Research Laboratory and particularly of its Mathematics and Electrical Engineering Divisions, reached the stage where it became necessary to develop these two divisions into a separate institute. The first steps were taken with the appointment of the head of the Mathematics Division as the director of a National Research Institute for Mathematical Sciences. This development is closely linked with the need for additional computation facilities and electronic apparatus for research purposes. The new institute will be accommodated in a wing being added to the National Physical Research Laboratory.

In 1956, the Council for Scientific and Industrial Research and the South African Bureau of Standards were amalgamated in terms of the Standards Act (Transfer of Administration) (No. 63 of 1956). After four years, the Government has reviewed the operation of the combined organizations and the Council has been informed of the Government's intention to separate the two organizations. Pending the introduction of legislation to this effect, the Council has been requested to arrange for the South African Bureau of Standards to operate as a separate organization and the necessary steps have been taken.

Fundamental standards of physical measurement, however, remain the responsibility of the C.S.I.R. The provision of these standards was one of the specific tasks assigned to the Council by the Research Council Act (No. 33 of 1945) as amended. Over the years, the National Physical Research Laboratory has established a comprehensive range of national standards including those of length, mass, pressure, temperature, electricity, light and high energy radiation; these have been used extensively as reference standards by workers in science and industry, not only in this country but also in neighbouring territories. An active programme is maintained to ensure that these standards conform to those of other nations, and also that the techniques used are the most suitable offered by modern research to give the highest accuracy attainable.

## RESEARCH FOR INDUSTRY

The policy of the Council has been to encourage industry to do its own research, and not to regard research as something which can be left to others. Where this is not practicable, industries have been encouraged to develop their own industrial institutes through co-operative industrial research associations. Contributions by industrial subscribers are normally matched by Rand for Rand subsidies if they are guaranteed for periods of five years. The facilities of the Council's research laboratories are also made available to industries and other organizations on a repayment basis. In the financial year 1960/61, the contributions of industries to industrial research institutes amounted to R201,282 (£100,641) and the total amount paid to the C.S.I.R. for investigations under contract amounted to R959,705 (£479,852/10/0).

Industrial research forms the largest and most diverse part of the activities of the Council's national research laboratories and institutes.

Industry in the Republic has developed to the stage where it is largely self-sufficient in many fields and it has become increasingly important that problems should be solved locally, as they arise. Not only must industry keep pace with developments abroad but it must contend with many problems which are peculiar to local conditions. To meet these demands, the Council's policy has been to build up equipment and train research workers so that they have the background to solve typical problems that may be expected. Some projects are taken up because they are sponsored by individual firms or by industries acting through their associations; others to provide data of value to industry or because they are expected to contribute to future industrial development.

The National Physical Research Laboratory has assisted the mining industry in applying the methods of absorption spectroscopy for determining the residual impurities in gold of very high purity. Infra-red spectroscopy was found to be a very convenient method for detecting the poisoning of resins used in the extraction of uranium.

Physical methods  
of analysis

Radioactive tracer techniques were used to make a more accurate assessment of the fire assay method for determining the amount of gold in ore. The same techniques also provided the evidence for deciding that in pumping water from a certain group of mines, some recirculation of the water was taking place.

Development of new ion-exchange materials by the National Chemical Research Laboratory has progressed in the past year. One of the new materials produced has been applied to paper and, under suitably chosen conditions, gives an excellent ion-exchange membrane. An apparatus for making these membranes continuously in large sizes has also been developed and built. In other forms, the same material is well suited to recovery of certain metals in solution and a large batch has recently been made to test its potential for uranium recovery.

Ion-exchange  
materials

A completely different type of ion-exchanger is ammonium molybdophosphate, which has great potentialities in simplifying recovery of radio-caesium from wastes from nuclear reactors. Development of this has been carried out in collaboration with the Atomic Energy Research Establishment at Harwell, in the United Kingdom.

- Graphite electrodes**      A new type of graphite electrode developed by the National Chemical Research Laboratory has been tested out under industrial conditions and gives every indication that it can replace imported electrodes.
- Corrosion**              Huge national losses due to corrosion of metals are experienced each year and much of this could be saved by taking proper measures. Assistance has been provided to industry by the C.S.I.R., almost from its inception, but it has extended its activities in the past year by setting up a Corrosion Unit in the National Chemical Research Laboratory. This consolidates the present effort, and aims at formation of an enlarged staff with specialized training in and experience of corrosion.
- Microbiology**          A Microbiological Group has been formed from the combined resources of the National Chemical Research Laboratory and National Nutrition Research Institute. This enables work to be planned more effectively and means that the service which the C.S.I.R. can offer to industry in this field is greatly improved.
- Ceramics**              The Ceramics Unit, which has been formed by the National Building Research Institute and the National Chemical Research Laboratory to serve the ceramics industry, has continued to carry out a large amount of work under contract, and its services are now clearly considered indispensable by the ceramics industry. This is in large part due to the complete range of specialized equipment it has at its disposal. To use its heavier equipment effectively, it has been necessary to build a large extension for the Unit during the past year.
- Mechanical equipment**      While manufacturing industry is usually in a position to solve its own production problems using conventional methods, research and development work is often required to resolve difficulties peculiar to local raw materials or conditions. Circumstances also arise in which manufacturing firms require investigations of limited scope but do not have the necessary facilities. The National Mechanical Engineering Research Institute caters for both requirements and has contributed to the solution of many specific problems.
- This institute is often called in to investigate causes of failures in practice, as well as to undertake stress analyses of components subjected to severe loading conditions. Manufacturers of fans and pumps have been assisted with investigations on the working stresses and efficiency of their products. Fatigue testing, forming part of a programme of laboratory testing under controlled conditions in combination with field tests, was undertaken to assist manufacturers in the development of improved wire ropes for various purposes (mainly mine hoist ropes) and equipment such as rock drills for pneumatic hammers.
- Many aspects of the mechanical handling and treatment of cement clinker, in which worthwhile economics can result from a better understanding of the mechanisms involved, were investigated on behalf of the cement industry.
- Foundry sands**          The National Mechanical Engineering Research Institute has assisted in solving difficulties arising from inadequate knowledge of local foundry moulding materials. A research fellowship sponsored by the industry for three years, has been renewed for a further period of three years.

Mine shaft hoisting equipment presents unique difficulties at the great depths involved in this country. Problems associated with the ropes used on multi-rope friction winders were overcome after the requirements were established, and methods of selecting the most suitable types of rope were evolved by the National Mechanical Engineering Research Institute, in conjunction with the mining industry and rope manufacturers.

The facilities of the National Mechanical Engineering Research Institute have been used in a concerted effort to obtain a clearer picture of the importance of each component in the design of the equipment of the shaft itself, which must provide some form of guidance from the conveyances, and, at the same time, leave the passage as free as possible for ventilating air. These investigations have pointed the way to further avenues to be explored for additional improvements. It has been demonstrated that laboratory tests on models of proposed new configurations involving streamlined mine shaft structures, or rope-guidance of the conveyance, could be carried out reliably and effectively. This places a valuable tool in the hands of the designer with which his plans can be checked before they are committed to construction.

The pumping of large quantities of turbid mine water from deep-level mines causes rapid wear in pumps, leading to low efficiency and early replacements. Settling of water underground becomes progressively more expensive as the degree of settlement is improved. A study of both aspects of the problem was carried out, and a formula for estimating the optimum condition as well as for continually checking the turbidity of the water was developed by the National Mechanical Engineering Research Institute.

Problems associated with mining at great depth in the Witwatersrand goldfields were investigated by the National Mechanical Engineering Research Institute. In deep-level mining, one of the biggest problems is the sudden violent implosion of part of the workings without prior warning, known as rockburst. The conditions which lead to this phenomenon are already partly understood, but prevention or control can be achieved only when the problem is fully understood. This involves, *inter alia*, studies of the properties of rock and how it behaves under various mined conditions. Some of the institute's achievements in the field of deep-level mining, in addition to a statistical study of incidence of rockbursts, have been the development of reliable methods of testing rock specimens, improved strain measuring devices for use in small boreholes which are capable of measuring strain continually, advanced three-dimensional model testing methods (involving both photo-elastic and brittle models) to study the effect of excavations, and investigations into the possibilities of destressing the rock ahead of an advancing work face. From this work, there have emerged valuable indications as to the best layout to be followed in the planning of mines which are now being opened up. It is apparent, however, that the problem is inherently extremely complicated and that inevitably progress will be slow.

A start was made two years ago on investigations into strata movement and control in collieries. A recent decision was taken by industry to expand the work, part of which is to be undertaken at the C.S.I.R. Initial work has been concentrated on the further development of instrumentation to suit colliery conditions, and the application of model studies to investigate the anticipated effect of various degrees of extraction in a colliery. The clearer picture which is emerging from the data collected was of help in drafting the proposed research programmes for future work.

- Timber utilization**      The Timber Unit set up in the National Building Research Institute carries out research and co-ordinates all the services of the C.S.I.R. to the forest products industry, in close collaboration with the Department of Forestry, and with industry. The Unit has maintained its policy of keeping in close contact with the industry it serves by frequent visits to the major firms involved, and by cordial relations with the various associations representing the subdivisions of the industry. This enables the Unit to direct its activities and development along those lines which will result in the solution of the most urgent problems.
- Active research on the increased, but rational, use of timber in building, both as a primary construction material in timber houses, and in other building applications, is in progress in collaboration with the Departments of Forestry, Commerce and Industries, Bantu Administration and Development, and Housing, and private industrial interests.
- Cyclone resistant house construction**      An extensive building programme, involving some 40,000 new houses, has recently been initiated by the authorities in Mauritius, to replace houses damaged or destroyed by a cyclone a few years ago. To assist the authorities and the South African firms tendering for this work, investigations of the resistance to cyclonic wind forces of certain proprietary South African systems of low-cost housing construction have been carried out by the National Building Research Institute.
- The properties of South African pre-stressing steel**      The utilization of pre-stressed (or post-stressed) concrete techniques for structures is on the increase in South Africa, and many more bridges using this type of design will be constructed. Two important aspects concerning the properties of prestressing steel manufactured in South Africa are being investigated by a Research Fellow working at the National Building Research Institute. This work is sponsored by the manufacturers jointly with a professional group concerned with the use of prestressed concrete.
- Brick research**      Under the sponsorship of the Transvaal Clay Manufacturers Association, a "guest worker arrangement" was initiated at the beginning of 1961, whereby an officer of the Association was appointed and accommodated in the National Building Research Institute. In collaboration with Institute staff, and other C.S.I.R. agencies, he undertook research and development into the economic and technical aspects of the building-brick industry. The brick industries have now formed the South African Brick Association to continue, in collaboration with the C.S.I.R., work of this type together with promotion activities.
- Development of light weight aggregates**      In collaboration with the Government Metallurgical Laboratory, the Geological Survey and the C.S.I.R. Ceramics Unit, a new project for the study of the properties of clays and shales with a view to determining their suitability for lightweight aggregate production was initiated in the National Building Research Institute.
- Industries and internal water control**      Investigations have shown that proper water control in a factory can bring about substantial savings in water consumption. This requires intelligent planning, changes in manufacturing processes and systematic technological research. A striking example is the case of a factory manufacturing pulp for

the rayon industry, where a saving of approximately 7 million gallons of water per day resulted from research done by the factory under the direction of the National Institute for Water Research.

Various industries are experiencing great difficulty in regard to effluents, and during the year investigations relating to these problems were undertaken on a contract basis.

#### Effluent problems

These investigations have been particularly successful at Bellville. Here the anaerobic digestion process was applied to the effluent of a starch factory, where great difficulty had been experienced. These large-scale investigations are based on fundamental research undertaken in the laboratories of the National Institute for Water Research some years ago.

Because of the success achieved with the anaerobic digestion process in the case of starch effluent, the Institute has undertaken a similar investigation on the effluent from distilleries in the Western Province. The investigation in Paarl is being undertaken as a co-ordinated project for which a well-known engineering firm is, at its own expense, providing plant valued at R24,000 as well as maintenance services. The work is being done in collaboration with the wine industry, interested municipalities, the Oenological Research Institute and the Department of Health. Certain analytical services and other facilities are provided by the Paarl Town Council.

In certain industries usable by-products are often unwittingly discharged with effluent. This not only causes pollution of water sources but results in unnecessary wastage of usable water supplies. Control of processing materials is, therefore, an important factor in the prevention of pollution and the effective utilization of water.

