

Research Items.

RED DEER FROM THE HOLDERNESS PEAT.—Two discoveries of the remains of red deer in the peat of Holderness are recorded by Mr. T. Sheppard in the November issue of the *Naturalist*. The first was found in beds exposed on the shore near Skipsea, East Yorks. The entire skeleton with the exception of a few small bones was recovered and is now exhibited in the Municipal Museum at Hull. The antlers measure 2 ft. 3 in., and 2 ft. 2½ in., one having seven and the other six points. The second discovery was made in the peat on the shore at Withersea at very low water during the spring tides. Consequently little time was available for excavation and only the antlers were secured. The right antler measured 33 in. in length and 9 in. in diameter at the skull. The left antler was unfortunately broken in the course of excavation and only a part recovered.

GEOGRAPHICAL WORK IN EGYPT.—The Ministry of Public Works, Egypt, publishes the report on the work of the Physical Department for the year ending March 31, 1923. In the Hydrological Service, rainfall observations were received from 281 stations in Egypt and surrounding lands, an increase of ten compared with the previous year. The Nile basin is fairly well supplied with stations except Abyssinia, where there are only six. River discharge measurements were taken on all the main branches of the Nile. A discharge station at Nimule, on the borders of the Sudan and Uganda, will give a measure of the amount of water available for storage in Lake Albert which is essential in any project for controlling the waters of that lake. Among numerous other researches it may be noted that experiments were made with hydrogen drift balloons carrying a magnesium flash mixture, in order to connect, by the help of a camera, the European and African triangulations by way of Crete. The Meteorological Service now receives observations from twenty-four stations in Egypt and twenty-nine in the Sudan. A station in the Sinai peninsula at Bir Abu Tif, founded two years ago by a commercial company, was closed.

FLORA OF THE TIBETAN MARSHES.—The ecologist will find an interesting description of a little-known region in Mr. F. Kingdon Ward's account of the flora of the Tibetan marshes in the *Journal of the Royal Horticultural Society*, volume 48, parts 2 and 3, issued September 1923. He describes the glaciated limestone plateau east of the Yangtze, a country of wide Alpine valleys and numerous small lakes with frequent lofty escarpments overlooking the rivers running from north to south. This country appears to be magnificently rich in herbaceous alpine plants, which are unaffected by the seasonal droughts occurring in their non-growing season, while these conditions prevent the vigorous development of woody plants. As opposed to the country to its west, it is a land of primulas rather than of rhododendrons. Mr. Ward's account of the vegetation is none the less interesting because it is written with a special reference to the plants which are of horticultural interest when transferred to the amateur's garden. Many students of rock gardens will be interested by his pertinent remarks, based upon the study of the rock flora in Nature, as to the places where certain plants should appear in the garden. Thus he suggests that plants with translucent flowers, such as a species of *Onosma*, are intended to grow on a level with the eye so that the light reaches the observer through the petals of the flower, while others, like some of the dwarf *Campanulas*, are intended to hang downwards from the crevices in the cliff.

LIGNITE IN NIGERIA.—The Bulletin of the Imperial Institute, volume 21, No. 2, 1923, contains an important article upon the lignite deposits of Nigeria, which are to be found on both banks of the Niger and seem likely to afford a practicable fuel of special value for boats navigating the Niger. The geological relations of the lignite deposits in the Southern Provinces of Nigeria are discussed and the distribution of the beds indicated so far as it is known. Analyses of the chemical composition of samples from various seams are presented and trials reported of the suitability of the lignite for manufacture into briquettes. A large scale trial of the Nigeria lignite was made by making up a considerable amount of the material into briquettes through the co-operation of a factory in Saxony; these bricks were then used in locomotives on the railways in both the northern and southern provinces of Nigeria with results that suggest that they will provide quite a satisfactory fuel. In view of the cost of imported coal in British West Africa the subject would seem to be of considerable economic importance.

NEW OLIGOCENE TOOTHED CETACEAN FROM SOUTH CAROLINA.—Mr. R. Kellogg figures and describes (Smithsonian Miscellaneous Collections, vol. lxxvi. No. 7) an apparently new toothed Cetacean from beds probably of Oligocene age in Berkeley County, South Carolina. The fossil consists of a skull 371 mm. (=14½ in.) in length. In some respects it resembles *Agorophius* and *Archæodelphis*, but is considered to represent a new genus and species and has been named *Xenorophus sloanii*.

