

As is well known, the main idea governing the Commissioners' work so far has been the acquisition of land and the formation thereon of coniferous plantations, the original programme being to plant 150,000 acres in the ten-year period. For reasons detailed in previous reports, there was a check in the work. The area planted during the year under review amounted to 21,963 acres of conifers. It is estimated that 135,000 acres will have been afforested with conifers by the end of the ten years, of which 90,156 acres had been planted by the end of the eighth year, with, in addition, 4130 acres of broad-leaved species (hard woods); or a total of 94,289 acres. The report adds that a total area of approximately 117,300 acres had been completed by May 1928. It was proposed in the original programme that assistance should be given, by way of grants, to local authorities and private owners to afforest areas under their control, an area of 110,000 acres being prescribed for the ten years. About 62,000 acres have been more or less dealt with, and it is hoped to achieve a total acreage of 75,000 by the end of the ten years. The work on the provision of forest worker's holdings has proceeded. The systematic formation of these holdings was commenced in the summer of 1924. Up to September 1927, 357 holdings had been completed (171 in the year under review), and 219 were in process of formation.

The cost of planting still remains very high. The report says that the outlay per acre on labour and material on the area planted between 1919 and 1927 was as follows: England and Wales, £8:9:9; Scotland, £9:10:3; Great Britain, £8:16:4. These figures include the cost of preparation of the ground, drainage, fencing, plants, planting, replacement of failures, and weeding. It is noticeable that during 1927 the expenditure on replacing failures (beating up) was something over 25 per cent of the cost of original planting, a decrease on 1926, when it was nearly 50 per cent; the figure is, however, excessive, and few private owners could undertake afforestation if they had to face so high a proportion of failures.

The Commissioners have scarcely faced the question of undertaking a part of their work by direct sowing, of which few adequate experiments have yet been made; and yet it would appear that it is in this direction that the true solution of the afforestation question is to be sought. With high planting charges and nurseries costing as much as half the total expenditure entailed on the cultural operations (£351,046 as compared with £675,889 for the eight years), it is difficult to foresee how an adequate area of forests will be obtainable with the amount of money which the tax payer is likely to be able to devote to this forestry work, necessary as it is to the future welfare of Great Britain.

Moray Firth Fisheries.

THE Fishery Board for Scotland has recently issued two important papers dealing with commercial fishing in the Moray Firth. The first is a review of the cod-net fishing,¹ and the second is an account of the Danish seine-net fishery.² Prepared by so able an authority as Dr. Alexander Bowman, these two papers contain much interesting and valuable practical information. Read together, they demonstrate very clearly the great extent to which the prosecution of both cod-net fishing and Danish seine-netting has been influenced by the prevailing economic conditions of the great Scottish herring fisheries.

Between herring seasons, other work must be found for the steamers and motor craft, which need to be kept in almost constant commission to meet expenses; they cannot be laid up with the same facility as the older sail boats. Thus cod-net fishing, begun in the Moray Firth in the year 1906, attracted little attention until two or three years later, when the fact had become more generally realised that remunerative results were being obtained at a time of year when there is a general lull in herring fishing. Even then, one disastrous season in 1911 so weakened the confidence of the crews of the steamers that, in the following year, fewer steamers were fitted out for the fishery, although cod entered the area in considerable numbers. Moreover, the fact that their subsequent return to the fishery has been slow, seems

to suggest that, as yet, confidence in the method has not been fully regained.

The method of fishing by means of the Danish seine was first introduced into Scottish waters in the autumn of 1921. In that year, during the coal strike, a large number of Danish motor boats using the seine landed good catches at English ports, and even after bunkers again became available to trawlers, these small vessels proved able to compete successfully in the market. The Danish net was therefore rapidly adopted, at first by English vessels and almost immediately thereafter by a number of Scottish steam-drifters and motor boats. The vessels normally employed in the Scottish drift-net fishery being especially suitable for the use of the light Danish seine and easily convertible at comparatively small expense, both steam and motor drifters from Moray Firth were rapidly equipped with the new gear, and fishing was soon being carried on energetically in local waters. The adoption of the method was accelerated by the acute depression prevailing in the herring-fishing industry at the time. The intensity of fishing which characterised the early operations was, however, not maintained, and, in 1923, the total number of landings fell short of that of the previous year, but in the following years there was no sign of further decline. With the large number of power vessels adopting the Danish seine, it became a question of some interest whether or not the new method would supplant the older one of cod-net fishing. The innovation is of too recent a date, however, to permit a definite answer to be given at present.

¹ "Review of the Cod-net Fishing in the Moray Firth." *Fisheries, Scotland, Sci. Invest.*, No. 1; 1928.

² "Danish Seine-net Fishing in the Moray Firth." *Fisheries, Scotland, Sci. Invest.*, II.; 1928.

Liverpool Observatory and Tidal Institute.

AN agreement has just been made between the Mersey Docks and Harbour Board and the University of Liverpool for the administration as a single institution of the Board's Observatory at Bidston and the Tidal Institute of the University. The combined institution is to bear the name of "The Liverpool Observatory and Tidal Institute" and will

be governed by a joint committee of the Dock Board and the University.

The Liverpool Observatory was founded in 1845, and since 1867 it has been situated on Bidston Hill, near Birkenhead. The work carried on has always been intimately associated with the activities of the port, much attention being given to time-measurement

and distribution, together with the testing of chronometers and navigational instruments. Though in the past the director has always been primarily an astronomer, changing conditions have made the Observatory mainly a meteorological station with a regularly working seismograph.

The Tidal Institute was founded so recently as 1919, and its work has often been referred to in our columns.