#### Recovery of waste materials

A paper factory, collaborating with the National Institute for Water Research, has succeeded in recovering practically all the processing chemicals from its waste water. At present the chemical replacement amounts to only 12% where previously it was 100%.

In South Africa, as in Europe and America, the use of synthetic detergents for domestic purposes is increasing and already there are unmistakable signs of the presence of these detergents in our rivers. In accordance with the Water Act a high standard is maintained in the purification of sewage water in South Africa. The biological purification processes, however, have little or no effect on synthetic detergents; this not only causes serious disturbance of plant and animal life in our rivers, but also affects the efficiency of both sewage purification and the subsequent purification of drinking water. The presence of synthetic detergents in purified sewage works effluent and in surface water has a deleterious effect on the use and re-utilization of water in certain industrial processes, e.g. in boilers, cooling units and low-pressure evaporation.

#### Synthetic detergents

The National Institute for Water Research, under a contract with a South African industry, is investigating the suitability of a locally manufactured detergent which can be removed by biological purification unlike the imported product, which is not affected by such processes.

## Personnel selection

Great interest is being maintained in problems of management development. A preliminary step taken by a number of organizations, is to select promising material, from within their ranks, for special development courses or to be singled out for training in other ways. The National Institute for Personnel Research is contributing significantly to selection techniques, among which the "In-basket" Test, which simulates a real life executive situation, is proving very successful. A large insurance company has introduced this procedure for promotion purposes and has sent members of its secretarial and personnel staff to the National Institute for Personnel Research for training in the use of this and other selection methods.

The shortage of trained personnel psychologists in the country creates problems in the practical implementation of testing programmes, as the more advanced techniques can only be used by professionally qualified persons. By designing tests which do not need a sophisticated approach, and by means of special *ad hoc* training, this problem can be overcome to some extent. A strong case exists, however, for the institution of a diploma or degree in personnel management in one or more of the South African universities. A two-year post-graduate training course, following on a B.A., B.Sc. or B.Com. degree, with psychology as a major, would probably best meet industry's needs in this field.

## Attitude studies

Industry is showing an increased awareness of the value to be derived from attitude studies in its labour force. At present the National Institute for Personnel Research is investigating the problem of productivity in an industry, using extensive attitude schedules to determine the relationship between output and attitudes among all levels of workers. There is a possibility that this study will be repeated later in other sectors of this industry.

## Job evaluation

The National Institute for Personnel Research has also been called upon to undertake job evaluation for sponsors in three enterprises, covering life insurance, fertilizer manufacture and beverage production. In addition to well-known evaluation techniques new procedures intended to study the rationale of job evaluation will be tried out. These are based on the assumption that a man's concept of his organizational status is linked with the length of intervals between review of his function ("Time span of discretion").

Another new approach is being tested in which the possibility of setting up an effort index will be examined. This index is intended to distribute tasks in an organization in accordance with such phenomena as mental effort and vigilance required from the job incumbent. These studies will aim at finding a compromise between the often conflicting views of management and job incumbents concerning the relative worth of jobs.

## Guidance to management

The National Institute for Personnel Research is planning a series of training and appreciation courses to present its research findings on sound personnel procedures to management through the medium of courses at the Institute. Early in 1962 the first course will be presented, dealing with work study, personnel selection, group dynamics, morale and training. This course is intended for management exclusively. Other courses being planned are those dealing with training in personnel selection procedures and the training of Bantu supervisors.



## RESEARCH FOR LOCAL AUTHORITIES

There is an increasing awareness on the part of municipalities that in the provision of various services to their ratepayers, such as sewerage and sanitation, water supply and the treatment of industrial effluent, they are often forced to rely on antiquated and unsatisfactory processes and municipal authorities are showing a growing interest in research aimed at the improvement of existing techniques and the development of new techniques suitable for present-day conditions.

A review of the research activities during the past year clearly shows that the C.S.I.R. is becoming increasingly involved in the investigation of municipal problems such as housing, treatment of water supplies, sewage purification, sanitation and composting of domestic wastes.

Within a municipal area specific problems requiring investigation by specialized technologists, often arise. Examples of these problems are industrial effluents of exceptional nature and volume, pollution of lakes at pleasure resorts, or even sea pollution, a problem faced by a number of coastal municipalities.

An important aspect of the work undertaken by the National Institute for Water Research during the year was continued research on the use of stabilization ponds for sewage purification in small communities, and the use of maturation ponds for further purification of sewage effluent to render it suitable for re-use. In Windhoek, for instance, research is aimed at further purification, by chemical means, of biologically purified sewage in order to supplement the water supply of the city.

Purification of  
sewage for re-use

The conservation of water and the prevention of pollution are closely linked with the provision of proper sanitary services in the catchment areas of rivers. The National Institute for Water Research is making a comprehensive study of sanitary systems which will be both economical and efficient for Bantu communities, smaller rural communities and temporary development schemes.

Sanitary services  
in peri-urban  
areas

There are no design criteria for sewage purification works, and many water purification processes are unsatisfactory. As this also affects the national economy, the National Institute for Water Research has initiated an investigation into actual problems. At the same time basic research is undertaken in respect of flocculants and flocculation processes.

Water treatment  
and investigation  
of the efficiency  
of existing plants

This project is nearing completion. During the year attention was given to such factors as the presence of pathogenic organisms and helminthic eggs in the final product of various composting units, including the C.S.I.R.'s own pilot plant. An investigation relating to the ash in domestic refuse was also undertaken.

Composting of  
municipal wastes

During the year the co-operation of the Johannesburg City Council was obtained. The Council operates a large refuse transfer depot which could produce useful data on domestic refuse. The co-operation has also been obtained of the Department of Agricultural Technical Services for field tests at its

Horticultural Research Station, of the Polio Research Institute for a virus investigation at the pilot plant and of the University of Pretoria (Institute for Pathology) for bacteriological examination of various compost specimens. The City Council of Pretoria has given valuable assistance in the operation and maintenance of the pilot plant at the local sewage works.

**Atmospheric pollution**

A long-range programme of measuring the amount of atmospheric pollution present in a number of urban areas, (undertaken by the National Physical Research Laboratory), has resulted in a co-operative effort by a number of bodies to formulate suitable legislation for the control of activities likely to produce pollution.

**Fire research**

The main work on fire research carried out by the National Building Research Institute, besides the gathering and analysis of fire statistics, was an investigation into suitable test methods for determining, under South African conditions, the fire resistance of timber, and the various related fire retardant treatments available.

The system of reporting and analyzing fires on a national basis, made possible by the whole-hearted co-operation of the municipal fire brigades, is being continued and will enable attention to be devoted to major fire problems.

**Temporary low-cost housing**

The Timber Unit has been associated with a large emergency low-cost housing scheme, being carried out at Kwa Mashu near Durban. To further this research, twelve temporary timber houses, costing about R55 each, have been obtained. One of these, which was erected for demonstration purposes, is being used for thermal behaviour studies.

**Urban Bantu townships**

To reduce, if possible, the rentals and service charges payable by Bantu inhabitants in urban Bantu townships, the National Housing Office is sponsoring an investigation, which is being undertaken by the Institute, into the costs of providing essential services in these townships. The terms of reference of the investigation are to analyze the costs of services and, if possible, to recommend ways and means of reducing these costs without, however, affecting the standard of services provided.

Studies of the costs of seven services, namely administration, roads and storm water drainage, street lighting, rubbish removal, water reticulation, sanitation services and the maintenance of houses, were completed during the year. These studies concerned twenty-two townships situated throughout South Africa. Reports on the studies are now being consolidated into book form for eventual distribution to local authorities responsible for urban Bantu housing.

**Kaffir beer**

The Kaffir Beer Unit set up in the National Chemical Research Laboratory with financial support from municipalities through the Institute of Administrators of Non-European Affairs, is generally recognized as fulfilling an essential rôle. During the year, the Unit has added to its facilities by building a small pilot plant which is able to produce 25 gallons of kaffir beer at a time.

On behalf of a local authority, the National Institute for Personnel Research is investigating the intoxicating effects of kaffir beer, as compared with European

types of liquor. Effects are being studied in terms of central nervous impairment, responses on skilled tasks and work output. This investigation includes a survey of drinking habits in the social and family life of the urbanized Bantu and a study of the work output of labourers in relation to their drinking habits.

A number of projects of direct interest to coastal communities, such as those concerned with harbour situation, sea pollution and anti-shark measures, are referred to in this report under the general heading of *Marine Studies* (see p. 30).

Coastal studies

## RESEARCH FOR PROVINCIAL ADMINISTRATIONS

Research by the National Institute for Road Research is undertaken in collaboration with the roads departments of provincial administrations. This work is described in the section on *Transport* (see p. 19). In addition to road research, much of the work of the National Building Research Institute on school and hospital buildings and of the National Institute for Water Research is sponsored by or undertaken in the interest of provincial administrations.

### Hospital buildings

These investigations cover the design of the hospital as a whole, including polyclinics, and detailed planning studies of various departments within the hospital complex. Since the project started in 1955, research has resulted in conclusions on a number of aspects. Much of the work done has been incorporated in the Bantu hospital at Bloemfontein, now in the course of construction, and for which the research workers acted as planning consultants. However, not only are many aspects yet to be investigated, but also changing concepts on the rôle of the hospital in a community are leading to the reassessment of programmes of accommodation.

The building is planned for specialized functions at a particular time, but unfortunately the rapid development of medical equipment soon renders original decisions obsolete. Future developments must therefore be indicated so that both planning and organization may anticipate changes.

A recent report is concerned with the extension of the research programme to include the regional development of hospital services in under-developed areas, and sets out proposals for a rational approach by taking into account economic aspects and the application of research findings. Research during the year has indicated that by proper consideration of the above factors, the development of hospital services can avoid conditions leading to unbalanced distribution of facilities and can make the most of available funds.

An investigation at present in progress is concerned with engineering service installations, and the importance of this work may be gauged by the fact that up to 40 per cent of the initial capital cost of a hospital building is consumed by these installations. The provision of engineering services in other types of building also justifies much additional research.

### Functional design of school buildings

Two reports, one covering ventilation, and the other thermal and lighting design of school buildings, were drafted and are now being prepared for publication. All functional aspects such as ventilation, thermal design with respect to both summer and winter conditions, and natural and artificial lighting were considered. With regard to winter heating, a new theory was developed for calculating heat losses into the various structural components. Good correlation was found between experimental and predicted heat loads.

A start was also made with additional experimental work on the ventilation and lighting design of workshops for technical schools. So far, attention has been mainly devoted to workshops with saw-tooth type roofs. Again, use was made of scale model techniques for obtaining the essential design information.

### School buildings— architectural research

This project was initially undertaken on behalf of the four Provincial Administrations, and has covered research into the school buildings necessary

to house the child from nursery school age through to matriculation. The latest developments include the study of a high school to accommodate 1,200 pupils, the replanning of industrial art centres, domestic science centres, science laboratories and school libraries. It has become necessary to undertake these investigations on a virtually continuous basis as a result of changes in educational policy, and methods of teaching particular subjects.

Recently, the field of research has been broadened to cover the buildings associated with vocational education, and work in respect of commercial and technical high schools is well advanced.

A vital factor in the success of this work has been the active participation and interest of the Transvaal and O.F.S. Education Departments. A striking feature of all the Institute's work on schools is the interest shown by other African states at the recent C.S.A.\* Meeting of Specialists on School Buildings.

During the past year the Regional Laboratory of the National Institute for Water Research has continued with its investigations of the Swakop and Fish Rivers. The former research project has already provided important data for constructive planning and for conservation of subterranean water in the bed of the Swakop River.

Extensive tests have been conducted to determine the possible uses of water from new boreholes.

The Administration is also responsible for urban water supply schemes, and in this respect the Laboratory provided important advisory and analytical services.

The Regional Laboratory of the National Institute for Water Research in Durban is engaged mainly on biological and chemical surveys of the major rivers in the province. This work is sponsored by the Town and Regional Planning Commission. In addition, the research services are also employed in the development of water supply schemes under the control of the Provincial Water Engineer.

The major project undertaken by the laboratory during the past year was the study of sea pollution (see p. 30). The Administration has a direct interest in this work and is one of the sponsors of the project.

In collaboration with the Transvaal Provincial Administration much research has been done on the factors affecting fresh-water fish life. It was found, for example, that variations in temperature had a greater influence than was thought.

The Water Affairs  
Division of the  
Administration of  
South West  
Africa

The Natal  
Provincial  
Administration

\* A separately published, detailed report on these activities was issued for the year 1959/1960.

