

Research Items.

THE RAINMAKER AMONG THE LOTUKO, S. SUDAN.—In *Sudan Notes and Records*, Vol. 8, No. 2, Prof. C. G. and Mrs. Seligman have published notes on material relating to social organisation collected among the Lotuko of the Southern Sudan in the winter of 1921–1922. The Lotuko are organised into a number of independent territorial groups, each including a number of villages and divided into clans. At its head is a rainmaker (*Kobu*, fem. *nobu*), who is commonly referred to as “Sultan” by any Arabic-speaking Lotuko. He is the religious as well as the temporal head of the community. Both parents of a rainmaker should “have rain,” though individuals with rain descent on the male side only have attempted to set up as rainmakers. They are not confined to any particular clan, but vary in different localities. Yet the clan gains prestige from his membership and his seat is looked upon as the headquarters of the clan. This tends to a territorial grouping of clans. A male rainmaker succeeds to the office on the death of his father, but a female cannot perform rain ceremonies until she is married to a rainmaker. A pool, Itaraba, has a sacred character and is associated with a semi-mythical rainmaker who is said to have lived five generations ago. In this pool live the crocodiles who are the deceased rainmakers of the Igago clan. A gourd of its water plays an important part in the rainmaking ceremony.

GYPSY MARRIAGE IN ENGLAND.—Mr. T. W. Thompson, who has been engaged in investigating gypsy marriage customs for some years, publishes in the *Journal of the Gypsy Lore Society*, Series 3, Vol. 5, Pt. 1, the results of a detailed analysis of a number of records of marriages contracted in some of the leading gypsy families in the nineteenth century. From these it is deduced that descent in the direct line and common parentage are bars to matrimony, notwithstanding a case of marriage to a granddaughter, and one of a half-brother and sister. There has been a number of cases of marriage between uncle and niece, and aunt and nephew, the latter less frequently, and usually uncles have preferred their brothers' to their sisters' daughters. The mating of first cousins has been exceedingly common in some families, and first cousins marry more frequently than second cousins. There is also a marked preponderance of ortho-cousin over cross-cousin marriages, which reflects a definite tendency towards marriage within the family circle. On the other hand, certain southern groups seem to show a preference for cross-cousin marriage, and generally with daughters of a mother's brother rather than a father's sister. It is suggested hypothetically that the Indian proto-gypsies possibly practised a two-clan exogamy, such as actually exists among Indian nomads classed as ‘gypsies,’ and that on quitting India they had a marked tendency to wed near kindred. Further, that while sojourning on the upland stretches between India and Armenia under the influence of Iranians and Arabs, they weakened the hold of exogamy and strengthened the tendency to alliances between close blood relatives. Polygyny occurs sporadically and the marriage of two or more brothers to two or more sisters is specially common. Further, a polygynist's wives have more often than not been sisters. Formerly it may have been usual to wed a deceased wife's sister and for a young widow to wed a brother-in-law; also it may not have been permissible to wed a younger sister before an elder. In addition to the sororate and the levirate there is evidence for the custom which exists among the Santals of India by which a man

might cohabit with his wife's sisters before their marriage.

THE INSECT FAUNA OF THE DUTCH EAST INDIES.—Two recent supplements to *Tyebia*, the official zoological journal of the scientific institutes at Buitenzorg, are of special interest to entomologists. The supplement to vol. 6 (April 1926) is devoted to an extensive monograph of the Tabanid flies of the Dutch East Indies by Dr. J. H. Schuurmans Stekhoven, jr. This work forms a bulky volume of 552 pages with 18 excellent three-colour process plates of representative species. The fact that certain Tabanids play a significant part in the transmission of the disease known as ‘surra’ has evidently prompted the large amount of study and collecting that has been entailed in the production of this important monograph. It is probable that *Tabanus striatus* is the most prevalent mechanical transmitter of that disease in the East Indies, but it is very uncertain whether or not other species and genera of these blood-sucking flies may also be implicated. Altogether 266 species of the family are fully described in this work, and many are new to science. The supplement to vol. 8 (July 1926) consists of a very detailed study of the immature stages of Malayan Thysanoptera by Mr. H. Priesner. This work forms, unquestionably, one of the most careful and accurate accounts of the post-embryonic forms of those insects that has so far appeared anywhere. The abundance of material at his disposal has enabled the author to construct family, generic, and specific keys to the identification of both primary and secondary larvæ, while his descriptions are greatly enhanced in utility by the 16 plates illustrating numerous structural features.

THE RESPIRATORY EXCHANGE OF THE MUSSEL.—In a very interesting paper in the *Biochemical Journal* (vol. 20, No. 4, 1926, p. 289) Mr. J. R. Bruce describes an apparatus by means of which he studied the gaseous metabolism of a stock of common mussels, *Mytilus edulis*, L., kept in a large concrete tank at the Marine Biological Station, Port Erin. For the experiments, equal samples were taken from the stock at fifteen roughly equal periods between March 1925 and April 1926; oxygen was determined by Winkler's method and carbon dioxide by an indicator method elaborated by the author. It was found that the oxygen requirements rose and fell in close agreement with the rise and fall of the temperature during the year, and also, though to a slighter extent, depended on the oxygen pressure. By making corrections for variations in these two factors, a third variation in oxygen intake was made evident which followed closely the reproductive cycle, there being an increase of 30 per cent. per unit weight of wet tissue between July and March, the period in which the reproductive reserves (largely glycogen) are being built up after the depletion consequent on the spawning of the previous spring. A point of the greatest interest is furnished by the disparity between the respiratory quotients at different periods, it being at its lowest in June and July and rising to a maximum in March. This is apparently associated with the changing chemical composition of the tissues during the period when glycogen is being stored, the drop from March to May corresponding to the period of fat formation preliminary to spawning in May.