Five years ago an agreement was made between the Dock Board and the University whereby both these institutions were placed under the government of a joint committee of the Board and University, and a large measure of co-operation has resulted. For example, the tidal predicting machine has been housed in the Observatory building, so that the major part of the work of constructing tide-tables has been done at Bidston. The new arrangement, which comes into force on Jan. 1, goes much further than this and completes the association of these two types of scientific activity. The work in meteorology and seismology hitherto carried out at the Observatory will be continued, the testing of chronometers and instruments will be undertaken, and the time-gun at Birkenhead will be fired as heretofore.

The last director of the Observatory, Mr. W. E. Plummer, died a few months ago. The new combined institution will have for director Prof. J. Proudman of the University of Liverpool, and for associate director Dr. A. T. Doodson, who will reside at the Observatory. The total scientific staff will consist of five men and three women.

Properties of Electrons.¹

C. G. DARWIN.—(1) On the magnetic moment of the electron. Starting from the wave equations for an electron and the associated electric density and current, it is shown how the electromagnetic fields of a moving electron can be attributed partly to the convection of electricity and partly to an intrinsic magnetisation. A geometrical construction shows the relation between the wave constants and the magnetisation. The formulæ, first worked out for slow motion, are easily generalised by relativity for high speeds, and in this case there are electric as well as magnetic moments, and various invariant properties are given.

A comparison is made between an electron wave and a light wave, and the resemblance may be loosely expressed by saying that a light-quantum is an electron without charge or mass.

(2) On the diffraction of the magnetic electron. The problem is solved of the diffraction of an electron wave by a line-grating exerting periodic electric or magnetic forces; this represents the essential features of diffraction by a crystal. The incident wave is supposed to be magnetised in a definite direction, and it is shown that, when the grating exerts only electric forces, the effect is to rotate the direction of magnetisation through a definite angle about an axis perpendicular to the incident and diffracted rays, and no polarisation can be produced by the diffraction. For some magnetic forces a similar rotation occurs, but in general the simultaneous action of electric and magnetic forces may produce a partial polarisation, though the case is too remote from experiment to be worth treating in detail.

G. TEMPLE.—The scattering power of a bare nucleus according to wave mechanics. A direct proof is given of Mott's result (*Proc. R. S.*, vol. 118, p. 542) on the scattering of an infinite plane wave by a bare nucleus. The accurate expression for the incident and scattered waves is obtained, together with the complete asymp-

totic expansion, leading to a rigorous proof of Rutherford's formula for the scattering power. The same problem is briefly considered on the basis of the relativistic wave equation, and the necessary modification of Rutherford's formula is obtained to the usual approximation, neglecting the terms involving the square of the electrostatic potential.

J. E. LENNARD-JONES AND H. J. WOODS.—The distribution of electrons in a metal. The distribution of electrons in a two-dimensional metal is worked out by statistical methods on the assumption that the assembly of electrons is 'degenerate' in the sense of Fermi and Dirac.

University and Educational Intelligence.

BIRMINGHAM.—Dr. Leonard G. Parsons, physician to the General Hospital and senior physician to the Children's Hospital, has been appointed professor of infant hygiene and diseases of children.

The Council has approved an expenditure of about £300 for the preparation of a laboratory to be used specially for tissue culture in connexion with the Department of Physiology.

From October 1929 there is to be a considerable reduction of fees for engineering students.

The degree of D.Sc. has been conferred on R. H. Hopkins for contributions to biochemistry.

CAMBRIDGE.—Prof. Eddington, Mr. Landon, Mr. R. H. Fowler, and Mr. Rideal have been appointed members of the council of the school of physical sciences, and Sir F. G. Hopkins, Prof. T. B. Wood, and Mr. C. F. Cooper have been appointed members of the council of the school of biological sciences.

EDINBURGH.—At a graduation ceremony on Dec. 14, the degree of D.Sc. was conferred upon Sunder Lal Hora (Assistant Superintendent, Zoological Survey of India) for his thesis on "Ecology, Bionomics, and Evolution of the Torrential Fauna, with Special Reference to the Organs of Attachment"; and on Richard Maclean, for his thesis on "Strengthening of Certain Important Bridges of Main Line of Bombay, Baroda, and Central India Railway."

LIVERPOOL.—At the meeting of the Council of the University on Dec. 11, Prof. J. H. Dible, professor of pathology and bacteriology, Welsh National School of Medicine, Cardiff, was appointed to the George Holt chair of pathology.

At the same meeting Prof. Warrington Yorke, who has held the Walter Myers chair of parasitology in the University since 1914, was appointed to the Alfred Jones chair of tropical medicine as from Jan. 1, 1929.

MANCHESTER.—The council has accepted the resignation of Dr. Stuart Thomson, senior lecturer in zoology; Dr. Stuart Thomson has been a member of the staff of the Zoological Department since 1910.

The Council has elected the following to honorary research fellowships in physics: Dr. A. G. Bradley, Dr. Szabo V. Naray, Dr. Felix Machatshchik, Mr. J. West, and Dr. W. H. Zachariassen. The following have been awarded elected research studentships: Mr. Harold Walkden (in botany), Dr. Werner Albrecht (in physics).

THE Phonetic Institute of the University of Vienna has assigned tables for foreigners who wish to study their own speech by the graphic method. Four tables are now used for Czechisch, Hungarian, Yiddish, and Hindustani. Two others are available. Applications may be made to the Director, Prof. E. W. Scripture, Strudelhofgasse 4, Vienna.

¹ Abstracts of papers read before the Royal Society on Nov. 1.