## RESEARCH FOR AND IN COLLABORATION WITH GOVERNMENT DEPARTMENTS

### Digestion in ruminants

Some years ago, a combined team was formed by Onderstepoort and the C.S.I.R. to investigate this problem. It is now well established and work published in the last year has given rise to enquiries all over the world, together with an invitation to present a paper at an international conference in Canada in 1962. Many laboratories are working on problems of ruminant digestion, but the particular aspect selected by the combined groups has been the development of methods to distinguish quantitatively between different groups of micro-organisms in the rumen, and to study the effect of changes in diet on the balance between them.

### Fibre production

Assistance has been given to the Department of Agricultural Technical Services in its aim to produce locally-grown fibres from kenaf (stokroos) in place of jute. The process of retting to obtain clean fibre is a complex microbiological problem, and much information has been provided on controlling and accelerating this process.

### Desalting of water

The National Chemical Research Laboratory has designed and set up a small unit (in the Uppington area) to desalt brack water, so that the Department of Agricultural Technical Services can carry out experiments on limiting salinities of drinking water for stock.

### Plants poisonous to animals

Chemical work on the poisonous principles is being carried out in the National Chemical Research Laboratory, while physiological research and feeding tests are carried out by Onderstepoort. Further progress in geeldikkop was obtained by discovery of a new, highly toxic substance. The poisonous principle of krimpsiekte was isolated and proves to be one of the most powerful poisons ever discovered.

### Protein chemistry

The special facilities developed in the National Chemical Research Laboratory have, among other things, been applied to assist the Central Tobacco Research Institute in isolation of a new antibiotic, and the Veterinary Research Laboratories at Onderstepoort in studies of an antigen and a toxin. The latter are of particular importance in production of sera.

### Building climatology

Good progress was made by the National Building Research Institute with the instrumentation of an automatic weather observing station.

The electronic recorders developed in collaboration with the National Physical Research Laboratory for recording all information in binary code on punched tape were built and installed. Keen interest in the system has been shown by several overseas scientific organizations.

Preliminary discussions were held with the Weather Bureau regarding the availability of basic weather data on punched cards for assessing more detailed design data for a larger number of stations in the Republic and South West Africa.

At the request of the C.C.T.A. Inter-African Committee on Housing, a start was made with the compilation of climatic data in tabular and simple

graphic form, suitable for use in building design for a number of centres in Africa south of the Sahara. These data, together with descriptive matter on how they can best be used, will be circulated to all member countries of C.C.T.A for comment and suggestions before being finally published.

Following on a C.S.I.R. survey concerning the socio-economic status and housing preferences of Coloured families in the Western Cape, a group of seven experimental prototype houses was planned and built on the Cape Flats for the National Housing Commission. The actual construction work was under the direct control and supervision of staff of the National Building Research Institute. These houses demonstrate the type of planning and use of materials in construction which should be suitable for housing the low-income Coloured population. Due to the climatic conditions peculiar to the Western Cape, particular attention has been paid to solving economically the problems of preventing the ingress of moisture through walls and floors and at external door openings. A similar group of four experimental houses was built near Johannesburg.

Housing for  
Coloureds

In South Africa millions of Rand have been invested in buildings which are built entirely or partially of sandstone or other similar natural building stones. Churches, monuments, public buildings and buildings of historic interest are typical examples. In the course of time, these stones are inclined to "weather" and deteriorate, and their subsequent repair and maintenance is often expensive, if not completely impractical.

Weathering of  
building stones

Following on discussions between the Department of Public Works and the National Building Research Institute, a sponsored investigation into this problem has been arranged in co-operation with the Geological Survey, with a view to developing preventive methods and preservatives. This investigation is concerned not only with existing buildings, but is also aimed at ensuring that only durable building stones will be used in the future.

The nature and degree of pollution to which a river or stream is subject is determined by the geographic characteristics of the catchment area and the accumulation of pollutants resulting from activities in the area. The pollution potential of an area, therefore, depends on whether it is an industrial, a residential, a Bantu or an agricultural area. As little is known about pollution in different areas it may happen that, because of the present rapid industrial development of the country, areas are allotted for specific purposes on an arbitrary basis without regard to factors of pollution that might affect water supplies adversely.

River pollution  
and regional  
activities

The National Institute for Water Research has embarked upon a research programme aimed at classifying areas according to the degree of pollution obtaining in each. It should be possible to apply the results of this fundamental research in the planning of new townships and in this way to combat pollution and evolve a sound basis for the development of catchment areas.

An extensive research programme has been undertaken to deal with possible biological accumulation of radioactive material in the Crocodile River — Hartebeestpoort Dam complex.

Biological accumu-  
lation of  
radio-active  
material

**Water storage  
and distribution**

The National Building Research Institute has completed research into the performance of a large multi-arch dam supplying a South African industrial city. Corrosion problems, encountered in several water pipe-lines serving large cities, have also been investigated during the year.

The properties of concrete, using Portland blast-furnace slag cement made from South African blast-furnace slags, make it an ideal material for mass concrete dam construction. This slag cement was originally developed at the Institute and its use, not only for dams, but for many other purposes, is widely accepted. However, further necessary fundamental research is being carried out. The National Building Research Institute is at present also busy with a mineralogical investigation into slags from different sources, with a view to determining their properties in relation to their use in the manufacture of cement.

**Agricultural  
engineering**

The improvements in agricultural methods and increased mechanization have given rise to problems with a mechanical engineering background which often require specialized technical experience if a satisfactory solution is to be reached. The National Mechanical Engineering Research Institute has participated in several such investigations, the apparatus at its disposal and the specialized knowledge of its staff being effectively used by Government departments.

**Nutrition and  
food**

As in the past, the services of the National Nutrition Research Institute were made available to government departments and other undertakings. Special mention must be made of co-operation with the Department of Health in problems concerning the incidence of kwashiorkor, and in combating the disease by distribution of powdered milk. In order to investigate certain special problems concerning products controlled by the Oilseed Control Board, a research contract with the Board was entered into. The nutritive value of certain maize products, such as baker's cones was determined on behalf of the Mealie Industry Control Board and as a result of this, it was possible to reaffirm the scientific basis for the prohibition on the free sale of baker's cones.



## TRANSPORT

The road "industry" in South Africa, served by the National Institute for Road Research comprises the activities of rural and urban road authorities, the former being responsible for the greater part of the country's expenditure on the construction and maintenance of roads—estimated currently at some R75 million per year, excluding expenditure by urban authorities.

The task of the Institute, indeed the aim of all road research, is to find ways and means of building better and safer roads at the minimum cost to the country. Since this is also the aim of every highway department, it is evident that the research worker and the highway engineer have a common objective which can best be attained by very close co-operation between them. The Institute serves the roads departments in several different ways, the two most important of which being basic research into problems which arise in the field and the investigation in close collaboration with the roads authorities of the various practical problems which arise and which often demand quick *ad hoc* solutions.

The Institute's work on surfacings provides perhaps the best example of the importance of the road itself in the research pattern. The public road provides the best laboratory for road research and, indeed, the carefully designed and controlled full-scale road experiment provides not only the final proof of research findings, but often provides the only research tool that can be used. An example of this is the series of road experiments recently begun to determine the durability and cost of surfacings on new construction laid to a variety of different specifications and on roads covering a range of traffic conditions. The first experiment in this series was constructed on the National road between Standerton and Volksrust in 1960 and is over 3 miles long and comprises some 60 different specifications. The next experiment was laid near Malmesbury in the Cape in 1961 and covers an even wider range of materials on a road carrying less traffic. A third experiment is now planned to extend this series into lighter and more economic types of surfacing construction for roads carrying very light traffic.

Bituminous  
surfacings

Careful inspection of the performance of all these experiments over a period of years, together with a study of costs, will enable recommendations to be made to roads authorities on the choice of specifications to give the best technical and economic results in different situations.

South Africa has a much greater mileage of gravel roads than of "black-top" road and current expenditure on improving and maintaining the gravel road system is estimated at R20 million annually. Although the greater volume of traffic in South Africa is now carried by the surfaced road system, the gravel road in the rural areas is still the most important link to this system and provides a large part of the "farm-to-market" road mileage.

Gravel roads

Research aimed at improving methods of building and maintaining these roads and at reducing annual maintenance costs per mile has been started on a serious scale this year with particular emphasis, initially, on reduction in dust and loss of material from the gravel surface.

A series of full-scale road experiments is currently being laid to investigate the use of waste liquor from the rayon pulp industry in Natal for stabilizing gravel surfaces, and promising results have been obtained from the first trials.

## Road foundations

One of the most important research projects in the Institute is a long-term basic study of the problem of designing road foundations which are both adequate and economic for South African conditions. This problem has many aspects to it and includes the study of the engineering properties of natural road building materials, many of which give rise to peculiar problems of their own.

Practical investigation on a road to find a particular solution to a problem can however also be of value to the basic research effort. An example is the Institute's recent investigation into the problem of cracking in the surfacing of the new Durban-Pietermaritzburg main road. A series of field investigations in collaboration with the National and Provincial road authorities has revealed the main causes of the trouble, indicated possible remedial measures and also means of avoiding similar trouble on new roads in this area.

The Soil Mechanics Divisions of the National Institute for Road Research and the National Building Research Institute work together on several common projects and much of their work is complementary. In this way, the fundamental studies being undertaken by the National Building Research Institute on moisture transfer and the strength of partially saturated soils is directly related to problems of road construction.

## Development of special instruments

One of the most important measurements the road engineer must make in controlling the construction of new road foundations is that of moisture content and density of each foundation layer. The institute has been working in recent years on the new radio-isotope method for making these measurements rapidly and non-destructively and has designed an improved instrument that is being manufactured by a South African firm and sold at a price that compares very favourably with that of imported equipment. This equipment and another piece of apparatus developed by the Institute for sub-surface soil exploration will, it is hoped, find a considerable sale overseas and thus encourage South Africa's secondary industry in the export market.

## Studies on costs of road building

In most countries the capital resources available for road construction and improvement are severely limited. The State, be it through the central government or provincial authorities, is faced continuously with the problem of how to allocate scarce funds, including provision for roads, in the most economical manner. In South Africa, apart from the current expenditure on roads to which reference has already been made, there are indications that vast amounts of capital and revenue funds will be required for the expansion, improvement and maintenance of the country's urban and rural road network in the next 20 years. The Institute has recently begun an appraisal of the cost-benefit type of analysis, which aims at providing a means not only of comparing investment in road works with other forms of capital expenditure, but also of determining the relative merits of different road projects. The object is to provide road authorities with a basis for deciding on the priorities of different schemes by relating the cost of them to the likely net benefits resulting therefrom, i.e., a basis for assessing the economic returns from investing in road works.

It is estimated that the present investment in road plant by the four Provincial Road Authorities in South Africa and the Roads Department of South West Africa amounts to about R30 million at book value. The value of new purchases amounts to about R6 million per annum.

During the past year a further series of studies concerning the performance rates and possible operating costs of alternative types and makes of road plant

have been made on behalf of a Provincial Road Authority. The results of these investigations, based on purely economic grounds, together with other considerations, were used as a basis for making certain tender recommendations to the Executive Committee of the particular Administration. The Institute undertook these studies as it was considered that considerable savings could be effected by road authorities if they are provided with some basis for the selection of plant on purely economic grounds, though it is recognized that this does not take into consideration all the relevant factors governing the selection of plant.

Following on these investigations, the Institute completed a study of the very important problem of earth-moving techniques based on economic considerations. It is hoped that this study will contribute greatly towards the formulation of an earth-moving policy that may result in considerable savings for Provincial Road Authorities.

Although in the field of materials and methods of construction the scientific needs of the "road industry" are being met reasonably adequately at present by the National Institute for Road Research, in the field of traffic engineering and road safety the available funds and research effort are quite inadequate. The cost to the country of road accidents has been put as high as R60 million per year. If research can do anything to reduce the increasing annual "accident bill", it must be sponsored and financed on a scale commensurate with the problem.

The present small Division in the National Institute for Road Research can do little more than build up basic data to enable the most important fields for study to be defined, and to investigate certain particular problems on an *ad hoc* basis.

As an example, one of the most important factors required in this research is data on annual mileage travelled by various classes of road user and various types of vehicle, so that exposure to risk can be evaluated and accident rates found which enable meaningful statistical comparisons to be made. Records available from official sources do not give this type of data and the Institute has attempted to obtain information on mileage travelled, first for the country as a whole on the basis of motor fuel consumption and, secondly, in more detail in the Pretoria licensing area by means of a questionnaire survey. This survey has yielded useful information and will probably be extended to other large urban areas.

