

Research Items.

MEDIAEVAL METALLURGY.—An interesting article on mediæval metallurgy, by M. L. Becker, appears in the *Memoirs and Proceedings of the Manchester Literary and Philosophical Society* (1923-1924, No. 4). No important metallurgical information of early times can be obtained from works prior to those of Dioscorides (first century A.D.), who describes brass and the recovery of zinc oxide. Pliny at the same period describes the smelting of metals, but he does not appear to have had practical experience in this direction. The really important literature dates from the eleventh century onwards, and includes the works of Theophilus and Agricola. The latter's contributions to metallurgical science, embodied in his book "De Re Metallica," are considered in detail, many illustrations being reproduced.

PAUPERISM IN THE UNITED STATES.—Prof. Raymond Pearl contributes to *Science* of October 31 an interesting note on the racial composition of paupers in public almshouses in the United States. Between 1910 and 1923 the proportion of foreign-born white paupers decreased from 42.6 per cent. to 32.6 per cent. The countries of origin which showed the greatest proportional excess of the paupers, having regard to their percentage shares in the whole population, were Ireland, Germany, and England, in that order. "With a few trifling exceptions," writes Prof. Pearl, "all the countries from which the present law encourages immigration contributed to almshouse pauperism in 1923 in excess of their representation in the population in 1920. On the other hand, again with a few trifling exceptions, those countries from which the present immigration law was especially framed to discourage immigration appear in the lower part of the diagram, because they contribute a smaller proportion to almshouse pauperism in 1923 than their representation in the general population in 1920."

ASYMMETRY OF THE AXIS IN THE PRIMATES.—In the course of a comparative study of the mammalian axis, Dr. Delattre has found that the axis of primates, and particularly of the anthropoids, is asymmetrical in a large proportion of cases. In the current issue of the *Bulletin of the Société d'Anthropologie de Paris* (Sér. VII. t. iv. fasc. 4-5-6), he describes the deformation and endeavours to account for its occurrence. Beyond the primates it does not occur among the mammalia except in certain carnivora and ungulates. There are several theories which are held to account for its occurrence in man, such as unequal action of the spinal muscles on one side. Any inequality in the lower limbs involves a compensating curvature in the vertebral column, as will also any deformity or defect tending to unilateral action. Although an inequality of the lower limbs is of sufficiently common occurrence among the primates, the asymmetry of the axis is rather to be attributed to a special attitude which is an accompaniment of the arboreal life. One of the upper limbs being employed constantly in prehension is habitually raised and held in a more forward position than the other. The torsion of the trunk and the constant thrust forward of the head causes an unequal action of the muscles which produces a deformation of the cervical vertebræ.

HISTORY OF CIVILISATION.—An Occasional Paper (No. 6) lately issued by the Royal Anthropological Institute is of the first importance for students of races and history. The early pottery of the near East has been summed up by Mr. H. Frankfort of Amsterdam, in a thesis for his M.A. degree in the

University of London. He deals with Mesopotamia, Syria, and Egypt and their earliest interrelations in 142 well-illustrated pages. During the last third of a century our view of the past has been immensely enlarged; the four civilisations known before the present one have been extended now to eight. The great mass of new facts remained mostly in their original monographs, in which they had been partly explained. The summing up of them as a whole, in full view of all the material, was a work much needed, and Mr. Frankfort has done it with great diligence, searching out unpublished specimens, and with remarkable judgment and sanity. He carefully distinguishes the ideas often vaguely expressed, of racial and artistic terms, and seeks to secure every precision and definition available. The discussion of Mesopotamian material leads to the conclusion that the earliest Susian civilisation was crushed by drought, which drove the people down to the rivers. They were neither Semite nor Sumerian, and the Sumerians came up later from the Persian Gulf. Their possible Indian connexion has been rendered much more likely by the recent discovery of quasi-Sumerian engraving and signs in India. As to Egypt, it is well to find that the explanations given at the time of new discoveries during the last quarter of a century hold good in almost every point. The scantiness of the Asiatic discoveries is scandalous, now that the regions are more accessible, and sites are liable to be destroyed by commercial business. The opportunity will not keep, and both men and money are wanted speedily for Eastern research in civilisations.

