to low concentrations of carbon dioxide; a practical and economic means of controlling posthitis in wethers by implanting under the skin small pellets of the male hormone, testosterone; progress in work on worm parasites of sheep and cattle; and evidence that selection of cattle for their resistance to ticks may be a highly satisfactory means of minimizing losses due to tick infestation. Codling moth infestations have been found to depend largely on the larvæ which over-winter in an orchard, and these, in turn, on the amount of cocoon shelter available in the orchard. This can be reduced by adequate management, and, if trap bands are provided to which the overwintering individuals are attracted in large numbers and destroyed by special toxic deposits, relatively few insecticidal treatments are needed in the following season. Work at Katherine has shown that nitrogen in a form available to plants concentrates just under the soil surface during the dry season and the greatest loss occurs during the wet season, owing to leaching by rain.

It has now been demonstrated that when the appropriate fertilizer dressings to overcome deficiences in nitrogen, phosphorus, potassium, sulphur, calcium, zinc and molybdenum are applied to the infertile coastal lowlands of southern Queensland, pastures can be grown on these soils which grow and fatten cattle at stocking-rates of a beast to 1·5 acres, with annual live-weight increases of 300 lb. per beast. Investigations on the role of elements in plants have shown that manganese deficiency inhibits a reaction involved in the evolution of oxygen during photosynthesis and also that manganese is a constituent of normal chloroplasts. Studies on the life-habits of the freshwater snail *Lymnea tomentosa*, which infests grazing lands, have revealed great difficulties in applying effective control measures, as if the population is drastically reduced each surviving snail will harbour so many liver flukes that the end result is much the same. Spoilage of dried prunes of high-moisture content has been prevented by hot-filling the prunes into laminate bags.

A direct-reading tester for increasing the regain of wool has been developed, consisting of a hot-air blower to dry the wool and a balance which indicates regain directly. Evidence has been obtained that substantial numbers of freezing nuclei occur at altitudes of 50,000–60,000 ft., and work has been completed on a recorder, designed to operate for periods up to 12 months, to provide continuous records of water-level in streams, dams or bores for gauging purposes, or of rainfall, temperature, humidity, wind speed or evaporation. A process has been devised for production of pure thorium by converting thorium carbide to volatile thorium iodide and depositing thorium metal from this on to a heated surface. A new cyclone elutriator, the 'Cyclosizer', developed for precise separation of solid particles in the subsieve ranges, is based on the stable flow patterns and high centrifugal forces obtainable in hydraulic cyclones of suitable dimensions.

A thorough examination has been made of resistance measurements to establish clearly the possible limits of accuracy using both direct and low-frequency alternating current; and fundamental investigations of cell wall organization of the tissue elements of wood and of the pits between them has demonstrated that in hardwoods the initial penetration path is through the vessels and then via the pits to the rays and adjacent fibres or vertical parenchyma. In softwoods the path is from tracheid to tracheid, or tracheid to parenchyma, through the pits. A notable advance in the metal-staining technique for the electronmicroscopy of wool has revealed further structural details within the microfibrils and a resolution of 1 in 4,000 has been achieved with a mass spectrometer constructed at the Chemical Research Laboratory, while new techniques, involving an optical filter of narrow band-width, have provided photographs showing the velocity distribution in selected areas of the solar chromosphere.

SCIENTIFIC RESEARCH IN NEW ZEALAND

THE report of the Department of Scientific and Industrial Research, New Zealand, for the year ended March 31, 1961*, includes the Minister's Statement, the report of the Council of Scientific and Industrial Research and that of the Secretary, while the third annual report of the Ross Dependency Research Committee is appended. Lists of publications during the year are given under the respective branches of the Department together with lists of projects in hand.

Expenditure during the year amounted to £1,963,486 net, of which £201,421 was on the Dominion Laboratory, £225,114 on the Dominion Physical Laboratory, £131,777 on the Grasslands Division, £124,885 on the Geophysics Division, £114,532 on the Geological Survey and £111,986 on the Soil Bureau. The Council again points out that New Zealand is still lagging behind in the application of science and the scale of research, and her expenditure in 1959–60 of about £3·98 million on scientific work or 0·32 per cent of the gross national produc compares with 2·3 per cent in Britain and 2·7 pe cent in the United States in 1957–58. Professional staff at April 1 was 401 compared with 390 in 1959–60, total staff being 1,121 and 1,067, respectively, and the Secretary refers to a loss of 30 professional staff during the year, overseas, nearly all experienced scientists, although the overall calibre of the Department's staff has substantially improved over the past decade. During the past five years M.Sc. graduates in physics in New Zealand universities have averaged 10, in chemistry 21 and in mathematics 13, but about half those obtaining first-class honours accept posts overseas and do not return. The Secretary stresses the importance of being able to attract scientists of high quality and indicates some of the factors, besides adequate salary, which are important. In 1960 the establishment of two senior research fellowships tenable in the Department's laboratories for up to two years was approved and two fellowships have now been awarded. The Council is gravely concerned, however, that no action has been taken towards securing the 40–50 increase in staff per annum

* New Zealand: Report of the Department of Scientific and Industrial Research for the year ended 31 March, 1961. (H. 34.) Pp. 87. (Wellington: Government Printer, 1961.)

over the next five years which is required to implement fully the Department's present programme of work.