Other recent projects have included preliminary studies of the effect on night-time accidents of the compulsory fitting of reflectors to all motor vehicles, the influence of alcohol on accident frequency, the behaviour of different classes of driver at "stop" signs, and special studies of particular lengths of road having abnormally high accident rates. Close co-operation with the National Road Safety Council is maintained in all aspects of this work.

The National Road Safety Council is considering the possibility of instituting tests for professional drivers. It is realized that the use of tests to determine the driving ability of all motorists, would not be justified at this stage. Experience gained in the testing of professional drivers who are more seriously exposed to the risk of accidents, and who are also more likely to involve members of the public, may provide an indication of the extent to which testing of other

Traffic and  
safety research

Tests for  
professional  
drivers

drivers might be feasible (e.g. it might be possible to test those involved in more than one accident to determine whether they are accident prone). A task group has been set up under the chairmanship of the Director of the National Institute for Personnel Research to plan an extensive programme of experimental testing and follow-up of professional drivers. A study is being made of procedures used overseas and of the success of existing test programmes in South Africa, before experimental testing is put into operation.

**Aeronautical  
research**

Aeronautical research has so far gained little recognition in South Africa, due to the lack of an aeronautical industry in the country. However, the results of an investigation undertaken by the National Physical Research Laboratory in co-operation with the National Mechanical Engineering Research Institute and the Weather Bureau, under the guidance of the National Advisory Committee on Aeronautical Research, has demonstrated that operational conditions, as far as gustiness is concerned, are more severe here than elsewhere in the world. Further research on these aspects has been advocated. Care has been taken in the procurement of basic aerodynamic research equipment such as wind tunnels for the National Mechanical Engineering Research Institute, to ensure that as far as possible, they will be suitable for aeronautical research work.

**Railways and  
harbours**

In the field of railways and harbours, the National Mechanical Engineering Research Institute was instrumental in the development of suitable laboratory tests for items such as special insulating fishplates for rails, certain features of concrete sleepers, and rubber dock fenders. In each case, available equipment could be adapted to the special requirements.

## MANPOWER

Manpower questions continue to engage the attention of the National Institute for Personnel Research. Further analyses have been made of the data collected in the course of a survey of the educational achievements and occupational intentions of white male persons between the ages of 17 and 19 years. It has been confirmed definitely that 43% of those with educational qualifications below Std. VIII had at least a 70% chance of passing that standard, but failed to do so largely through lack of incentive.

Currently a survey of white labour resources in the building industry is being carried out in all the principal centres of the Republic. The aim of the survey is to assess the likely flow of new apprentices into the industry, by carrying out a study of the attitude of school-leavers towards employment in the building industry. An assessment is also being made of the number of qualified and experienced building workers currently available and their attitude towards conditions of service in the building trades. Alongside this enquiry, another is being conducted to determine the functions of non-whites in the industry, the level of efficiency achieved by them and the factors that determine their productivity. Finally, the scope for mechanization and the possibility of achieving greater productivity by means of organizational changes and enhanced managerial efficiency, are being investigated.

Estimates of future demand for skilled labour have been undertaken by the Building Costs and Economics Section of the National Building Research Institute. These estimates involve a projection of building activity during the period in question, and the translation of this activity level into skilled labour requirements. This estimate, in conjunction with that regarding probable future supply will, it is hoped, provide some indication of the magnitude of any shortage of skilled labour which could occur during future periods.

Industry in South Africa has paid much attention during the year to the desirability and possibility of raising Bantu wages. A number of high-level conferences have concerned themselves with this theme and various problems have been encountered which require further consideration before practical action can be taken on a significant scale. The National Institute for Personnel Research has contributed considerably to the discussion of these problems in the light of its own investigations involving mine labourers, employees of public authorities and of secondary industry. Many thousands of cases are involved in these studies directed towards the origins of the labour force; its work preferences; job attitudes and aspirations; reactions to conditions of service, supervision, wages and the like.

Some interesting facts have emerged concerning characteristics of the black industrial labour force, as one finds it in and around Johannesburg. Using three criteria for urbanization, namely: continuous residence in an urban area for not less than five years, residence of wife and family in the urban area, and not possessing land-rights in a rural area, it was found that approximately half of a large sample of over 1,000 cases could be looked upon as urbanized. Of those not fully urbanized, less than one-fifth still followed a migrant pattern.

The commonly held view that the Bantu worker drifts from job to job and frequently interrupts his work periods with prolonged visits to rural areas, is not borne out by these investigations. The survey showed that 70% of the group could be looked upon as industrialized men who had never reverted to rural work.

**Development of  
Bantu labour**

Studies were also made of the typical migrant worker as employed on the mines. 90% of the Bantu mine labourers have no wish to be engaged in any paid employment other than mining. A smaller proportion eventually find their way to industry. 16% of an industrial sample were found to have an early history of mining. These were probably men who had used mining as a jumping off point; they differed from the mine-going group in respect of personality, being more self-reliant and less in need of the paternalistic environment of mines and compounds. Basically the mineworker remains a peasant who prefers the rural way of life, and his tours of mine employment are interludes compelled by economic circumstances.

The difficulty experienced by Bantu subjects at all educational levels, in thinking in terms of three-dimensional spatial relations, or in obtaining three-dimensional impressions from drawings of the conventional type has been referred to previously. This basic study is being pursued further in the field of stereoscopic vision in order to determine to what extent the deficiency of the Bantu is due to cultural and educational or to constitutional factors. Practical use is already being made of the results obtained in these enquiries in two studies of the interpretation by Bantu subjects of health and safety posters.

## NUTRITION RESEARCH

(Many of the medical research units and groups supported by the C.S.I.R. are investigating nutritional problems. Information on these activities was given in the Sixteenth Annual Report, pp. 63 and 73).

General policy

The activities of the National Nutrition Research Institute included research aimed at improving the nutritional status of the South African population, special services to government departments and other authorities, special services to private industries, and liaison with other interested bodies on an international and national level.

The work on food and nutrition was aimed firstly at determining the nature and extent of malnutrition, under-nutrition and over-nutrition and, secondly, at finding how best to combat existing unfavourable conditions.

As very little is known of the nutritional status of the South African population, surveys were continued. Attempts were made to evolve methods and criteria suited to this country with its heterogeneous population. Progress was speeded up by the appointment of three full-time dieticians, and by the use of questionnaires to collect data on the incidence of deficiency diseases from medical practitioners in various parts of the country.

Certain diseases of particular interest to South Africa and other African states, were further investigated. These diseases fall into two main categories viz. those caused by malnutrition and under-nutrition such as kwashiorkor, marasmus, pellagra, siderosis and fatty infiltration of the liver, and those believed to be caused by over-nutrition, like the cardio-vascular diseases.

Major problems

In South Africa kwashiorkor and marasmus are by far the most common of the diseases caused by mal- and undernutrition. Special attention has, therefore, been paid to the pathology of these diseases and to the development of cheap, high-protein foods such as skimmed milk powder, oilseed meal, legume seeds, fish flour etc., which could be used in combating them. The value of skimmed milk powder as a food supplement in cases of these diseases has already been established. Work is now being done on the preparation and testing of combinations of cheap vegetable and animal protein products likely to possess the same nutritive value as powdered milk, and this may be a means of providing, at low cost, sufficient protective nutrients to children, particularly in the age group 6 months to 5 years.

Malnutrition and under-nutrition

In conjunction with the investigations, further work was done on the testing of techniques for the biological evaluation of the protein, calorie and mineral values of foods, while the physiological principles on which such evaluations are based were studied. Electron-microscopic and other histopathological techniques, as well as histochemical and microchemical techniques were studied and applied in investigations into the pathological and biochemical changes occurring under conditions of undernutrition and malnutrition.

In order to test the hypothesis that severe deficiency of protein in the diet may have both pre-natal and post-natal effects on the development of the central nervous system and hence on learning ability and ultimate intellectual capacity,

Effects of malnutrition on learning ability

a series of investigations is being conducted by the National Institute for Personnel Research, in which successive generations of laboratory rats are bred on a protein deficient diet.

#### Over-nutrition

Research on problems of the degenerative cardio-vascular diseases continued as part of the investigations into diseases which, according to available evidence, are caused by over-nutrition. These diseases are not confined to South Africa, but because of the pattern of their incidence in the different population groups (low incidence amongst non-whites and high incidence amongst whites) South Africa offers exceptional opportunities for comparative research. The present investigation of the National Nutrition Research Institute is aimed at gaining the basic information which would make it possible to determine at an early stage whether an individual would be likely to suffer from cardio-vascular diseases later, and whether the unfavourable metabolic pattern of susceptible individuals could be corrected by a change of dietary habits. The results obtained so far have been both interesting and encouraging.

#### Staple foods

For specific reasons some South African staple foods warrant particular attention in the field of food technology. They include maize, maize products and kaffir corn which constitute the staple foods of the Bantu, and also oil seed by-products which, after extraction of the oil, have thus far been used mainly for animal feeds. These often contain significant quantities of protective food proteins, minerals and vitamins and could possibly be utilized in human food.

Progress has been made in improving the souring process of mahewu and kaffir beer, in the production of a precooked maize porridge powder, in the investigation into rancidity in maize meal, the improvement of methods for the bacteriological investigation of maize porridge and determination of the protein values of maize meal, kaffir corn, kaffir beer, mahewu, enriched mahewu, soya products, sunflower seed meal and other products.

An extensive investigation into the quality of South African milk powders, in regard both to nutritive value and purity was completed. The results showed that the South African product compares favourably with those from overseas.



## MEDICAL RESEARCH

Medical research is supported by the C.S.I.R. in a number of medical research units, groups and projects, the activities of which were reviewed in the Sixteenth Annual Report, pp. 61-77. Certain projects, however, are being investigated in the Council's national research laboratories.

Studies on the biochemistry of cancer were initiated in the National Chemical Research Laboratory by the National Cancer Association, and have led to important discoveries on the nature of cancer of the liver. The work has been broadened in the past year, and studies of the biochemistry of cancer cells have been initiated to determine their difference from normal cells.

Cancer research

Work on occurrence of alkaloids in South African plants has been continued by the National Chemical Research Laboratory in collaboration with the Division of Botany of the Department of Agricultural Technical Services. The survey has been very thorough and certain of the alkaloids which have been found are of pharmacological interest. The structure of one new alkaloid has been almost completely worked out. Work has also continued successfully on the extremely poisonous "bitter principle" found in the cucumber family. Such poisons are of considerable pharmacological interest, and the work in South Africa has received wide recognition in the scientific world. A C.S.I.R. officer was invited to give papers on the work of his group at an international conference on chemistry of plant products held in Australia during 1960, and this resulted in a series of collaborative investigations which have borne fruit in the past year.

Plants important to medicine

If a selective poison could be found for the snail which transmits the bilharzia schistosome, a great step forward would have been taken. Some new ideas are being followed up at present by the National Chemical Research Laboratory and show sufficient promise for the work to be continued.

Bilharzia

## MARINE STUDIES

South Africa's early history is bound up with the sea. During the past 100 years or so the emphasis has shifted to the interior. However, with its long coast line, South Africa is essentially a maritime country, and a scientific study of the surrounding oceans has not been neglected, both from the point of view of fishing and whaling and their important influence on our weather and climate. In recent years, the C.S.I.R. has been called upon to co-ordinate and develop oceanic studies and has set up a National Co-ordinating Committee for Oceanographic research for this purpose. In addition, financial support has been provided for Oceanography Research at the University of Cape Town and a Marine Research Unit set up by the University of Natal in association with the South African Association for Marine Biological Research in Durban.

### Anti-shark measures

The C.S.I.R., after drawing attention to the fact that the shark menace on certain South African beaches warranted scientific investigation, has been instrumental in the formation of a corporate body known as the Anti-Shark Research Association Ltd. which will finance such research.

### Marine engineering

A major problem which has received the attention of coastal authorities for some time in the Natal area is the movement of sand along the Durban coastal area, and how this influences the siltation of the harbour entrance and the sand coverage of the beaches. The conclusion was reached that a model test would be required to study the problem in detail. The interested parties have combined with the C.S.I.R. in the planning of an extensive model test, based on the information derived from studies of wind and current distribution and wave formation in the Durban vicinity under various weather conditions. The work also dovetails into the investigations being carried out on the Natal coastal conditions. The model was recently completed by the National Mechanical Engineering Research Institute and initial tests were started.