FUNGI AND EPILEPTIFORM CONVULSIONS.—In the *Transactions of the Mycological Society*, 10, p. 121, Prof. J. Russell Greig describes the association of fungus spores with epileptiform convulsions in dogs. In three cases showing the symptoms (two of which died), the fæces and intestines were found to contain spores of *Tilletia Tritici*, the stinking smut of wheat. These were present in very large quantity and were conceivably derived from straw used for bedding. In the cases examined, no macroscopic lesion was visible in the body, but in one case in which the cranium was also investigated, an acute cerebral meningitis was observed, associated with numbers of spores. The fungus spores are often present as isolated specimens in the fæces of normal dogs. There appears to be evidence that they can be absorbed by the intestines, though how this is accomplished in the case of an inert body of about 18 μ in diameter, remains to be determined.

TRANSPIRATION OF XEROPHYTIC PLANTS.—It is now generally recognised that the thick cuticle, sunken stomata and other structures characteristic of plants growing in dry places do not necessarily produce any noteworthy modification in the rate of transpiration. This point has now been examined for a number of typical Australian xerophytes by Mr. H. W. Wilson (*Proc. Roy. Soc. of Victoria*, 36, N.S., pp. 175-237), who was unable to find that these plants had any special powers of accommodation when subjected to rapid increases in temperature or to hot winds. The so-called xerophytes are, in fact, provided with a high average number of stomata, and they respond very rapidly to changes in the evaporating power of the air. The phyllodes of the Acacias and the leaves of the Eucalypts in particular, are regarded by Mr. Wilson as almost perfect transpiring organs. One of the curious features of the results to which no reference is made, is that the average transpiration rate per

million stomata bears no apparent relation in different species to the depth to which the stomata are sunk or to the degree to which they are protected by hairs or other excrescences.

BROWN BAST DISEASE OF RUBBER TREES.—In the *Malayan Agricultural Journal*, Vol. 12, September and October 1924, pp. 290-343, Messrs. A. Sharples and J. Lambourne record a very large number of further field experiments upon this subject in continuation of the experiments referred to in *NATURE* of February 17, 1923, p. 234. These experiments leave them still more firmly convinced of the physiological origin of this disease, as opposed to the bacterial origin suggested by P. E. Keuchenius. On the other hand, they are unable to agree with Prof. J. B. Farmer and Mr. A. S. Horne that phloem necrosis is a significant primary feature of the disease, as they find lignification of the sieve tubes a common feature of the phloem in healthy trees. They conclude that over-extraction of latex is the most important factor in initiating the disease, and suggest that this may cause an excessive loss of water to the plant at times or seasons when this loss of sap seriously affects the water balance in the tissues. These authors seem somewhat pessimistic as to the possibility of developing successfully high yielding plantations by methods of vegetative propagation (bud-grafting). It is difficult to select the tree in which high yield of latex is an intrinsic quality and not the result of favoured position and climate, and difficult to know whether such high yield is associated with resistance to brown bast disease. The authors argue that such high-yielding trees will have leaves more liable to fungus attacks, though their reasons for such a pessimistic conclusion do not read very convincingly.

FOG AT THE SCILLY ISLES.—Fog frequency at Scilly during summer months in relation to weather types indicated by barometric pressure is discussed by Mr. E. G. Bilham in *Professional Notes*, vol. 3, No. 37, issued by the Meteorological Office, Air Ministry. The investigation is somewhat tentative, more complete work being in hand, but as fog at the entrance to the Channel is of considerable importance to seamen, the facts at present to hand are published. In the summer months "fog" as distinct from "mist" is reported at Scilly on one day in seven, and including "mist," the frequency is at least twice as great. Only days with fog are included in the present inquiry. The period dealt with is the fourteen years 1905 to 1918, which gives 1288 days, and as there were 192 fogs the chances against fog are nearly 6 to 1. Of the total fogs, 61 occurred in June, 60 in July, and 71 in August. In individual months the fogs varied from none in August 1905 to 12 in June 1915. In individual years the number of fogs for the three summer months combined varied from 8 in 1909 to 24 in 1914. The numbers are given for each of several types of pressure distribution. Illustrations are given of the several foggy types and of the clear weather types. With a large area of high barometer over Scandinavia and several smaller ones to the south-west, the chances are only 1.4 to 1 against fog at Scilly. No fog was recorded during the summer months in 14 years at Scilly with a "V" shaped depression over the east of England or with a high barometer over Scandinavia and low over Mediterranean. With high barometer to the north-west of the British Isles and low over the north of France, the chances against fog are 2.4 to 1.