ITALIAN EARTHQUAKES IN 1911.—For the first time since the War, the Central Office of Meteorology and Geodynamics at Rome has issued its "Notices of Earthquakes observed in Italy." The present volume of nearly 600 pages deals with the earthquakes of the year 1911 and forms an appendix to vol. xviii. (1914) of the *Bollettino* of the Italian Seismological Society. One advantage of late publication is that the results obtained at foreign observatories can be incorporated. The total number of earthquakes recorded in 1911 is about 800, of which one-fifth were of external origin. Of the latter, one in every three is described as a "distant earthquake," the position of its origin being apparently undetermined.

THE CHEIROPTERYGIUM IN AMPHIBIA.—Cope's genus *Eryops*, an early Labyrinthodont from the Permian of Texas and New Mexico, has been much discussed; but new light is now shed on it by a paper on its carpus, by W. K. Gregory, R. W. Miner, and G. K. Noble (*Bull. Amer. Museum of Nat. Hist.*, vol. 48, p. 279, Oct. 17, 1923). The authors point to the primitive characters revealed by their research, and come to the far-reaching conclusion that, while all known fossil and existing amphibia have four digits in the manus, the most primitive forms had "a prepollex, five digits, and a postminimus" in the hand and similar features following a prehallux in the foot. The cheiropterygium was thus at least seven-rayed, with a tendency to reduction in the two marginal rays. It is pertinent to the recent discussion in *NATURE* as to the spelling of names derived from Greek that "cheiropterygium" in this paper is not only docked of its first "i," but, when broken at the end of a line, has the hyphen placed between the "p" and the "t."

CORAL-REEFS AND COASTAL PLATFORMS.—The papers on coral-reefs recently read by W. M. Davis before the National Academy of Sciences, Washington, D.C., and

referred to in NATURE (vol. 112, p. 460), have now been printed in the Proceedings of the Academy, vol. 9, pp. 292 and 296. The first deals with the marginal belts of coral seas, and it is pointed out that platforms of low-level abrasion are not known in association with the islands in the cooler zones of the Pacific region, while their depth below sea-level is not so uniform where they do occur as to satisfy Daly's theory of glacial control. If we accept glacial control, as Davis is quite willing to do, the evidence for subsidences of various degrees of magnitude, as put forward by Darwin, remains unimpaired. The second paper deals with the argument based on the uniformity of depth of the lagoons within adjacent atolls, and the author urges that level floors arise through infilling with detritus, which is spread out evenly by the wash of marine water.

PLANTS OF THE MIDDLE OLD RED SANDSTONE.—R. Kidston and W. H. Lang (Trans. R. Soc. Edin., vol. 53, pt. 2, p. 409, 1923) have investigated and completely described the remains of *Palaeopitys Milleri* McNab, a plant originally found by Hugh Miller in beds containing *Cocosteus decipiens* near Cromarty. The authors confirm McNab's observation of bordered pits in the tracheides; but they are unable to decide, in the absence of any evidence as to the fructification, whether the genus should be referred to the gymnosperms or to the pteridophyta. In either case it is probably a distinctly archaic type. The same authors (*ibid.* p. 405) describe, and figure in a photographic plate, an extremely beautiful specimen of a plant with numerous stems spreading radially from a basal region. This was collected by G. Edward, and described by him in 1888. Edward placed it, with his other specimens from Scotland, in the Manchester Museum. Its locality is the Hill of Forss, Waas, Caithness, and it is of Middle Old Red Sandstone age. Sporangia set on short stalks occur; but G. Hickling, when on the staff of the University of Manchester, examined these for spores in vain. The authors now give a name to the plant, *Hicklingia Edwardi*, and seek its affinities in forms from the famous Rhynie cherts. It may be found, indeed, that *Hicklingia* extends our knowledge of the Rhyniaceæ.

DAILY AND SEASONAL VARIATIONS OF FOG.—The Meteorological Office of the Air Ministry has recently issued a Professional Note, vol. iii., No. 33, by Mr. F. Entwistle, on the above subject. Observations of fog from April 1920 to March 1922, a period of 2 years, were grouped for each month at Croydon, Lympne, Cranwell, and Dungeness for all hours of the day for which observations were made. A temporary increase in fog is shown in the early morning, a maximum being reached between one and two hours after sunrise. The summer maximum occurs about three hours earlier than the winter maximum. London smoke naturally somewhat affects the general visibility at Croydon, being influenced by the direction of the wind. Increase of fog in the early morning is said to be due probably to eddy motion mixing the layers of air near the surface. There is generally less fog during the afternoon, between midday and 6 P.M., than at any other time during daylight. For civil aviation it is considered desirable to arrange early morning services, before the maximum fog intensity is reached, while for ordinary services the middle of the day is the best time. In the winter season the larger proportion of slight fogs at Croydon are doubtless due to town influence. The thick fogs at Lympne are due chiefly to low cloud caused mainly by winds between south to south-west, so that the high ground of the North and South Downs is enveloped. The small amount

of fog in winter at Dungeness seems to suggest that the best position for an aerodrome in winter is on the coast near sea level. In the summer months thick fog is frequent at Lympne and Dungeness; at Dungeness it is chiefly sea fog caused by the relatively warm air from off the land passing over the cooler sea.