### Sea pollution

The pollution of the sea along the Natal Coast resulting from the discharge of untreated sewage has serious economic implications, not only for coastal resorts where an estimated R40 million is spent annually by holiday makers, and for established industries in which several hundred million Rand have been invested, but also, through these affected assets, for the national economy in general.

The present state of affairs is due to ignorance of the consequences when untreated sewage and industrial effluent is discharged into the sea. The main purpose of the research programme is to obtain the basic information on which alone a logical approach to the whole problem can be based.

The research project has been undertaken by the C.S.I.R. in collaboration with other bodies. Four C.S.I.R. research institutes—the National Mechanical Engineering Research Institute, the National Physical Research Laboratory, the National Building Research Institute and the National Institute for Water Research—have drawn up a co-ordinated programme which also provides for the participation by certain other bodies. The Durban Corporation and the South African Marine Biological Research Association, for instance, have

assumed responsibility for specific aspects of the programme and will prepare reports on their work for submission to the Steering Committee. In addition, financial support will be provided by an important industrial undertaking and by the Natal South Coast Safety Bathing Association.

During the past year useful preliminary data have been recorded. The leader of the project also undertook an extensive overseas tour to obtain certain information on sea pollution. This tour was made possible by a generous donation from the World Health Organization on the recommendation of the Department of Health.

The Co-ordinating Committee for Oceanographic Research is also the South African National Committee for the Scientific Committee for Oceanic Research (SCOR), an international committee set up by the International Council of Scientific Unions. The major SCOR project with which South Africa is concerned is the International Indian Ocean Expedition, scheduled for 1962 to 1964, in which at least thirty oceanographic vessels from some 20 nations will be taking part.

National  
Co-ordinating  
Committee for  
Oceanographic  
Research

Considerations which determined the choice of the Indian Ocean for the first international effort of this kind were: firstly, it is the least-known ocean in the world; secondly, the correlation between the prevailing winds and surface currents can be studied over the complete period of a monsoon cycle, in which the prevailing winds completely reverse their direction; thirdly, the harvest of the sea is of vital interest to many countries bordering the Indian Ocean.

Active participants in the I.I.O.E. include scientists from the Marine Research Unit, Durban; the C.S.I.R. Oceanography Unit, Durban; the Oceanography Research Unit, University of Cape Town; the Division of Sea Fisheries of the Department of Commerce and Industry; the Marine Biological Division of the South African Museum, Cape Town; the University of Cape Town and the Weather Bureau. Ships taking part in the expedition include the South African naval vessel "Natal", the University of Cape Town's vessel "John D. Gilchrist", a hired vessel, the "Queen", and the Division of Sea Fisheries' vessel "Africana II". During the course of the year the Working Group paid visits to all the ships with the exception of the "Queen".

The Co-ordinating Committee has had splendid co-operation with the Government Departments involved in the Oceanography programme, particularly the Department of Defence which has made so much time available on the "Natal" for oceanographic research during I.I.O.E.

In addition, the Weather Bureau has been asked to take a greater part in the activities of the I.I.O.E., as meteorology will be an important item in the programme. The Division of Sea Fisheries has given considerable free ship time to a number of scientists for two long voyages during the international year.

The I.I.O.E. is scheduled to start in 1962. South Africa has so far completed only two tracks of 1,000 miles each carried out by "Africana II" during June/July. During this period "Africana II" carried out mainly biological oceanographic work. In addition, meteorological and physical oceanography observations were carried out at a number of stations.

## DEVELOPMENT OF BANTU AREAS

**Water** Some of the rivers constituting the major sources of water in South Africa rise in areas bordering on Bantu reserves, so that development of industries in those areas gives rise to special problems. Problems at present being investigated by the National Institute for Water Research include the treatment of industrial effluent, pollution caused by the concentration of Bantu communities, and effective and economic systems of sanitation.

During the past year the National Institute for Water Research, in collaboration with the Municipality of East London, has started to collect specific data on the establishment of industries and Bantu towns in the catchment area of the Buffalo River, and on the effect of these activities on the usability of water from the river.

Investigation into effluent problems arising from the establishment of industries in the Hammersdale area has also been started.

**Construction** Research already completed or still in progress in the National Building Research Institute can make a valuable contribution to the solution of problems connected with regional development. A specific example is the mapping of soils from the point of view of foundation conditions.

Soils may vary considerably even over fairly limited areas and foundation conditions vary accordingly. A thorough knowledge of these soil conditions in the planning stages of any project is necessary to allow the best use to be made of the available ground. An adequate soil map of the area is therefore necessary before any development project can be efficiently planned. In the past, the production of soil maps has required *in situ* inspection of the whole area, and has proved time-consuming and costly. In recent years great advances have been made in the interpretation of aerial photographs with the object of identifying various soil zones, and other characteristics of a site necessary to permit of its optimum development. This technique eliminates a great deal of the fieldwork, as it is only necessary to check the boundaries of the zones and to establish what the soil conditions are within each zone. It is now being successfully applied to South African conditions, and should prove most useful in any area where development is envisaged. The area north of Pretoria, including the site for border industries, has already been mapped in this way, and areas of good, bad, and indifferent foundation conditions have been delineated, substantially facilitating the regional planning and development.

**Labour** The wealth of information available in the National Institute for Personnel Research on the antecedents, needs and attitudes of Black labour should prove to be of great value in an integrated scientific plan for the development of the Bantu areas.

## SOUTH AFRICAN BUREAU OF STANDARDS

Six meetings of the Standards Council were held during the period 1st April 1961—31st December 1961. The Council was constituted as follows:—

Dr. B. Gaigher (Chairman)  
Dr. V. Bosman  
Mr. G. S. J. Kuschke  
Mr. D. Lion-Cachet  
Dr. S. M. Naudé  
Dr. J. H. Rauch  
Prof. W. G. Sutton  
Mr. J. W. van der Merwe  
Dr. F. J. de Villiers  
Mr. I. de Villiers.

As always, a considerable volume of test work was carried out for government departments. Departments for which the major part of the acceptance testing, identification and other work was done included Defence, Customs and Excise, Posts and Telegraphs, Water Affairs, South African Railways and Harbours and the State Tender Board.

Increased use of the Bureau's facilities was also made by provincial administrations and municipalities.

Services to the State

In June, 1961, the Director of the S.A.B.S. attended the Triennial Conference of the International Standards Organization held in Helsinki.

Of the 44 member bodies present at the Conference, the S.A.B.S. was the first to establish its own testing laboratories and to organize a standardization mark scheme so successful that it is now being closely followed. What he found most gratifying was that, in the field of standardization our country is among the world leaders and that the Bureau is earning international acknowledgment and esteem for South Africa.

Triennial Conference  
—ISO

As a means of keeping abreast with overseas developments in their particular spheres, senior officers of the Electrical Engineering, Packaging, Paints and Leather and Footwear Sections visited the testing and research laboratories of many countries in Europe and in the United States. Conferences and courses were also attended. All were impressed by the great emphasis placed on quality control overseas. They also noted with some satisfaction that the testing facilities available in the relevant S.A.B.S. laboratories equalled those of other countries visited.

The knowledge acquired in the course of these study tours is extremely valuable in the drawing up of specifications and in the conducting of tests.

Overseas study tours

The Entomology Section was approached by one of the most important manufacturers of pyrethrum-based insecticides in France for details of its small chamber for measuring knock-down and for information about its general methods of test.

Overseas interest in SABS test methods

Requests were received from as far afield as London, New York, Germany, Portugal and Burma for information and photographs pertaining to articles describing new methods of test evolved by S.A.B.S. technologists, published in the South African Standards Bulletin.

**Help for United States warship**

The Non-Destructive Testing Section was able to render assistance to the United States warship U.S.S. New, when a magnetic particle examination of damaged reduction gear was carried out. The help given proved beneficial and was much appreciated by the United States Embassy.

**Closer links with the consumer**

The decision to hold meetings of the Consumers' Liaison Committee on a regional basis, namely, in Durban, Port Elizabeth, Cape Town and Johannesburg in turn, instead of in Johannesburg only, proved highly successful. In addition to representatives of consumer and other women's organizations the committee now includes representatives of the big purchasers such as the South African Railways Administration, the Mining Groups, provincial administrations and municipalities. These meetings enable consumers to discuss their problems with senior officials of the S.A.B.S., while the Bureau, in turn, keeps the consumer informed of what is being, and what can be done to solve these problems.

**Compulsory specifications**

In addition to the compulsory specifications for canned meat, canned Fish and outer sole leather already administered by the Bureau of Standards, the Minister for Economic Affairs also announced his decision to declare the following electrical standard specifications compulsory. The relevant specifications cover the minimum safety requirements in respect of the undermentioned commodities:

Manually Operated Airbreak Switches, S.V. 124—1960, Portable Electric Immersion Heaters, SV 125—1960, Electric Air Heaters and Radiators, SV 126—1960, Flexible Cords for Power and Lighting Purposes, SV 127—1960, Portable Electrical Appliances for Heating Liquids, SV 128—1960, Plugs, Socket Outlets and Socket Outlet Adaptors, 129—1960, Electric Hand Lamps, SV 130—1960, Electric Stoves and Hotplates, SV 131—1960, Lampholders and Bayonet cap Lampholder Adaptors, SV 132—1960, and Apparatus Connectors for Portable Domestic Appliances, SV 133—1960.

The compulsory specifications will be administered by the Bureau of Standards.

**Standard specification for safety belt assemblies**

The Bureau was requested by the South African Road Safety Council and the motoring organizations to draw up a standard specification for safety belt assemblies. As this is a case where a poor article could be the direct cause of loss of life a quality specification is essential. Two meetings of the technical committee appointed for its preparation have been held and laboratory tests are being developed for incorporation in the specification.

Statistical data from countries overseas indicate that a good safety belt can reduce serious injuries and fatalities caused by motor accidents by between 60 and 80 per cent, as compared with cases where belts are not worn.

**The buy South African movement**

Although the Bureau could not take an active part in the "Buy South African" movement as such, it contributed in no small degree to the success so far achieved by means of its efforts, not only to maintain the quality of

locally manufactured products at a high level, but also to improve that quality. The results obtained could not have been achieved without the aid of standardization and the practical way in which it was applied to every problem. Much was done to assist industry and the Bureau experienced a greatly increased demand by local manufacturers for the comparative testing of their products against the imported article. Of particular interest were the comparative tests carried out on locally made and imported champagne bottles, and on tool handles made from locally grown and imported wood, the latter test involving the use of 156 handles of nine species of local and one of imported timber, continuing over a period of several months. A considerable volume of comparative testing of motor car components was undertaken while other tests included imported and locally made crockery, for which latter a standard specification is being prepared.

The S.A.B.S. Electronics Laboratory moved to a new site near Wonderboom Aerodrome. Reasons for this decision were to enable the testing of radios to be carried out in an area free from electrical interference, and to check the new V.H.F. radio receivers necessitated by the introduction of V.H.F. transmission by the South African Broadcasting Corporation, for transmission of interference waves. The Bureau is thus able to make its contribution towards the establishment of the new broadcasting system.

Electronics  
laboratory moved  
to Wonderboom

The following items taken at random serve to illustrate some of the developments and inspection work carried out during the period:

General

#### *Paratroopers' Boots*

The Leather and Footwear Section was approached by the Department of Defence for the production of paratroopers' boots on the lines of those used in Great Britain but with a longer leg. The South African boots, incorporating special features, were designed by technologists of the Section within four days, proving so satisfactory in test jumps by members of the first South African Parachute Unit that a further 50 pairs in different sizes had to be provided within a few weeks.

#### *Demand for Timber Inspection*

In response to a request by the Secretary of Forestry a permanent Timber Inspector was stationed in the Eastern Transvaal. This arose from a three-month trial period when a Bureau inspector stationed at Nelspruit carried out regular weekly inspections at sawmills entitled to use the S.A.B.S. mark. Because of the favourable reaction and the increased demand for mark-bearing timber and for S.A.B.S.-inspected timber for which no standard specifications exist, a further inspector was transferred to Port Elizabeth to cover the Cape area.





Appendix 1 — continued

(B) Headquarters, Services, Regional and Overseas Offices (as at 31st December 1961)

CSIR COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

P.O. Box 395  
Pretoria  
Telephone 74-6011

Executive Division

President S. M. NAUDÉ, M.Sc., Ph.D., F.R.S. (S.A.)

