

CHEMISTRY SECTION.

REPORT OF R. E. R. GRIMMETT, M.Sc., F.N.Z.I.C., CHIEF CHEMIST.

The past year has been one of important changes in the Chemistry Section. Of these the most notable was the retirement on superannuation of the Chief Chemist, Mr. B. C. Aston, F.I.C., F.R.S.N.Z., Hector Medallist of the Royal Society of New Zealand, who was the first Chemist appointed to the Department of Agriculture and under whom the Section has developed from its beginnings in 1899.

The contributions of Mr. Aston to agricultural chemistry in New Zealand have been varied, and in some cases of such outstanding importance as to make his name familiar to chemists all over the world.

Among the best known of Aston's researches are the isolation and identification of the poisonous principle of the tutu, tutin, and the poisonous principles of the karaka (Karakin and Corynocarpin), both in collaboration with Easterfield; the discovery and isolation of the alkaloids of the pukatea; the monumental work extending over thirty years leading to the recognition that the widespread and severe disease of ruminants on the pumice lands known as "bush sickness" is due to a deficiency of one or more of the minor elements, and the introduction of an economical cure in the form of a lick containing limonite which has made possible the rehabilitation of thousands of acres of abandoned farm lands and the settlement of new areas. Mr. Aston also directed the pioneer work of the Chemistry Section in carrying out preliminary soil surveys, and more detailed surveys of estuarial and other tidal mudflats in connection with reclamation projects; and initiated and controlled much of the investigation into the mineral contents of pasture in connection with the health of live-stock, undertaken as part of the Empire Marketing Board's scheme of co-operative research. Among the latter may be mentioned the iodine survey of New Zealand live-stock, and surveys of the pastures of Wairarapa, Taranaki, Waikato, Bay of Plenty, Central Otago, and part of Southland, from the point of view of nutritive value and content of essential minerals in relation to stock-production and stock ailments.

Some reorganization of the staff and of the scope of the work has been carried out.

The Fairlie Terrace Laboratory undertakes soil and fertilizer analyses. Analyses of plant and animal tissues and products in connection with crop-production and utilization and animal-nutrition problems are the functions of the laboratory situated in the Public Works building, while most of the general work of the main laboratory has been transferred to rooms in the adjacent Public Health building.

I am glad to record my appreciation of the enterprise and spirit of co-operation shown by all members of the staff in carrying out these removals with a minimum of dislocation in the work of the section.

Four of the staff are on study leave in Great Britain—Miss E. M. Mason has carried out at the Rowett Institute, Aberdeen, some extremely difficult and important work for the British Medical Council in connection with the testing of analytical methods for the determination of iodine in the minute amounts present in foodstuffs and other materials; Mr. E. B. Davies is studying methods of soil analysis, soil microbiology, and other aspects of soil research at the Macaulay Institute, Aberdeen; Mr. F. B. Shorland is taking advantage of a scholarship to study the composition of fish and other animal oils of New Zealand origin at Liverpool University; while Mr. R. J. McIlroy is investigating the chemical nature of the components of fibres, especially New Zealand flax (*Phormium tenax*).

During the year the Inspector of Fertilizers was transferred to the Fields Division.

Close co-operation is being maintained with the Cawthron Institute, research officers of other organizations, and the divisions of the Department.

DEFICIENCY DISEASES OF LIVE-STOCK.

Bush Sickness.—Important progress in the investigation of this stock ailment has been made during the year. The experiments recorded in last annual report on the feeding of limonites from various sources, cobalt, zinc, and purified iron salts to sheep at Atiamuri have been concluded and the results embodied in two papers published in the *Journal of Science and Technology*—"Trace Elements in relation to Bush Sickness," by Miss E. M. Wall, and "Cobalt Content of Limonites used in the Treatment of Bush Sickness," by K. J. McNaught. The results of these experiments provide evidence that the chief factor in the causation of bush sickness is a deficiency of cobalt. Taken in conjunction with the similar conclusions reached independently by research workers in Western Australia and at the Cawthron Institute, the evidence becomes practically conclusive. There is still doubt as to whether some part is played by other "trace" elements, notably nickel and zinc, and it may be that the provision of easily soluble iron is also an advantage. Experiments designed to throw light on some of these points are being continued in the Rotorua and Atiamuri districts.

In connection with experiments instituted at Mamaku State Farm by the Officer in Charge, Veterinary Laboratory, cobalt is being determined periodically in pastures top-dressed with limonite, as well as in others not top-dressed, and in organs from control sheep and sheep fed with cobalt-lick.