FORMATION OF OZONE IN FLAMES.—Prof. Manchot, of Munich, communicated to the autumn congress of German Chemists at Jena a paper on the formation of ozone in flames. Parts of the flame which have a temperature of 750° C. only contain ozone, as can be proved by the silver reaction. The formation of ozone does not depend on the nature of the combustible gas, ozone being formed with hydrogen, carbon monoxide, methane, acetylene, cyanogen, etc. A flame of oxygen and hydrogen gas of 1300°-1900° C. contains about 0.1 per cent. of ozone, one of acetylene and oxygen of 2100° C. about 1 per cent. The latter blackens silver as if it were covered with soot. The thermal formation of ozone, and also the formation from hydrogen peroxide, are not possible, since ozone is also formed within a flame of perfectly dry carbon monoxide. It is probable that the ozone is formed by the action of electrons.

STANDARDISING PIEZO-ELECTRIC APPARATUS.—The extensive use of the piezo-electric properties of crystals in the measurement of transient pressures such as those due to an explosion makes it necessary to inquire into the validity of the method used to standardise the apparatus. It has generally been considered sufficient to apply a steady known pressure to the crystal and to note the effect. In a short paper in the November issue of the *Philosophical Magazine*, Dr. D. A. Keys, of the McGill University, Montreal, points out that as the standardisation experiment is an isothermal and the ordinary use an adiabatic one, there may be a difference in the piezo-electric constant of the crystal in the two cases. He examines this possibility in the case of tourmaline and comes to the conclusion that for that crystal the difference between the isothermal and adiabatic constants is only $\frac{1}{2}$ per cent.

CHANGES IN CRYSTALLINE STRUCTURE DUE TO TEMPERATURE.—Describing a simple arrangement for showing the alteration in the appearance, under the microscope, of a polished etched metal plate when heated, Herr H. Vogel, in the *Zeitschrift für Elektrochemie*, July 1, 1923, makes the following assumption as to the behaviour of the crystallites, of which the metal is built up. If two crystallites touch one another, the distance between the atoms in the boundary plane of one of them will, in general, be greater than in that of the other, and the forces holding the atoms in these respective planes will be different. When the metal is heated the first crystal will grow at the expense of the other, and as this takes place throughout the metal, the average size of the crystallites increases. It is possible for a crystallite to grow on one side and be consumed by another crystallite on another, so that the relation between the initial and the final structure may be complicated. The distance between atoms in the octohedron plane is greater than in the cube surfaces of the lattice, and it is still greater in the rhombic dodecahedron surfaces; thus when two crystals *A* and *C* touch with surfaces of the first and third kind, crystal *A* grows; while when *A* and *B* touch with surfaces of the first and second kind, crystal *B* grows and *A* is consumed.

CHEMICAL ANALYSIS BY X-RAYS.—In a paper read before the Deutschen Bunsen-Gesellschaft, Dr. D. Coster shows that the relations between the X-ray spectra of the different elements are so simple that, in

some respects, they are more useful for purposes of chemical analysis than ordinary luminous spectra (*Zeitschrift für Elektrochemie*, Aug. 1, 1923). An important advantage is the fact that the X-ray spectrum of an element is quite independent of the nature of the compound containing it which is examined. It is easy to detect the presence of an element when only 1 per cent. is present in a mixture of which not more than 1 mg. is available. Certain precautions are necessary in examining the X-ray spectra; although the number of lines for each element is comparatively limited, recent observations have shown the existence of a number of weaker lines; in addition to this, with the high voltages now generally used, not only the spectrum of the first order, but also those of higher orders appear. Slight impurities in the material of the anticathode, and in the substance under examination, also give their lines, so that there are often various possibilities to be considered before a given line can be explained. Not only the wave-length, but also the typical appearance of the suspected lines must be considered, as well as their relative intensity. By measuring photometrically the intensity of the spectral lines it is possible, in some cases, to obtain a quantitative estimate of the amount of an element present in a mixture. The method was used by Hevesy and the author in determining the amount of hafnium in zirconium minerals, and in investigating the chemical properties of the new element.