Vice-Presidents W. S. RAPSON, D.Phil., F.R.I.C., F.R.S. (S.A.)  
Secretary/Treasurer  
Accountant, etc.

N. STUTTERHEIM, D.Sc., A.M.I. (Chem.) E.,  
Hon. M. (S.A.) I.C.E.  
Public Relations  
see INFORMATION AND SPECIAL SERVICES  
DEPARTMENT

see ADMINISTRATIVE SERVICES  
DEPARTMENT

Scientific Liaison Offices Overseas

London

South African Scientific Liaison Office  
Chichester House, 278 High Holborn,  
London WC 1  
Telephone CHANCERY 9641

Cologne

South African Scientific Liaison Office  
c/o South African Embassy,  
Machabärstrasse 75/77, Cologne  
Telephone 7-3877

J. A. KING, B.Sc.

P. LE R. MALHERBE, D.Sc.

Washington

South African Scientific Liaison Office  
1907 K Street N.W., Washington 6, D.C.  
Telephone FE 8-1800 Ext. 21

D. R. MASSON, B.Sc. (Eng.)

C.S.I.R. regional representation

Cape Town

Western Cape Regional Laboratory, C.S.I.R.  
Liesbeek Road, Rosebank, Cape.  
Telephone 69-5588

Port Elizabeth

Midland Regional Research Committee,  
C.S.I.R.,  
P.O. Box 3013, Port Elizabeth  
Telephone 4-4131

B. R. LOMBERG, B.Sc.

H. SCHAUDER, M.A., B.Sc., *Chairman*  
I. F. NEL, *Secretary*

Durban

Natal Regional Laboratory, C.S.I.R.,  
P.O. Box 1, Congella, Durban  
Telephone 5-1741

S.W.A.

Regional Laboratories,  
P.O. Box 5035, Ausspännplatz, S.W.A.  
Telephone 4504

W. G. WINCKLER, B.A. (Hons.), Diploma  
Forestry

O. O. HART, B.Sc.

## Appendix 1 — continued

## (B) Headquarters, Services, Regional and Overseas offices

ASD ADMINISTRATIVE SERVICES DEPARTMENT  
P.O. Box 395  
Pretoria  
Telephone 74-6011

Secretary/Treasurer A. J. MILLER-SMIT, B.A.,  
M.Com.

Under Secretary/  
Treasurer J. H. VISAGIE, B.A., B.Com.

Persomel Officer and  
General Administration L. A. W. Skinner, B.Econ.

Accountant A. E. Makin, B.Com., A.C.I.S.

Registry Mrs. M. M. du Plessis

ISSD INFORMATION AND SPECIAL SERVICES DEPARTMENT  
P.O. Box 395  
Pretoria  
Telephone 74-6011

Head D. G. KINGWILL, M.Sc.

Administration J. Sales

Industrial Economics L. A. Beard, B.Com., M.B.A.

Industrial Research Development R. G. Shuttleworth, Ph.D., F.R.I.C.

Information (publishing and translating) L. R. Dickson, B.Arch.

Inventions Development A. M. Schady, B.Sc., B.Sc. (Eng.)

Library J. I. Greijbe (Miss), B.A., F.S.A.L.A.

Public Relations D. R. Maude

Research Grants M. F. Baxter

Science Co-operation E. Boden, M.Sc., U.E.D.  
(i) Pretoria—C. G. Hide, B.Sc. (Hons.)  
(ii) Washington—D. R. Masson, B.Sc. (Eng.)  
(iii) London—J. A. King, B.Sc.  
(iv) Cologne—P. le R. Malherbe, D.Sc.

Appendix 1 — continued

(B) Headquarters, Services, Regional and Overseas offices

ESTATES SECTION, C.S.I.R. P.O. Box 395 Pretoria Telephone 74-6011	<i>Administration and security</i>	A. Krüger
	<i>Accommodation</i>	W. de Beer
	<i>Mechanical Maintenance</i>	P. J. Greeff
Head D. J. J. BISSCHOFF	<i>Structural Maintenance</i>	D. P. du Plooy

TSD TECHNICAL SERVICES  
DEPARTMENT  
P.O. Box 395  
Pretoria  
Telephone 74-6011

Head J. VAN DER STAAY	<i>Graphic Arts</i>	J. B. Kirstein
Administration J. H. Bosch	<i>Design Office</i>	J. L. Kidd
	<i>Woodwork</i>	F. Kolb
	<i>Electrician</i>	S. J. Botes
	<i>Instrument Makers</i>	G. O'Grady, A. de Kleyn
	<i>Sheet Metal and Welding</i>	P. J. Fourie
	<i>Glass Blowing (N.C.R.L.)</i>	D. M. Seymour
	<i>Transport</i>	A. B. Groenewald

The Technical Services Department also maintains specialized workshops at six laboratory buildings on the C.S.I.R. site at Scientia, as well as an engineering design office at N.B.R.I.

(C) National Research Laboratories and Institutes (as at 31st December 1961)

NBRI NATIONAL BUILDING  
RESEARCH INSTITUTE  
P.O. Box 395  
Pretoria  
Telephone 74-6011

Director T. L. WEBB, D.Sc.  
Liaison S. J. RICHARDS, M.Sc.  
Administration J. H. P. J. van Rensburg

<i>Architecture</i>	D. M. Calderwood, D.Arch., Dip. Town Planning (Rand), M.I.A., A.R.I.B.A., A.M. (S.A.) T.P.I., A.M.T.P.I.
<i>Civil Engineering</i>	M. F. Kaplan, Ph.D., B.Sc. (Eng.), B.A., B.Com., A.M.I.C.E., A.M.I.Struct.E., A.M. (S.A.) I.C.E.
<i>Functional Efficiency</i>	J. F. van Straaten, M.Sc. (Eng.)
<i>Materials</i>	J. H. P. van Aardt, M.Sc.
<i>Soil Mechanics</i>	G. W. Donaldson, M.Sc. (Civ. Eng.), D.I.C.
<i>Timber Unit</i>	D. L. Bosman, M.Sc. (Mech. Eng.), M.B.A.

Appendix 1 — continued

(C) National Research Laboratories and Institutes

<b>NCRL</b>	<b>NATIONAL CHEMICAL RESEARCH LABORATORY</b> P.O. Box 395 Pretoria Telephone 74-6011	<i>Biochemistry</i> <i>Physical, Inorganic and Analytical Chemistry</i>	H. M. Schwartz (Miss), M.Sc., Ph.D. F. J. Joubert, M.Sc., D.Sc.
<b>Director</b>	P. C. CARMAN, M.Sc., Ph.D.	<i>Process Development</i>	E. O. Seipold, Dr. Rer. Nat. (Acting)
<b>Administration</b>	E. Meyer	<i>Organic Chemistry</i>	P. R. Enslin, M.Sc., Ph.D.
		<i>Ceramics Unit</i>	E. R. Schmidt, M.Sc.
		<i>Kaffir Beer Unit</i>	L. Novellie, M.Sc., Ph.D.
<b>NIPR</b>	<b>NATIONAL INSTITUTE FOR PERSONNEL RESEARCH</b> P.O. Box 10319 Johannesburg Telephone 835-2466	<i>Personnel Selection</i>	D. J. Gouws, Ph.D.
<b>Director</b>	S. BIESHEUVEL, Ph.D., M.B.E.	<i>Psychometrics</i>	A. O. H. Roberts, M.Sc., H.E.D.
<b>Liaison</b>	J. W. F. BÖHR, B.A. (Hons), H.T.D.	<i>Applied Social Psychology</i>	F. A. Verwey, B.A. (Hons.)
<b>Administration</b>	H. R. Oberholzer	<i>Ethnic Social Psychology</i>	Y. Glass (Mrs.), B.A. (Hons.)
<b>Library</b>	L. E. Andor (Mrs.)	<i>Ethnic Experimental Psychology</i>	W. Hudson, Ph.D.
		<i>Neuropsychology</i>	G. K. Nelson, M.A.
		<i>Applied Experimental Psychology</i>	H. Reuning, Dr. Rer. Nat.
		<i>Mathematical Statistics</i>	R. S. Hall, B.A., B.Comm., A.I.S., Dipl. R.S.S.
		<i>Work Study</i>	L. E. Cortis, M.A.
<b>NIRR</b>	<b>NATIONAL INSTITUTE FOR ROAD RESEARCH</b> P.O. Box 395 Pretoria Telephone 3-1261	<i>Special Problems</i>	S. H. Kühn, B.Sc., B.Sc. (Eng.), M.Sc. (Eng.), A.M. (S.A.) I.C.E.
<b>Director</b>	P. J. RIGDEN, M.Sc., Ph.D., F.Inst.P., M.Inst.H.E.	<i>Soil Mechanics</i>	A. A. B. Williams, B.Sc. (Eng.), D.I.C., A.M. (S.A.) I.C.E.
<b>Administration</b>	J. D. van Zyl, B.Com., M.B.A.	<i>Traffic and Road Safety</i>	J. Treiterer, Dipl.Ing., Dr.Ing., A.M.I.T.E., A.M. (S.A.) I.C.E.
		<i>Bituminous Materials</i>	R. N. Walker, B.Sc. (Eng.), M.Sc. (Eng.)
		<i>Industrial Economics</i>	A. E. Scheurkogel, M.Com. (Econ. & Ind.Econ.)

## (C) National Research Laboratories and Institutes.

**NITR** NATIONAL INSTITUTE  
FOR TELECOMMUNICA-  
TIONS RESEARCH  
P.O. Box 10319  
Johannesburg  
Telephone 835-5255

**Director** F. J. HEWITT, Ph.D., M. (S.A.)  
I.E.E.

**Administration** J. H. H. du Raan

*Senior Research Staff*

T. L. Wadley, D.Sc. (Eng.), A.M. (S.A.)  
I.E.E.

P. Meerholz, M.Sc.

R. W. Vice, B.Sc. (Eng.), A.M. (S.A.)  
I.E.E.

**NIWR** NATIONAL INSTITUTE  
FOR WATER RESEARCH  
P.O. Box 395  
Pretoria  
Telephone 74-6011

**Director** G. J. STANDER, M.Sc., Ph.D.

B. R. Allanson, B.Sc., Ph.D.

C. G. Bruckman, B.Sc. (Eng.)

T. F. W. Harris, B.A., B.Sc.

O. O. Hart, B.Sc. (Hons.)

M. R. Henzen, M.Sc.

P. R. Krige, B.Sc.

P. G. J. Meiring, B.Sc., B.Sc. (Eng.)

H. van Eck, Ir.

## (C) National Research Laboratories and Institutes

NMERI	NATIONAL MECHANICAL ENGINEERING RESEARCH INSTITUTE P.O. Box 395 Pretoria Telephone 3-1261	MATERIAL AND SOLID MECHANICS <i>Metallurgy</i>	D. E. Lissner, Dr.-Ing.
Director	H. G. DENKHAUS, Dr.-Ing.	<i>Strength</i>	T. C. de K. Kuun, M.Sc. (Eng.), M.Com. (B. & A.)
Assistant to Director	R. S. LOUBSER, B.Sc. (Eng.)	<i>Process and Machinery</i>	E. R. Leeman, M.Sc. (Eng.)
Administration	F. J. H. Barnard, B.A. (S.S.), B.A.	<i>Rock Mechanics</i>	E. R. Leeman, M.Sc. (Eng.) C. Grobbelaar, B.Sc. (Eng.), M.Sc.
Information	(Mrs.) U. E. Alheit, B.A., H.S.T.D.	HEAT MECHANICS <i>Heat Transfer</i> <i>Heat Refrigeration</i> <i>Heat Engines</i>	T. Hodgson, B.Sc. (Eng.) S. J. P. Joubert, B.Sc. (Eng.), B.Sc. (Hons.) R. C. de Villiers, B.Sc. (Eng.)
Design	B. J. Zulch, N.A.T.C. 1.	AEROMECHANICS <i>Aerodynamics</i> <i>Gasdynamics</i> <i>Aeronautics</i>	J. F. Kemp, Ph.D. T. W. van der Lingen, B.Sc. (Eng.) C. G. van Niekerk, B.Sc. (Eng.)
		HYDROMECHANICS <i>Hydrodynamics</i> <i>Hydraulics</i>	E. R. P. Chunnnett, B.Sc. (Eng.), D.I.C., M.Sc. J. M. Jordaan, D.Sc.
NNRI	NATIONAL NUTRITION RESEARCH INSTITUTE P.O. Box 395 Pretoria Telephone 74-6011	<i>Physiology</i>	J. J. Dreyer, M.Sc. (Physiology).
		<i>Histopathology and Cytology</i>	J. J. Theron, M.B.Ch.B., D.Sc.
		<i>Food Technology</i>	F. Schweigart, Dipl. Chem., Dr. Agr.
		<i>Physiological Chemistry</i>	D. J. de Lange, M.Sc. (Biochem.)
		<i>Food Chemistry</i>	A. S. Wehmeyer, M.Sc. (Chem.)
		<i>Clinical Studies</i>	P. J. Pretorius, M.B.Ch.B., M.Med. (Paed.), M.D.
		<i>Field Studies</i>	J. F. Potgieter, D.Phil. (Sos.)
		<i>Microbiological Research Group</i>	J. P. van der Walt, D.Sc. Tech.

