

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, AUSTRALIA

THE eighteenth annual report of the Council for Scientific and Industrial Research*, Commonwealth of Australia, covers the year ended June 30, 1944, and as in the previous year a large part of the total expenditure of £682,849 was incurred in activities devoted to the solution of problems arising out of the War, and to assistance and advice to Government departments, and institutions and organisations concerned with the war effort. The reference to such activities is either confined to brief general statements or omitted entirely. The Council was giving much more attention than formerly to problems of post-war construction, and the work of the Division of Soils, in particular, turned more directly to the needs of land settlement in rural reconstruction. There was a strong demand for soil surveys, as a basic step in considering new areas for sub-division as new farms, and in defining problems of development.

Because of the importance of vegetable investigations, a Committee on Vegetable Problems representing the Division of Plant Industry, Merbein Research Station and the Griffith Research Station was established. The Division of Plant Industry received numerous urgent requests for undertaking weed investigations. Experiments on the control of galvanized burr, a native shrub species that has become a weed on certain natural pastures, were continued. Pasture investigations were also concerned with the control of capeweed, while sixty-four varieties of soya beans have been obtained and are being grown at Canberra, with a view to a programme of trials, selection and breeding, with reference to their value as fodder legumes. Wheat investigations on the influence of plant-food depletion on the damage caused by take-all of wheat continued, and investigations at Stanthorpe concerned with apple and pear root-stocks which have been in progress for ten years were concerned primarily with finding apple root-stocks giving better performance under Australian conditions than the commonly used Northern Spy. Drug plant investigations were largely concentrated on chemical work associated with the investigation of the opium alkaloids and quinine; work on the chemistry of the *Duboisia* alkaloids was practically suspended. The cinchona trees established on the Atherton Tableland did not develop satisfactorily; where not sheltered by adjacent forest, growth was stunted and a high mortality sustained. In vegetable investigation the emphasis was placed on the more important types, such as potatoes, tomatoes, beans, peas, cabbage, carrots, red beet and onions, particularly with reference to the development of suitable varieties for large-scale production and processing. Potato investigations included arrangements for the permanent maintenance and multiplication of the stocks of Up-to-date and Bismarck potatoes free from virus X, which is responsible for considerable losses throughout Australia. Studies of the technique of sampling populations of the aphids that transmit potato virus diseases continued, and experiments on dew- and water-retting of plants showed that providing the ret is stopped at the right

time the chief factor determining the quality and quantity of the resultant fibre is the quality of the straw.

Entomological investigations in association with the Army led to important advances in the control of disease-carrying insects; effective methods were evolved for controlling moths in stored, raw and scoured wool; as well as new methods for fumigating bagged and bulk-stored wheat for protection against insect pests. Promising results resulted from intensive investigations on the cattle-tick. Some parasites of the potato moth, the green vegetable bug, and citrus scales imported from overseas have become established in the field. Research on mosquito repellants in Australia and New Guinea confirmed and extended the results obtained previously; by using oils already available in bulk in New Guinea, a blend of distillate, creosote and furnace oil was produced which was as effective as 'Malariaol'. The slow knockdown effect of fly sprays containing 0.03 per cent or more of D.D.T. was remedied by adding low concentrations of pyrethrum.

The Division of Animal Health and Nutrition continued work on similar lines to the previous year, and at the MacMaster National Health Laboratory further studies of the effect of phenothiazine on immature forms of *Trichostrongylus* spp. showed that the usual dose was ineffective against immature worms ten to fifteen days old, but that a dose of 40 gm injected directly into the rumen was effective. Studies of the administration of phenothiazine in a sheep lick indicated that a daily consumption of 0.5 gm. was not so valuable as a single dose of 15 gm. once a month. During the year a joint Department of Soil Chemistry was established to cover the work carried out by the Waite Institute and the Division of Soils; this Department is to undertake the routine testing of the many soil samples collected by the Survey Section, as well as chemical research on specific soil problems. Symbiotic nitrogen fixation continued to be the major subject under investigation by the Bacteriological Department, because it affects pasture practice in South Australia.

During the year, the Division of Forest Products acquired considerable information on the timbers of New Guinea and the surrounding islands, and paid considerable attention to fibre investigations in co-operation with the Wood Chemistry Section, which devoted much of its time to the study of fundamental problems on behalf of the Australian pulp and paper industry. The Section of Timber Physics extended its work of collecting detailed information on the more important physical properties of Australian timbers to material from New Guinea and the Northern Territory. Studies on the preservation of timber indicates that Tego and urea-formaldehyde bonded plywood will not withstand attack by *Naustoria*, although the urea-formaldehyde bonded material appears to be the more resistant. The practicability of impregnating with a hot- and cold-bath treatment plywood bonded with phenol-formaldehyde glue was demonstrated, although plywood bonded with urea-formaldehyde glue gave patchy penetration.

The Division of Food Preservation also continued investigations on problems of direct importance to the war effort. The Division of Fisheries continued its work on similar lines to the previous year, its development activities relating chiefly to the shark oil industry, which is of considerable importance for medicinal (vitamin) oil production, the seaweed industry, chiefly that producing agar-agar, the trawling of fish

* Eighteenth Annual Report of the Council for Scientific and Industrial Research for the Year ended 30th June, 1944. Pp. 78. (Canberra: Government Printer, 1945.) 3s. 4d.

in Tasmanian waters and making tests on methods of catching pelagic fish. A strong publicity policy was developed to reach the trade and fishermen and secure their confidence and co-operation.