THE RECOIL OF THE ELECTRONS WHICH SCATTER γ -RAYS.—Mr. D. Skobelzyn describes, in the *Zeitschrift für Physik* of October 14, an investigation of the

γ -rays of radium, in air, by the Wilson cloud method. A magnetic field was employed, perpendicular to the path of the γ -rays. This caused the resulting β -rays to move in spiral and often in circular paths. It prevented β -rays produced on the walls from penetrating into the space surrounding the γ -ray beam, and made it easy to investigate the β -rays from the gaseous atoms. Although the energy given by a hard γ -ray to an electron is in some cases nearly equal to $h\nu$, in many others it is only a small fraction of this quantity. It is also found that the initial velocity of the electrons has always a forward component, and that the energy depends on the angle θ between the direction of the initial velocity and that of the γ -ray, being on the average smaller as θ increases. These results are in accord with the hypothesis of Compton that, in the case of the lighter atoms, the secondary β -rays are recoil electrons, and contrary to that of Wilson and Bauer, according to which the scattering of the γ -ray takes place as a spherical wave, and that the whole elementary impulse of the radiation $h\nu/c$ is given up to the electron.

HEAT INSULATORS.—Special Report No. 5 by the Engineering Committee of the Food Investigation Board (First Report on Heat Insulators, Experiments. Second Edition. London: H.M. Stationery Office. 2s. net), deals with the first series of measurements made by Dr. E. Griffiths at the National Physical Laboratory of the heat conductivities of some of the heat insulators used in the construction of refrigerating stores. Dr. Griffiths finds that the heat conductivities of good dry cork, slagwool, charcoal and wood fibres at ordinary cold stores temperatures are all about 0.00011 C.G.S. units. Different brands of the same material differ to some extent in conductivity, and some of the materials at present used for heat insulation are liable to deterioration in situations where they may be subjected to heat or vibrations. In one case the conductivity had increased 40 per cent. Of the 17 materials tested, one—expanded rubber—appears to be little known as a heat insulator although its heat conductivity is about the same as that of cork.

COAL DUST EXPLOSIONS.—Prof. H. B. Dixon's presidential address before the Manchester Literary and Philosophical Society, which dealt with coal-dust explosions, is printed in the *Memoirs and Proceedings of the Society for 1923-1924*. A general account of the work carried out at Eskmeals is given. A coal-dust cloud can be ignited and can propagate a flame, but this cloud must pre-exist before the flame reaches it. The effect of the presence of inert dust varies; if the explosion wave is set up in pure coal dust it will continue to travel for some distance when it meets a dust containing as much as 75 per cent. of inert dust. A mixture of equal parts of coal dust and inert dust may propagate an explosion, provided there is an intense explosion flame to start it; such a mixture may be exploded by the discharge of 24 oz. of blasting powder.

DIAZONIUM TETRACHLOROIODIDES AND PLUMBI-CHLORIDES.—These compounds are described by F. D. Chattaway, F. L. Garton, and G. D. Parkes in the October issue of the *Journal of the Chemical Society*. The tetrachloroiodides are among the most stable of diazonium derivatives and they separate as yellow crystals when cooled solutions of diazonium chlorides are poured into cooled concentrated hydrochloric acid solutions of iodine trichloride. They are decomposed by hydriodic acid to the corresponding iodobenzene derivative; on heating with alcohol the diazo-group is mainly replaced by chlorine. Diazonium plumbi-

chlorides are prepared as above with the substitution of lead tetrachloride for iodine trichloride. They react with hydriodic acid and alcohol in the same way as the tetrachloroiodides. They all decompose explosively at a definite temperature; the tetrachloroiodides melt sharply, although always with decomposition.

EXPLODING AMMONIA WITH ELECTROLYTIC GAS.—The products obtained by exploding ammonia with varying amounts of oxygen and of electrolytic gas have recently been examined by J. R. Partington and A. J. Prince, the results being published in the *Journal of the Chemical Society* for October. Mixtures of electrolytic gas with ammonia are explosive when the former constituent is in slight excess; 79 per cent. of the ammonia is decomposed under these conditions. Complete decomposition occurs when the proportion of electrolytic gas just exceeds 75 per cent. When more than 1.6 parts of ammonia are exploded with 1 part of oxygen, the latter unites preferentially with the hydrogen, leaving a residue of nitrogen and excess hydrogen. When less than 1.6 parts are used, oxides of nitrogen are formed; the maximum oxidation of nitrogen is 16 per cent. and occurs when the ratio of the exploding gases is 1.22 : 1. The amount of nitrogen oxidised when mixtures of nitrogen, hydrogen, and oxygen are exploded is always less than when the ammonia which would be formed from these mixtures is exploded with the same ratio of oxygen.