## (C) National Research Laboratories and Institutes

NPRL	NATIONAL PHYSICAL RESEARCH LABORATORY P.O. Box 395 Pretoria Telephone 74-6011	<i>Electrical Standards</i>	O. W. H. O. BRUNE, D.Sc.
		<i>Acoustics</i>	J. P. A. LOCHNER, Ph.D.
		<i>General Physics</i>	E. C. HALLIDAY, Ph.D.
Director	E. J. MARAIS, D.Sc.	<i>Spectroscopy</i>	T. J. HUGO, D.Sc.
Liaison	O. W. H. O. BRUNE, D.Sc.	<i>Optics</i>	T. J. HUGO, D.Sc.
Administration	F. C. LOCHNER, B.Sc., B.Sc. (Landb.), B.Com., M.Com. (B. & A.)	<i>Spectrochemistry</i>	A. STRASHEIM, D.Sc.
		<i>X-ray</i>	F. H. HERBSTEIN, Ph.D.
		<i>Geochronology</i>	A. J. BURGER, Ph.D.
		<i>High Tension Physics</i>	C. W. F. T. PISTORIUS, Ph.D.
		<i>Oceanography</i>	F. P. ANDERSON, B.Sc. (Eng.) M.Sc.
		<i>Nuclear Physics</i>	I. J. VAN HEERDEN, Ph.D.
		<i>Radioactivity</i>	W. R. McMURRAY, Ph.D.
NRIMS	NATIONAL RESEARCH INSTITUTE FOR MATHE- MATICAL SCIENCES P.O. Box 395 Pretoria Telephone 74-6011	ELECTRICAL ENGINEERING	J. D. N. van Wyk, B.Sc. (Eng.)
		AUTOMATION	J. D. N. van Wyk, B.Sc. (Eng.)
		<i>Solid State Electronics</i>	A. G. K. LUTSCH, D.Sc. (Eng.)
		<i>Applied Electronics</i>	J. G. JOUBERT, B.Sc. (Eng.)
		<i>Electronic Instrumentation</i>	W. W. SCHROEDER
Director	A. P. BURGER, D.Sc.	MATHEMATICS	A. P. BURGER, D.Sc.
Liaison Officer	G. ABRAHAM, M.Com.	<i>Mathematical Analysis</i>	A. P. BURGER, D.Sc.
Administration	A. J. de Klerk	<i>Statistics</i>	N. F. LAUBSCHER, D.Sc.
		<i>Numerical Mathematics</i>	J. D. NEETHLING, Dr. Rer. Nat.

## (D) South African Bureau of Standards

**SABS**  
**SOUTH AFRICAN**  
**BUREAU OF STANDARDS**  
 Private Bag 191  
 Pretoria  
 Telephones:

<i>Directorate</i>	3-6481
<i>Administrative</i>	3-8441
<i>Biological Sciences</i>	3-6047
<i>Food Inspectorate</i>	3-6047
<i>Footwear and Leather</i>	3-1508
<i>Packaging and Paper</i>	3-6541, 3-6551
<i>Timber</i>	3-6481
<i>Visagie Street Laboratories</i>	3-0851

**Director** A. W. LATEGAN, B.Sc., M.Sc.  
 (Chem.), Ph.D.

**Assistant Director** T. Bedford, B.Sc.

**Secretary** N. van der Merwe, B.Com.,  
 B.Econ., U.E.D.

*Biological Sciences and Materials* W. R. Mottram, B.Sc., F.N.I.R.D.,  
 F.I.M.L.T.

*Chemical Processing Industries and  
 Products* R. F. J. Teichmann, B.Sc., M.Sc.

*Chemical Technology and Services* C. C. van der Merwe, B.Sc., M.Sc.

*Mechanical and Civil Engineering* A. M. Mehl, B.Sc. (Eng.)

*Physics and Electrical Engineering* A. A. Middlecote, B.Sc.

*Analytical Chemistry* G. P. Verster, B.Sc., M.Sc.

*Civil Engineering* R. H. Watkins, B.Sc. (Civil Eng.)  
 B.Sc. (Mech. Eng.)

*Electrical Engineering* F. J. Prins, B.Sc., M.Com.

*Food Inspection* S. P. Malherbe, B.Sc.

*Foods and Feeds* E. Naujoks, D.Phil.

*Mechanical Engineering* H. M. Kritzinger, B.Sc. (Mech.Eng.)

*Microbiology, Mycology and  
 Entomology* R. H. Ford, B.Sc. (Agric.)

*Vitaminology and Pharmaceuticals* R. R. de Villiers, B.Sc., M.Sc.

*Paper* E. Beyers, B.Sc., M.Sc., D.Sc.

*Textiles* N. Cryer, Fellow Textile Institute Dip.  
 Textile Industries (Univ. Leeds) City and  
 Guilds—Dip. in Woollen and Worsted  
 Manufactures.



Appendix 1 — continued

(E) C.S.I.R. Research Units, Groups and Projects

Medical

AMOEBIASIS RESEARCH UNIT P.O. Box 1035, Durban Telephone 5-9593	Director	R. ELSDON-DEW, M.D., F.R.S. (S.A.), (U.S.P.H.S.)
ANAESTHETIC DEATHS RESEARCH UNIT 43, Lawley Street, Waterkloof, Pretoria Telephone 2-9741	Director	O.V.S. KOK, M.B. Ch.B., D.T.M., D.A. R.C.P. & S. (Ire.), D.A. R.C.P. & S. (Eng.), F.F.A. R.C.S.
ARTHROPOD-BORNE VIRUS DISEASES RESEARCH UNIT P.O. Box 1038, Johannesburg Telephone 44-1444	Director	J. H. S. GEAR, B.Sc., M.B., B.Ch., D.P.H., D.T.M. & Hy., Dipl. Bact.
BILHARZIA RESEARCH UNIT Voortrekker Road, Nelspruit Telephone 310	Sub-Director	R. J. PITCHFORD (Nelspruit), M.R.C.S., D.T.M. & Hy., R.C.P. & S.
P.O. Box 1038, Johannesburg Telephone 44-1444	Sub-Director	J. H. S. GEAR, B.Sc., M.B. B.Ch., D.P.H., D.T.M. & Hy., Dipl. Bact.
Potchefstroom University, Potchefstroom Telephone 2222	Sub-Director	J. A. VAN EEDEN, M.B. Ch.B.
CARDIO-PULMONARY RESEARCH UNIT General Hospital, Johannesburg Telephone 44-1011	Director	G. A. ELLIOTT, M.B. Ch.B., M.D., M.R.C.P., F.R.C.P.
CARDIO-VASCULAR PULMONARY RESEARCH GROUP Medical School, University of Cape Town, Cape Town Telephone 5-1111	Director	V. SCHRIRE, M.B. Ch.B., M.R.C.P.
CLINICAL NUTRITION RESEARCH UNIT Department of Medicine, Medical School, University of Cape Town, Observatory. Telephone 5-3688	Director	J. F. BROCK, M.B. B.Ch., M.D., F.R.C.P.
DEGENERATIVE DISEASES RESEARCH GROUP Karl Bremer Hospital, Bellville, Cape Telephone 97-9521 Ext. 93	Director	A. J. BRINK, M.B. Ch.B., M.D., M.R.C.P.

Appendix 1 — continued

(E) C.S.I.R. Research Units, Groups and Projects

DENTAL RESEARCH GROUP Dental School, University of the Witwaters- rand, Milner Park, Johannesburg Telephone 835-6031	Director	C. J. DREYER, M.B. Ch.B.
ENDOCRINE RESEARCH GROUP Medical School, University of Cape Town, Observatory, Cape Telephone 5-3688	Director	F. FORMAN, M.B. Ch.B., M.D., F.R.C.P.
HEART RESEARCH GROUP General Hospital, Pretoria Telephone 2-9741	Director	H. W. SNYMAN, M.B. Ch.B., M.D.
HUMAN BIOCHEMISTRY RESEARCH UNIT S.A.I.M.R., P.O. Box 1038, Johannesburg Telephone 44-1444	Director	A. R. P. WALKER, M.Sc. (Edin.), Ph.D. (C.T.)
NUTRITION AND DENTAL HEALTH RESEARCH GROUP Oral & Dental Hospital, Beatrix Street, Pretoria Telephone 2-6404	Director	C. L. DE JAGER, B.A., (S.A.), B.D.S. (Rand)
NUTRITION AND METABOLISM RESEARCH GROUP Medical School, University of the Witwaters- rand, Hospital Street, Johannesburg Telephone 44-1492	Director	H. B. STEIN, M.B. Ch.B., D.P.H., M.D.
ORTHOPAEDIC DEVELOPMENT UNIT Medical School, University of Cape Town, Rondebosch, Cape Telephone 55-5929	Director	C. LEWER-ALLEN, M.B. B.Ch., F.R.C.S., M.Ch.
PHOTOBIOLOGY RESEARCH GROUP 524 Medical Centre, Pretorius Street, Pretoria Telephone 2-3081	Director	G. H. FINDLAY, M.B. B.Ch., M.D.
PNEUMOCOCCUS RESEARCH UNIT P.O. Box 4788, Johannesburg Telephone 44-6383	Director	I. WEBSTER, M.B. B.Ch.

## (E) C.S.I.R. Research Units, Groups and Projects

RENAL METABOLIC RESEARCH GROUP Medical School, University of Cape Town, Observatory, Cape Telephone 5-3688	Director L. EALES, M.B. Ch.B., D.P.H.
TUBERCULOSIS RESEARCH PROJECT King George V Hospital, P.O. Dormerton, Durban Telephone 88-2921	Director B. A. DORMER, M.B.B.S., B.Hy., D.P.H., M.D., T.D.D.
VIRUS RESEARCH UNIT Medical School, University of Cape Town, Observatory, Cape Telephone 5-3688	Director A. KIPPS, M.B. Ch.B., M.D.
Non-medical COSMIC RAY RESEARCH UNIT Potchefstroom University for C.H.E., Potchefstroom	Director P. H. STOKER, M.Sc. (U.K.), D.Sc.
MARINE RESEARCH UNIT Oceanographic Research Institute, P.O. Box 736, Durban Telephone 6-8374	Director D. H. DAVIES, M.Sc., Ph.D. (C.T.)
NATURAL PRODUCTS RESEARCH UNIT University of Natal, Pietermaritzburg Telephone 2-5559	Director F. L. WARREN, D.Sc., Ph.D. (Lond.) A.R.C.S., D.I.C., F.R.I.C., F.R.S.A.
OCEANOGRAPHIC RESEARCH UNIT University of Cape Town, Rondebosch, Cape Telephone 69-4351	Director VISITING PROFESSOR IN OCEANOGRAPHY
SOLID STATE PHYSICS RESEARCH UNIT University of the Witwatersrand, Johannesburg. Telephone 835-8181	Director F. R. N. NABARRO, M.B.E., M.A., B.Sc. (Oxon.), D.Sc. (Birm.)

Appendix 1 — continued

(F) Industrial Research Associations (Contributions from Industry matched by contributions from C.S.I.R.)