After discussions with the University Research Committee and the chairman of the new University Grants Committee the Council proposes to terminate the present type of research grant made to the universities by the Department. From the end of the present financial year the Department will sponsor and provide funds for research units in universities in fields of study deemed essential in the national interest, and in which an outstanding man is stationed in the university, and by entering into research contracts with universities. Grants to research and allied institutions in 1960–61 amounted to £176,862, of which £33,810 was to universities and agricultural colleges and £91,376 to research associations.

The Council's recommendation for the establishment of a new Wool Research Organization as an incorporated research association with an annual income of £100,000, half from the New Zealand Wool Board and half from the Government has been approved, and the new buildings for the Meat Research Institute were completed during the year. The Council has decided to continue New Zealand's scientific programme in Antarctica at about its present level (£86,606 in 1960–61), and topographical and geological survey work will be continued until the reconnaissance of the Cape Adare–Beardmore section is complete. Some concern is expressed as to the effect of delay in developing the Institute of Nuclear Sciences on the research programme in this field.

Points in the research work completed during the year noted in the Secretary's report include the completion of the first volume of the new *Flora of New Zealand*; the high yields now being obtained with Aotea wheat, bred at the Crop Research Division and released in 1957; the marked difference in the distribution of radioactive selenium in plants; the variation of the nitrate-levels and of sodium, potassium, calcium, manganese, aluminium, copper, titanium, iron, zinc, sulphate and phosphate in rye-grass plants, and the study of the systematics and taxonomy of bacterial plant pathogens.

The Fruit Research Division's apple-variety collection has led to the selection of the Canadian variety Spartan and a local seedling, Red Fresca, for extensive commercial trial, and satisfactory drying of tobacco leaf has been obtained by two methods which enable a kiln to be loaded with much less labour and permit the use of smaller kilns. A study has been made of the Adelie penguins breeding at Cape Royds, Ross Island; and a set of 54 soils selected representing a range of New Zealand soils for agricultural, forestry and highway purposes is being examined comprehensively by chemical physical and biological tests.

An intensive mineralogical study of volcanic ash showers has been commenced, and the four-mile geological map project commenced in 1956 to be completed in 1964 has already indicated areas meriting more detailed examination. A rugged tester, in which the sample is dried for 5 min. in hot air and weighed on scales calibrated directly in water content (corrected for buoyancy) has been developed by the Dominion Laboratory, and 20 of these machines are now in use in scouring works and freezing works throughout New Zealand for controlling the drying of wool. A fœtal heart-rate recorder has been constructed using a heart-sound pick-up which delivers this conglomeration of sounds to a system specially designed to deal with a fœtal pulse which may be mostly even below the level of background noise. Investigations of the variation in the essential oil derived from samples of *Pinus radiata* have been initiated, and an instrument developed for rapidly and accurately determining the density of a wood sample taken from a living tree, utilizing a very narrow beam of beta-radiation from a strontium-90 source. A novel type of navigation light for marking narrow channels has been developed which can be used when the configuration of the land in line with the channel will not permit the use of more than one light. An emergency wheat-testing service provided by the Wheat Research Institute avoided substantial loss during the 1961 wheat harvest. A survey of currents in McCurdo Sound established that at least in summer there is a definite movement of water towards the Antarctic Ice Shelf.

FOOT-AND-MOUTH DISEASE

IN a report issued by the Research Institute (Animal Virus Diseases), Pirbright, Surrey*, the director, Dr. I. A. Galloway, describes the investigations made into foot-and-mouth and related virus diseases over the past five years.

The research programme of the Institute is considered in relation to foot-and-mouth disease in Britain, and, in turn, as a world problem. In Britain, periods of relative freedom from the disease (or at least of low incidence) are interrupted by times when as many as 200 farms may become infected in one month. These periods of higher incidence do not generally last more than three or four months, and the number of animals involved in relation to the animal population of the country remains less than half of 1 per cent. It is generally agreed that a vaccination programme against the disease in a country where it is endemic is unlikely to reduce the incidence much below this figure. If, therefore, the disease were allowed to become endemic in Britain, and vaccination were decided on, the ultimate goal which could reasonably be achieved would be an incidence equivalent to that which now obtains. At that point, a slaughter policy would undoubtedly be invoked to attempt to achieve eradication of the disease. If the situation in the European countries is considered, it is seen that, in spite of an increasing extension of vaccination since the 1951–52 epidemic, the incidence of the disease, though greatly reduced, is still somewhat higher than in Britain. Some countries are applying, and others considering, limited slaughter of infected animals as a further step towards eradicating the disease. Outside Europe, in endemic areas, effective control of the disease is still some way off, and it is here perhaps that the new improved vaccines have the greatest part to play, if the cost of the vaccination campaign can be reduced and the efficiency of the vaccine increased. Assistance in reduction of the incidence of the disease elsewhere

* Research Institute (Animal Virus Diseases), Pirbright. Report for the years 1956–1960. Pp. 52. (Pirbright, Surrey: Research Institute (Animal Virus Diseases), 1961.) 2*s*. 6*d*.