The Royal Botanic Gardens, Kew.[1]

PRINCESS AUGUSTA of Saxe-Gotha, widow of Frederick, Prince of Wales, started a Botanic Garden, or, as it was then termed, a Physic Garden, at Kew in 1760, but it was with "the appointment of Sir Joseph Banks as Botanical Advisor . . . that the golden age of Kew may well be said to have commenced."

Sir Joseph initiated the practice of sending collectors throughout the world to collect seeds and living plants for Kew. After the death of Sir Joseph Banks in 1820, Kew languished for a time until, as the outcome of a Report presented by a Committee appointed by the Treasury and over which Dr. Lindley presided, in 1841 Sir William Hooker was appointed Director. Under the inspiring guidance first of Sir William Hooker and then of his son, Sir Joseph Hooker, Kew expanded into a great scientific institution, rising to its responsibilities as the centre to which scientific problems relating to horticulture might be referred as they arrive from all parts of the British Dominions.

The work has expanded so that, in addition to the beautiful gardens and houses with their wealth of plants, there are now available great museum resources. There are four buildings housing examples of the economic products of the plants of the world, one of the largest herbaria in the world, very completely organised and exceptionally rich in botanical paintings and drawings as well as in pressed plants, and the Jodrell Laboratory, which is equipped for investigations in physiology and mycology.

Dr. Hill cites one or two striking examples in which a little more knowledge, of the type only to be gained in such studies as are rendered possible at Kew, might have saved vast sums of money to the Empire. In the case of camphor, it has only recently become known that there are two varieties of this tree, closely allied botanically, but one almost useless in commerce because, instead of valuable solid camphor, it yields on distillation camphor oil. Unfortunately, when the effort was made to introduce camphor into the West Indies and to other British Colonies, owing to ignorance of this fact, the relatively valueless variety was usually planted. In the case of para rubber, similarly, planters have propagated seeds taken almost at random from trees of *Hevea Brasiliensis*, although the yield of latex may vary from tree to tree from 2 per cent. to 40 per cent.

The work done at Kew in the way of advice and investigation of problems dealing with the vegetable resources of the Empire has been frequently referred to in our columns. It is to be hoped that this compact statement of its work and possibilities of further work may be studied by those of our administrators who are alive to our Imperial problems. Throughout the Empire there is growing up a vast service of Botanic Gardens and Experiment Stations, conducted in the main by men whose training and inspiration derive from Kew, and if this work is to extend and to give its full harvest in co-operation with wise Colonial administration, then for many years to come it is a vital Imperial need that Kew, at the heart and centre of this work, should not lack for funds and for public support. Since the days of Sir William Hooker it has never lacked for disciplined scientific enthusiasm and for devoted service from both scientific and garden staff.

[1] Journal of the Royal Society of Arts, Vol. 72, No. 3710, December 28, 1923. "The Work of the Royal Botanic Gardens, Kew." By Dr. A. W. Hill.

Bottom Fauna of the North Sea.

THE economic study of fisheries and fish must always depend largely on quantitative methods such as the numbers of fish caught in relation to the fishing power employed, to the area of ground fished, and to the number of fish that can be adequately fed on this ground. The latter depends largely on the quantity of floating life in the waters at the depths in which the fish feed at different stages of their lives and on the quantity of bottom living organisms. Most fish are bottom feeders, so that the ground organisms are of prime importance. The bottom animals, however, feed mainly on the floating life, which reproduces with such rapidity that it is the chief builder of living matter in the sea. A cycle is thus created from man to the fish, to the bottom living organisms, to the floating forms, and so ultimately to the meteorological conditions, which alone can affect the ocean as a whole. Some of the bottom forms serve as food to fish, while others do not, thus cutting the economic cycle. Some are absolutely inimical to the fish, since they feed on the same food as that required by fish. It thus becomes clear how important and basal is the quantitative and qualitative study of the ground life in relation to economic questions connected with fisheries.

The North Sea has been selected for the first studies as the world's chief fishing ground. The way to these was paved in 1920 by arrangements for the publication of a full account of its bottom deposits and for obtaining the practical knowledge of the technique, invented by Dr. C. G. J. Petersen for use in Danish semi-inland waters. This consists of the utilisation of a grab, somewhat similar to that employed for clearing harbours, let down with wide open mouth with sufficient force to drive into the sand or mud for some little distance; its mouth and teeth close tightly on the uphaul and bring to the ship a sample of the surface of a measured area of the bottom, size one-tenth or one-fifth of a square metre. The contents are dumped into a series of sieves of different meshes made to fit tightly into each other. They are thus divided into different sizes, only the finest sand and smallest animals passing through to the tray below. By this means all the individuals from a certain area of the bottom can be easily graded and counted, so that quantitative methods become practical. The method is good, save only that the results relating to swimming, fast darting, and jumping animals may be inaccurate, while scantily distributed forms (less than 1 per unit area) have to be neglected.