<p><b>FIRI</b> FISHING INDUSTRY RESEARCH INSTITUTE University of Cape Town, Rondebosch, Cape Telephone 69-9341</p>	<p><b>Director</b> G. M. DREOSTI, M.Sc., D.Sc.</p>
<p><b>LIRI</b> LEATHER INDUSTRIES RESEARCH INSTITUTE P.O. Box 185, Grahamstown, Cape Telephone 720</p>	<p><b>Director</b> S. G. SHUTTLEWORTH, Ph.D., F.R.I.C., F.B.S.I., F.B.S.I. (S.A.)</p>
<p><b>PIRI</b> PAINT INDUSTRIES RESEARCH INSTITUTE P.O. Box 16, Congella, Natal Telephone 5-1981</p>	<p><b>Director</b> G. M. HAMILTON, M.Sc., Companion I.E.E.</p>
<p><b>SAWTRI</b> S.A. WOOL TEXTILE RESEARCH INSTITUTE Rhodes University, Grahamstown, Cape Telephone 1574</p>	<p><b>Director</b> C. C. KRITZINGER, M.Sc., M.S., Ph.D., A.R.I.C.</p>
<p><b>SMRI</b> SUGAR MILLING RESEARCH INSTITUTE University of Natal, King George V Avenue, Durban, Natal Telephone 5-9192</p>	<p><b>Director</b> K. DOUWES-DEKKER, Ph.D.</p>

## APPENDIX 2

## International conferences attended by C.S.I.R. Staff during 1961

Members of the Council's staff attended a number of scientific conferences abroad as representatives of the C.S.I.R., as members of Government delegations or by special invitation. Specialist conferences in particular play an essential rôle in facilitating the exchange of information between individual scientists, and help to avoid duplication of research.

Dr. S. M. Naudé, President of the C.S.I.R., attended the *Sixteenth Session of C.C.T.A.* (Commission for Technical Co-operation in Africa South of the Sahara) which was held at Lagos, Nigeria from 3rd–11th February, 1961. Dr. Naudé attended the meeting in his capacity as Vice-President of C.S.A. (Scientific Council for Africa South of the Sahara).

The *Twelfth Meeting of C.S.A.* was held at Pointe-Noire from 8th–18th August, 1961 and was attended by Dr. S. M. Naudé and Dr. P. J. du Toit.

The *Meeting of COSPAR* (Scientific Committee on Space Research of the International Council of Scientific Unions) and the *Third International Space Science Symposium* held in Florence, Italy from April 9th–14th, 1961 were attended by Dr. F. J. Hewitt, Director of the National Institute for Telecommunications Research, and Mr. W. J. Botha, a member of the Institute's staff. Dr. Hewitt was also invited by the U.R.S.I./U.G.G.I. Committee on Radio-Activity to attend a *Conference on Radio Meteorology* of U.R.S.I. (the International Scientific Radio Union) held in Paris, France, from 4th–8th April, 1961.

The *U.R.S.I. Symposium on Ionospheric Soundings in the IGY/IGC*, held in Nice, France from 11th–16th December, 1961, was attended by two members of the staff of the National Institute for Telecommunications Research—Mr. R. W. Vice, who is responsible for ionospheric research and Miss J. Hewitt, who is in charge of the ionospheric data section. Mr. Vice presented a report on *Ionospheric soundings in the IGY/IGC*.

The *Meetings of the CAARC* (Commonwealth Advisory Aeronautical Research Council) *Co-ordinators in the Field of Noise* and *Co-ordinators in the Field of Atmospheric Turbulence*, held in Pretoria, South Africa, from 30th January–10th February, 1961, were attended by Dr. H. G. Denkhous, Director of the National Mechanical Engineering Research Institute, as South African Executive Delegate to CAARC; by Mr. C. G. van Niekerk, Head of the Aeronautics

Section of N.M.E.R.I., as South African Co-ordinator in the Field of Noise and by Dr. E. C. Halliday, as South African Co-ordinator in the Field of Atmospheric Turbulence. Dr. Denkhous also attended the *Third Meeting of National Delegates to the International Bureau of Rockmechanics* held in Leipzig, German Democratic Republic, from 31st October–4th November, 1961 at which he presented a paper on *Modellversuche in der Gebirgsmechanik* (Model studies in rockmechanics) and the *12 Kolloquium der Internationalen Arbeitsgemeinschaft für Geomechanik* held in Salzburg, Austria from 19th–20th October, 1961.

The *International Colloquium on Fatigue of Wire Ropes*, held in Turin, Italy, from 7th–11th September, 1961, was attended by Mr. T. C. de K. Kuun, Head of the Strength of Materials Division of the National Mechanical Engineering Research Institute, at the request of an industrial firm which is sponsoring an investigation in the Institute.

A *Conference on Freeze Drying of Foods* held in Chicago, U.S.A. from 12th–14th April, 1961, was attended by Dr. P. C. Carman, Director of the National Chemical Research Laboratory, as the guest of the National Academy of Sciences of the U.S.A.; he presented a paper on *Some basic principles of freeze drying and molecular distillation*.

The *Meeting of ACHEMA* (Austellung für chemisches Apparatewesen) held at Frankfurt, Western Germany, from 9th–16th June, 1961 was attended by Mr. W.G.B. Mandersloot, Dr. L. Miller and Dr. F.W.E. Strelow of the National Chemical Research Laboratory and Dr. P. le R. Malherbe, the Council's Scientific Liaison Officer in Cologne. They attended in a private capacity at the invitation of DECHEMA (Deutsche Gesellschaft für chemisches Apparatewesen).

The *Colloquium Spectroscopicum Internationale* in Lyons, France, from 6th–10th June, 1961, was attended by Mr. W. W. Schroeder, Head of the Electronic Instrumentation Section of the National Physical Research Laboratory, on the invitation of the Institute of Physics and the Physical Society of Great Britain; he presented a paper on *A synchronized direct reading spectrometer-spark system for time-resolved spectra*.

The *Tenth Pacific Science Congress* held in Honolulu, Hawaii, in August, 1961, was attended by Dr. J. P. A. Lochner, Head of the Acoustics Division of the National Physical Research Laboratory, as a member

of a South African delegation concerned with research on anti-shark measures.

The *Fourth Inter-African Conference on Food and Nutrition* held under the auspices of C.C.T.A., F.A.O. and W.H.O. at Douala in Cameroon, was attended by the late Dr. W. I. M. Holman, Head of the Nutrition Division of the National Nutrition Research Institute, as South African delegate and rapporteur for the session on organization and co-ordination.

The CCTA/CSA meetings held at Livingstone, Northern Rhodesia from 11th–20th October, 1961, which included a *C.S.A. Meeting of Specialists on School Building, a Symposium of representatives of Housing Research Organisations* and the *Fifth Meeting of the C.C.T.A. Inter-African Housing Committee*, were attended by: Dr. N. Stutterheim, Vice-President of the C.S.I.R., who took the chair at the Specialist Meeting, Dr. T. L. Webb, Director of the National Building Research Institute; Mr. S. J. Richards, Head of the Information and Liaison Section of the National Building Research Institute and Secretary of the C.C.T.A. Inter-African Housing Committee; and Dr. D. M. Calderwood, Head of the Architectural Division of the National Building Research Institute. Mr. Richards presented papers on *Research relating to housing being undertaken by the National Building Research Institute of the S.A. C.S.I.R.*, a *Note on the dissemination of research findings*, and *Notes on some problems for research*. Dr. Calderwood presented papers on *The Development of buildings for mass education in South Africa*, *A statement on mass education: teachers and buildings* and *The importance of a design team in school planning*.

Dr. Calderwood was also South African delegate to the *United Nations Seminar on Building Research and Housing Programmes*, held in Copenhagen, Denmark from 14th May–10th June, 1961 at which he submitted a *Monograph on South African housing and housing research*.

The *Five-Yearly Conference of Building Research Directors*, held in Ottawa, Canada and Washington, D.C., U.S.A., from 11th–23rd September, 1961, and the *First Australian Building Research Congress* held at Monash University, Melbourne from 16th–17th August, 1961, was attended by Dr. T. L. Webb, Director of the National Building Research Institute. At the latter congress he presented papers on *The function of aggregate in volume changes of concrete and mortar associated with moisture content changes*. *The design and repair of buildings erected on expansive soils* and *Relatively slow progress in the industry of building in relation to other industries*.

The *CCTA/WHO Symposium on Hygiene and Sanitation in Relation to Housing*, held in Niamey,

Niger, from 4th–9th December, 1961, was attended by Mr. P. R. Krige, Head of the Information Division of the National Institute for Water Research as a member of the South African delegation and by Mr. S. J. Richards, Head of the Information and Liaison Division of the National Building Research Institute, in the capacity of Secretary of the C.C.T.A. Housing Committee. Mr. Krige presented papers on *Treatment and supply of water and prevention of pollution of water supplies*, by G. J. Stander, P. R. Krige, J. H. Denysschen and *Research in progress at the S.A. C.S.I.R. on sewerage and sanitation problems in South Africa* by P. G. J. Meiring, V. Shaw, C. J. Loedolff. A paper by D. J. Fairbairn of the National Building Research Institute entitled *A rational hospital service* was also read at this Symposium.

Mr. Richards was responsible for the *Introductory statement* and presented a paper on *Environmental hygiene in housing: the indoor physical environment*.

The *C.C.T.A./C.S.A. Symposium on Soil Stabilization* held in Nairobi, Kenya from 3rd–8th October, 1961 was attended by Dr. P. J. Rigden, Director of the National Institute for Road Research, and Mr. J. S. Gregg, a member of the Institute's staff, who presented papers on: *Laboratory comparison of the effects of a bitumen emulsion and a portland cement on the engineering properties of a wind blown sand*, *Summary of the methods and extent of soil stabilization in South Africa*, and *Interpretation of the results of triaxial tests on a cement stabilized silty sand*.

The *Fifth International Conference of the International Society of Soil Mechanics and Foundation Engineering*, held in Paris, France in July 1961, and the *Colloquium on Expansive Soils* convened in Haifa in July, 1961 by the Soil Engineering Laboratory of Technion Israel, were attended by Mr. A. A. B. Williams, Head of the Soil Mechanics Division of the National Institute for Road Research.

Mr. D. G. Kingwill, Head of the Information and Special Services Department, was a member of the South African delegation to the *First Antarctic Consultative Meeting*, held in Canberra, Australia, from 10th–24th July, 1961.

The *Conference of the International Federation of Documentation (IFID)* was attended by Miss J. Greijbe, Head of the Library Division, as South African representative.

At the *Ninth Assembly of the International Council of Scientific Unions (ICSU)* held in London, England, from 25th–28th September, 1961, the Council was represented by Prof. S. P. Jackson, of the University of the Witwatersrand, who is deputy chairman of the Council's Advisory Committee on International Co-operation in Science; Mr. C. G. Hide, Head of the

International Section of the Science Co-operation Division; and Mr. J. A. King, Head of the South African Liaison Office in London. Mr. Hide was a member of the South African delegation to the *Fifth Meeting of the Scientific Committee for Antarctic Research* (SCAR) held in Wellington, New Zealand, from 9th-14th October, 1961.

The *Fifth Meeting of the Scientific Committee for Oceanic Research* (SCOR) held in Monaco, in October, 1961 was attended by Prof. Jackson and a *Meeting of the Inter-governmental Oceanographic Commission*, held in Paris in October, 1961 was attended by Mr. King as an observer.

Prof. Jackson and Mr. King also attended the *British Commonwealth Space Research Consultative Committee* in London on 29th September, 1961. During January, 1961, Mr. King attended the *Small Rocket Meeting* convened by the Royal Society.

The *O.E.E.C. Seminar on Technical Information for the Smaller Firm* held at Varese, Italy during March, 1961 was attended by Mr. G. H. Oosthuizen of the South African Scientific Liaison Office in London.

In addition to attending the A.C.H.E.M.A. Convention already referred to Dr. P. le R. Malherbe, Head

of the South African Scientific Liaison Office in Cologne attended the *Fifth General Assembly and Congress of the International Water Supply Association* in West Berlin from 29th May-3rd June, 1961, the *Fourth International Congress of the International Civil Defence Organization* (ICDO) in Montraux, Switzerland from 7th-17th October, 1961, the *Symposium of the Deutsche Afrika-Gesellschaft* dealing with water supply problems in Africa, in Bonn, West Germany on 27th October, 1961, and the *Symposium on Nutrition*, organized by the German Ministry for Nutrition, Agriculture and Forestry, which was held in Bonn on 7th December, 1961.

Mr. D. R. Masson, Head of the South African Scientific Liaison Office in Washington headed the South African Delegation to the *XXIst Conference of the International Union of Pure and Applied Chemistry* which was held in Montreal, Canada, during August, 1961. He also attended, on behalf of the South African Weather Bureau, the *International Meteorological Satellite Workshop* which took place in Washington, D.C., U.S.A. in November, 1961 under the combined auspices of the U.S.A. Weather Bureau and the National Aeronautics and Space Administration.