MAGNETIC RECORDS OF THE BRITISH ISLES.—The British Meteorological and Magnetic Year Book for 1920, published by the Meteorological Office, gives particulars of the diurnal variation of the principal meteorological elements at the Aberdeen, Eskdalemuir, Valencia, and Kew Observatories, with rainfall and sunshine data at Falmouth. The major portion of the volume, however, is devoted to terrestrial magnetism, especially at Eskdalemuir. Two pages are devoted to the diurnal variation of the potential gradient of atmospheric electricity. The results for Kew are based on 10 selected days a month free from negative potential. For Eskdalemuir there are two sets of data, the first derived like the Kew data from days free from negative potential, the second from days when negative potential occurred, although they were comparatively quiet. Taking the first class of days, the mean value of potential gradient at Eskdalemuir for summer (May to August) is practically identical with that at Kew. In the other seasons the Kew value is the greater, the excess being 9 per cent. for the equinoctial and 45 for the winter season. The difference is thus greatest in the months when fog—a recognised source of high potential—is most prevalent in the Thames valley. In addition to the regular tables of hourly values and diurnal inequalities of terrestrial magnetism, there is a discussion by Dr. Crichton Mitchell of different measures of daily magnetic activity at Eskdalemuir. All his criteria make 1920 a quieter year than 1919, and the same conclusion is drawn from the Kew data. There was, however, an exceptionally violent magnetic storm on March 22-23, 1920, during which the range of declination at Kew exceeded 2°. According to the table on p. 47, the fall of westerly declination from 1919 to 1920 was 9.9' at Kew, 9.3' at Valencia, and 9.0' at Eskdalemuir. Inclination appeared to be practically stationary, while horizontal force showed a slight fall: 77 at Eskdalemuir, 67 at Kew, and 27 at Valencia.

PHOTOGRAPHIC BLACKENING AND COLOURED LIGHT.—The second number (August) of the Bulletin of the Kiryu Technical College, Japan, consists of a lengthy and copiously illustrated paper by Tadaroku Otashiro on "The Relation between the Photographic

Blackening and the Wave-length of Light." The author aims at expressing the blackening as a function of wave-length. For this purpose, different portions of a plate were exposed to different monochromatic lights of equal intensity, and in other cases the wave-length was kept constant and the intensity varied. Ordinary, orthochromatic, panchromatic, and ordinary plates "dyed" (bathed) with solutions of erythrosin, cyanin, and pinacyanol were employed. The author theoretically determines from the photoelectric viewpoint the actual relation between the blackening and the wave-length of the incident light, intensity being constant, and experimentally confirms it. "The general form of the function is quite independent of the kinds of plates, the strength of sensitising solutions, the time of bathing plates in a sensitising solution, the time of washing after bathing, the developers and the temperature during the time of development." The equation includes a "solarisation factor," and it is shown that there are "two maxima and one minimum effect of blackening on the continuous exposure to the most effective light . . . and the first maximum corresponds to the end of the period of over-exposure defined by Hurter and Driffield." He shows that there is a definite relation between the blackening and the strength of any dye solution. The author comes to other interesting conclusions, especially with regard to multiple exposures, and concludes "that the change when a plate has been acted on by white light should be essentially the same as that when the plate has been exposed to the most effective monochromatic rays of light."

ANALYSIS OF COAL.—The Fuel Research Board of the Department of Scientific and Industrial Research has issued through H.M. Stationery Office (1s. 6d. net), Pamphlet No. 2 on the "Physical and Chemical Survey of the National Coal Resources," consisting of an interim report on "Methods of Analysis of Coal." The Board has always had in view the physical and chemical survey of coal seams in the different mining areas—a task of great magnitude—and the policy pursued has been to encourage the formation of local committees of persons interested in the different coal fields to which the execution of the survey could be delegated. The results of such a survey would be greatly depreciated in value unless unity of analytical procedure were ensured, and accordingly the Board asked a committee on sampling and analysis of coal, presided over by Prof. T. Gray, to tabulate a scheme of coal analysis which could be uniformly adopted in the survey. This pamphlet records their efforts. The importance is even wider, for most commercial coal testing is confined to the proximate analysis—essentially empirical and demanding uniformity of practice if discrepant analyses and commercial friction are to be avoided. There is no doubt as to the value of the report in this direction. Although nothing of the kind has been done previously in Great Britain, the field has already been tilled by American fuel chemists—so well that in many cases the committee has been able to adopt their specification without serious modification. This applies particularly to the proximate analysis, and it is likely for that reason that many will find no difficulty in adopting the committee's recommendation. Several special and less common methods of coal assay and analysis are included which will add to the usefulness of the pamphlet. A statement of the permissible analytical error is sometimes given, and forms a welcome inclusion. In suggesting a form of report the committee employs a precision of stating results not quite consistent with its own tolerances. The important question of sampling is reserved to a second report.