PENANG HILLS RAILWAY.—The island of Penang consists of mountainous and broken country and is situated not far from the equator. The capital, Georgetown, is at sea-level, and the climate is trying for Europeans. It is therefore not surprising that a hill suburb is growing up on Penang Hills. Access to the summit has, until quite recently, been possible only by a tiresome and difficult journey by hill track some 5 miles long, and impossible for vehicles of any kind. A new railway was completed and opened on October 21 last year, the work having been carried out under the direction of Mr. A. R. Johnson of the Federated Malay State Railways. An illustrated account of this railway appears in *Engineering* for November 14, and the scheme has novel features. The total length is 1 mile 435 yards, and the upper station is 2381 feet above sea-level. In any funicular railway, the haulage engine has to move not only the cars but also the haulage rope, which may be considerably heavier than the useful load. The load on the engine is variable as the relative positions of the cars alter. The ideal arrangement is one in which the tractive force required from the haulage engine is a constant, and this effect is secured by making the profile of the railway a parabola. The Penang Hills Railway has been set out with a parabolic profile, and one of the striking features of the line is not only the practically constant loading of the haulage engine, but also the remarkably small power which it demands for its operation. The line is divided into two sections, and there is an electric-motor-driven winding engine at the top of each section. At the bottom of each section a short circular curve, tangential to the parabola, has been introduced. The object of this is to ease the starting grade so that the load does not rise above the normal during the period of acceleration. The total time for the journey to the top is about 25 minutes. The article is of interest also from the constructive point of view on account of the difficulties of the site.

A POCKET MICROSCOPE.—We have received through Messrs. Ogilvy and Co. (18 Bloomsbury Sq., W.C.),

the British agents, an example of the new Leitz "Minor" folding microscope, which when folded is contained in a leather case only 6 in. long. Coarse focussing is by sliding tube and fine focussing by a screw collar encircling the tube. By means of a duplex combination lens, two eyepieces and the draw-tube, magnifications of from 50 to 250 diameters may be obtained. A low power objective can also be supplied giving magnifications of from 7 to 26 diameters. The folding foot may be so adjusted as to form a handle, so that with the low power objective the microscope may be used as a hand lens. The microscope is a handy little instrument, very suitable for field work or travel.

A NEW DEW-POINT HYGROMETER.—The issue of the *Physikalische Zeitschrift* for September 15 contains a short description of a dew-point hygrometer constructed by Dr. M. Holtzmann of the Geophysics Department of the Central Physical Observatory of Leningrad. A polished copper tube 2 cm. in diameter and 15 cm. long is placed with its axis vertical, and round its upper end is wound an insulated wire through which an electric current is sent so as to warm the upper end of the tube a few degrees above the temperature of the air. A short distance below the coil, a horizontal line is drawn round the tube and the two wires of a thermo-couple are soldered to the tube at points on the line. A stream of liquid at a temperature two or three degrees below the dew-point is then sent up the tube, and its speed so regulated that dew is deposited on the tube up to a point above the line. The stream is then stopped and the heating current reduced until the top edge of the deposit of dew descends to the line. The electromotive force of the thermo-circuit is then read on a galvanometer in circuit. The author claims that the instrument gives the dew-point with an accuracy of 0.02° or 0.03° C.

A NEW SPECTROMETER.—We have received from Messrs. Bellingham and Stanley, Ltd., of 71 Hornsey Rise, N., their catalogue of spectrometric apparatus, polarimeters, and refractometers, containing particulars of instruments suitable for many types of work. Particular attention is directed to a new model universal spectrometer, which may be used as a wave-length spectrometer for the visible and ultra-violet spectrum, a monochromatic illuminator, an infra-red spectrometer, a spectrograph, or, with the addition of the Bellingham and Stanley photometer, a high precision spectrophotometer. The instrument is arranged on the Littrow principle. Light from the slit is directed by a small totally reflecting prism to a concave mirror and thence to a 30° prism, from which it returns to the mirror and passes to a second slit, carrying an eyepiece adapter, by means of which the particular spectrum line required is isolated. The prism may be rotated so as to bring the required line into view. The prism and mirror inserted vary with the purpose for which the instrument is to be used. The photometer necessary to convert the instrument into a spectrophotometer has a number of new features in its design. The polarimeters, of which there are several models, consist of two solid components of Iceland spar mounted in such a way that no totally reflecting cement is required, and the risk of disintegration is reduced to a minimum by locating the sharp edge in one of the natural cleavage planes of the crystal. The refractometers include a high accuracy critical angle instrument specially designed to meet the objections to existing instruments working on the same principle.