

as a whole before becoming more highly specialized in the work for which they may be more particularly adapted or trained. The branches of the Laboratory in Auckland, Christchurch, and Dunedin may be considered as such sections which have a rather wider range of functions than the sections of the Wellington Laboratory. The work carried out during the year ended 31st December, 1945, will be reported under headings which correspond only approximately with the above-mentioned sections owing to the overlapping which takes place.

Only in occasional instances will the work of the branches be mentioned separately.

PHYSICAL CHEMISTRY

The most important development in this section was the arrival of complete equipment for x-ray crystallographic analysis. At the end of the year the apparatus was being installed. It is anticipated that the equipment will find useful and increasing application in the examination of clays (both for Ceramics Research and for the Soil Bureau), of pigments, boiler scales, &c.

In continuation of work started last year, pH meters constructed by the Radio Development Laboratory were calibrated by this section.

The new policy of the Department in respect to assistance to industry through the Manufacturers' Research Committee brought a considerable increase of work in the preparation of reports on processes and in carrying out special investigations. Besides spectrographic analyses and work on electroplating, general work included reports on silvering of mirrors, on improved methods of making connections to carbon resistors, and an investigation of a method of estimating the antimony content of lead for batteries by determination of the freezing-point of the molten metal.

As in previous years, the Physical Chemistry Section had to carry out a considerable amount of work on electroplating problems. Analyses of solutions have been required, but the Hull cell has also been found useful in checking the performance of plating solutions. The thickness of electroplating on samples of hardware plated in New Zealand was determined for the Standards Institute in connection with the preparation of an Emergency Specification for Electroplated Hardware, and assistance was given in specifying methods for determining the thickness of coatings. The recommendation to use the B.N.F. jet test was confirmed by finding it in the B.S.I. Specification arriving shortly afterwards.

Assistance was given to industrial firms through the Manufacturers' Research Committee. Reports were prepared on speculum metal-plating, metallizing of plastics, lead coatings on brass, bronze finish on zinc-base die castings. A review of the plating industry in New Zealand won for its author, Mr. M. Fieldes, Physical Chemist, the Industrial Chemistry Essay Prize given by the New Zealand Institute of Chemistry.

Spectrographic analysis remains the main work of the Physical Chemistry Section, although even in this field, as well as in the other fields of physical chemistry, the work that can be done is seriously limited by the small staff available.

The end of the Japanese war brought an immediate fall in the considerable number of analyses of metals required for munitions. In particular, the daily testing of zinc-base die-cast alloy for mortar-bomb parts from several factories has now stopped. This had been carried out in a routine way since March, 1941, and at one time samples from four factories were being received. As far as is known, this is the only laboratory where a small glass instrument, the wave-length spectrometer with camera attachment, has been used for this purpose. Lead, tin, cadmium, iron, and chromium have all been occasionally found, as well as insufficient magnesium, and, apart from routine work, interesting points have been followed up. At the very last a long investigation was made of the cracking on firing of a certain lot of bomb tails. The trouble could not be correlated with the lead content, and a careful examination did not disclose any significant amount of other impurity. Mechanical tests by the Dominion Physical Laboratory confirmed that the metal was weaker than satisfactory samples. Further work by chemical methods indicated only that the weakness could be rather indefinitely associated with higher oxide content.