The work of the National Standards Laboratory continued to have a purely defence aspect.

Referring to investigations in industrial chemistry, the report states that the Chemical Engineering Section is now well equipped to conduct pilot plant work on several processes developed in the laboratories of the Division. It is anticipated that more and more the Division will turn in future to two main types of projects: first, projects based on problems common to groups of companies or to numbers of industries, such as corrosion, problems connected with the transfer of gases, liquids and solids, with filtration, evaporation and distillation; and projects based upon raw materials with which Australia is well endowed and which are not now used or are not being used to the best advantage. For example, Australia's deposits of zirconia are the most extensive in the world and it is desirable to conduct research work on the chemistry of zirconium compounds and on the properties of zirconium metal and its alloys. The chief investigations in the Biochemical Section were concerned with fellmongery and industrial fermentation, but some work was also carried out on water-vapour permeability, rot-proofing, and the production of butylene glycol by fermentation. The Physical Section was concerned chiefly with the production of titanous powders, the silicizing of steel, corrosion of metals in ethylene glycol and in glycol-water engine-cooling mixtures and the corrosion of aluminium alloy sheet. In addition to the study of various flotation problems, the Physical Chemistry Section developed a method for determining the molecular weights of lightly condensed resins used in aircraft manufacture. The Organic Section tested numerous silver catalysts for their efficiency for catalysing the oxidation of ethylene to ethylene oxide, and pilot-plant investigations in collaboration with the Chemical Engineering Section were conducted on the manufacture of furfuraldehyde from agricultural waste material. In the Chemical Engineering Section the pilot-plant production of chromic anhydride was undertaken to test a new acid process developed by the Minerals Utilization Section for chromic acid from chrome iron ore. Extensive investigations were undertaken on lubricants and bearings. The Dairy Research Section dealt with problems such as hardened butter substitutes, the oxidation of butter fat, the deterioration of tinned cheese, the keeping quality of milk powder and the fermentation of whey to give lactic acid.

The demands for the services of the Information Section continued unabated, and among the surveys carried out by the Section may be mentioned those of the available data relating to the occurrence and chemical composition of natural gases reported at different times from various parts of the Commonwealth; the isolation of amyl alcohols from the fusel oil residues of the alcoholic fermentation industries and the preparation therefrom of amylene and *p*-*tert*-amylphenol; and surveys of methods for the production of vinyl acetate from acetylene, and of the polysulphides of sodium and calcium to assist research projects in the manufacture of synthetic rubber of the thiokol type. Arrangements were completed during the year for the preparation of a revised edition of the "Catalogue of Scientific and Technical Periodicals in Australian Libraries".

SPECTROSCOPIC ANALYSIS

A JOINT meeting of the Physical Methods Group and the Scottish Section of the Society of Public Analysts and other Analytical Chemists was held at Edinburgh on May 23 at which five speakers dealt with various aspects of spectroscopic analysis¹. This was the third special meeting of this type arranged by the Physical Methods Group of the Society, previous symposia having dealt with polarography and chromatography².

Prof. R. A. Morton, in an introductory talk, emphasized the value to the analyst of the modern photo-electric spectrophotometer. One feature of the type of instrument now in use for ultra-violet absorption work is a specially designed electrical circuit for maintaining the light source (a high-intensity hydrogen lamp) at constant output. Measurements made with this apparatus are sufficiently reliable to form the basis of accurate analytical procedures.

As a precise method of analysis, absorption spectroscopy is, in general, limited to those instances where information is available concerning the absorption characteristics of all constituents of the material under examination. It may happen, however, that constituents other than those which it is required to estimate make an unknown and variable contribution to the measured absorption. Prof. Morton and Dr. A. L. Stubbs described a procedure by which a correction can be made to allow for this irrelevant absorption. Providing the absorption measurements can be made with the accuracy which is now attainable with modern equipment, the only assumption that has to be made is that the irrelevant absorption is linear over a selected short range of wave-lengths. The estimation of anthracene in petroleum oils was discussed as a typical instance where the correction procedure may be used. The application of the procedure to the spectrophotometric assay of vitamin A was also discussed at some length. The precise evaluation of the potency of an oil must involve an accurate determination of the absorption at 328 m μ which is unequivocally due to vitamin A. Such a determination must include, in most cases, a correction for irrelevant absorption, since saponification procedure does not always eliminate such absorbing substances. In order to convert the spectrophotometric measurement to international units per gram, a conversion factor is used. These spectrophotometric studies have suggested the most appropriate factors to use, for both corrected and uncorrected absorption measurements.

Chemical analysis by emission spectroscopy is also now attaining its full status as a reliable quantitative procedure. Both branches of spectroscopic analysis have recently shown some notable developments. These were discussed by Mr. B. S. Cooper who, in his paper, described the new apparatus and techniques which have made possible these recent advances. In the field of emission spectroscopy, probably the most important single factor is the development of electrical circuits which enable spectra to be excited with the greatest reproducibility consistent with high sensitivity. In metallurgical applications, an important feature is the study of the optimum conditions for casting and preparing sample electrodes. Another technique now employed is the preparation of a small flat surface on some fabricated part; this forms one electrode while the other is a pointed graphite rod. Photographic aspects discussed included sensitization of plates to the far ultra-violet by coating the emul-