The present paper[1] deals admirably with the Dogger Bank, an isolated plateau at about 15 fm., known to be a good growth ground for plaice, and may be regarded as a preliminary investigation. There are requisite "controls," and the trustworthiness of results is properly tested. Six voyages of investigation were made and samples taken from 533 stations. There are recorded 75 species of living animals with notes of interest relating to their natural history; of these, 47 specimens of Amphioxus, living only in gravel or shell patches, is of greatest interest, as clearly belonging to a form that prefers ground more or less kept in motion by currents. Worms, crustaceans, and molluscs form the more important fish

[1] Ministry of Agriculture and Fisheries — Fishery Investigations, series ii., vol. vi., No. 2: "Quantitative Studies on the Fauna of the Sea Bottom. No. 1. Preliminary Investigation of the Dogger Bank," by F. M. Davies. Pp. 54. (London: H.M. Stationery Office, 1923.) 6s. net.

food ; of these the last group are easiest to enumerate with accuracy, especially the scarcely motile bivalves. Much of the Report deals with two forms of the latter of the genera Spisula and Mactra. Of the former, 15,135 specimens of *S. subtruncata* were obtained in one voyage and afterwards measured. As examples, one station yielded 3301 specimens, 2-8 mm., and another 343 specimens, 12-21 mm., giving fairly regular curves round 5 and 17 mm. One station gave two curves round 4 and 20 mm., but otherwise the forms in this voyage from each station were all of one size and presumably one age. Work in this manner allows the plotting of areas according to the number and sizes (and thus weight and food value) and induces deductions as to mortality and growth. One bed of at least 1 year old forms covered 600 square miles and gave more than 83 million Spisula per square mile, while a second of a few months old extended to 700 square miles, 643 million for the square mile, figures which appear gigantic, but are relatively small as compared to layings of mussels and oysters in shallower waters. Omitting the first voyage, the figures range from 78 to 303 per square metre.

Enough, however, has been said to show the value, both scientific and economic, of this work, and Dr. Russell, as director, and Mr. Davis, as the naturalist concerned, are to be heartily congratulated on the very interesting investigations with which they commence a new serial publication, giving the results obtained by the Scientific Division of the Ministry of Agriculture and Fisheries. It is in every way up to the consistently high scientific standard that this Department maintains. Experience teaches that only by the submission of researches for criticism can such a scientific level of work be secured, but we fain would have in addition a popular publication of these and other fishery results perhaps more akin to the literature issued by the agricultural side of the same Ministry, not leaving the dissemination of knowledge solely to trade journals. J. STANLEY GARDINER.

The Radioactivity of Radium in Relation to Solar Radiation.

DR. A. NODON has carried out a series of experiments, which he interprets as showing the existence of solar radiations of shorter wave-length than the X- and γ-rays, and regards as the cause of radioactive disintegration. He has sent us papers on this work, one of which was presented to the Paris Academy of Sciences on June 11, 1923. A radiographic plate, protected by a lead screen with a small central hole, was enclosed in a black cardboard case, on the outer surface of which a small quantity of radium salt was fixed by an adhesive. The effect produced on the sensitive plate was found to be variable, depending on the electromagnetic activity of the sun ; in some cases direct exposure to the sun's rays produced strong impressions on the plate in a few minutes, while in others the impressions were weak after several hours' exposure, and this did not depend on differences in the heating effect of the sun's rays. During periods of solar activity the difference in the impressions produced in direct sunlight and inside a room or in a cellar was found to be very great, being much smaller indoors. The solar radiations do not affect the plate if no radium or other radioactive substance is present. The variations of the horizontal component of the earth's magnetic field were measured by means of a magnetograph, and it was assumed that these variations are closely related to the solar activity.

Measurements made with an electrometer confirmed those made by the photographic method ; these are described in an extract from *Ciel et Terre*, dated May 1923 ; they show very great differences in the action of the sun from hour to hour, and sometimes from minute to minute ; using uranium oxide on the screen closing the window of the electrometer, the deflexions during periods of low solar activity, in a certain series of experiments, varied from 10 to 45, while during periods of strong activity they varied between 100 and 150 divisions.

Dr. Nodon considers that these experiments prove that radioactivity is influenced by radiations emitted directly by the sun and indirectly by the higher atmosphere, which, to some extent, scatters the direct radiations ; and he supposes that, owing to this action of the atmosphere, some of the radiations are transmitted by diffraction from the molecules round the earth, so that even at night some effect is produced. The absorption of different substances for the ultra-radiations seems to be of the same order as that for the X- or γ-rays, the absorption being greatest in substances with a large atomic number ; large thicknesses of building material and of soil absorb a very large proportion of the rays, so that in the interior of a building, and particularly in a cellar, the effects are much smaller than in direct sunlight ; in spite of this the variations of intensity with different magnetic conditions were observed indoors and in cellars.

It is difficult to understand how such variations in radioactivity have hitherto escaped attention ; the radium " clock " is described as working at a uniform rate, indicating constant activitv ; the spinthariscope has not been observed to work better at one time than another, and a good deal of important modern work depends on the actual counting of the impacts of the α-particles on a phosphorescent screen, the rate apparently remaining constant for the same preparation. Measurements of the saturation current due to the ionisation caused by radioactive preparations do not appear to have shown any trace of this effect, and it will be interesting to see the results of further investigations into the phenomena observed by Dr. Nodon.

University and Educational Intelligence.

CAMBRIDGE.—Mr. John Pierpont Morgan has presented to the University a set of fifty-three volumes of the photographic reproduction of the Coptic manuscripts belonging to the Pierpont Morgan library.

The Statutory Commissioners have replied to various representations made to them by the Colleges. They propose to require Colleges to carry into effect the recommendations of the Royal Commission with regard to pensions ; they also adhere to the recommendations of the Royal Commission making all College scholarships and exhibitions for undergraduates eleemosynary. Further, they have given notice that they intend to institute a University Entrance Examination, to be passed before a student comes into residence.

A first list of universities has been submitted to the Senate for approval as institutions, the graduates of which may claim the privileges of affiliation under the new regulations. The list includes most universities of the British Empire, a select but by no means complete list of American universities, and two Continental universities, Basle and Berne. To meet the case of students attending certain colleges in Great Britain and graduating in the University of London, the University Colleges of Exeter, Nottingham, Reading, and Southampton are also added to the list.