THE MECHANISM OF GEOTROPIC CURVATURE.—We are still ‘in the dark’ as to the mechanism which is responsible for the different geotropic curvatures manifested by shoot and root, and recently another

suggestion has come from Polish sources. F. Tondera directs attention to the early work of Kraus, who showed that the amount of water in the tissues on the upper and lower side of a horizontal axis may be different, and suggests that the gravitational influence on sap distribution will be different upon the cortex of a root, from which water is moving inwards to the stele, and the cortex of the shoot, which is evaporating water and receiving a fresh supply moving outwards from the stele. He concludes that as a result the gravitational effect upon a horizontal root may reinforce and increase the natural sap movement on the upper side of the root and the lower side of the shoot, thus causing downward (positive) geotropic curvature in the first case and upward (negative) curvature in the second. His paper in the *Bulletin International de l'Académie polonaise des Sciences et des Lettres*, 8 B, 1925, contains very little experimental evidence; but the theory recalls in some respects the suggestion recently put forward by Ricôme in the *Rev. Gén. de Botanique*.

THE ROCKS OF JAN MAYEN.—The first comprehensive collection of rocks from the hitherto little known island of Jan Mayen was made by Mr. J. M. Wordie in 1921. This material has now been studied geographically by Dr. G. W. Tyrrell, and the results, together with seven new analyses, are recorded in the *Trans. Roy. Soc. Edin.* (vol. 54, Pt. 3, No. 19, Oct. 2, 1926). The most abundant rocks appear to be trachybasalts with subsidiary trachytes and ankaramite (ultrabasic olivine basalt), and they occur as lava-flows or small intrusions. Trachyandesites and plateau-basalts are also known, but so far only as blocks and pebbles in a volcanic conglomerate. The only previous analysis of first-class importance was made by Dr. H. F. Harwood of a trachybasalt described by Prof. A. Holmes in 1918. The new analyses now recorded show that the suite as a whole is of mildly alkalic character with titanium dioxide ranging up to nearly four per cent. Holmes's deduction of a richly titaniferous belt in the Brito-Arctic Province stretching from Greenland to the Hebrides thus receives further support. The original magma appears to have been of trachybasaltic composition, differentiation having produced sub-magmas of trachytic and ultrabasic extremes. The specimens of plateau-basalt seem to be more ancient than the exposed lavas and they probably represent the underlying basement of the island.

SPANISH PETROLOGY.—The Iberian Peninsula consists structurally of three main tectonic features: a central plateau of pre-Cambrian and Palæozoic rocks which were extensively invaded by granites towards the close of the Carboniferous; a southern Betic Cordillera of folded rocks; and a similar northern folded belt forming the Pyrenees and Cantabrian Mountains. Hitherto little has been known of the chemical characters of the Carboniferous granites, but in a recent paper this deficiency is made good by Dr. H. S. Washington (*Journ. Wash. Acad. Sci.*, Sept. 19, 1926). All the specimens studied, of which four have been analysed, are simple biotite granites of approximately average composition, the uniformity in this respect being especially noteworthy. The later igneous rocks of the folded and faulted borders are strikingly different, as they include a wide variety of alkaline, mostly soda-rich, types. It is pointed out in a comparative survey that a similar contrast between granitic horsts and alkaline peripheral regions is shown by many other areas, such as the Canadian, Brazilian, and Fenno-Scandian shields. The distribution of soda rocks around older granites

is regarded as unfavourable to the hypothesis that they are derived from basaltic magmas by assimilation of limestones.

WEATHER IN SAMOA.—The report of meteorological observations for 1923 made at the Apia Observatory has recently been received. Magnetic, meteorologic, and seismic observations are given in detail. Magnetic disturbances were not numerous during the year, and those which occurred had little effect upon the declination. The mean air temperature for 1923 was 26°.08 C., while the normal for the years 1890–1923 is 25°.78 C. The total rainfall in 1923 was 3772.6 mm. and the normal is 2688 mm. The abnormal rainfall was largely due to the unusual precipitation during March, when rain was general throughout the Samoan Islands; at Alisa the fall for the month was 117.82 in. (2993 mm.). This unusually heavy precipitation was the result of a circular storm which originated to the south-west of Samoa and was considered by residents to have been the most severe in twenty-five years. It caused general damage to roads and public works and resulted in considerable reduction of the copra output for the year. Of 119 earthquakes 79 were local and had their epicentre within 100 km. of the observatory; six earthquakes were reported as felt by people living in Apia and vicinity. Between June 1 and December 31 eighty-one balloons were sent up, and thirty-nine of these were followed to a height of 5 kilometres or more. The greatest altitude observed was 21 kilometres, on December 19. Grateful acknowledgment is expressed of substantial grants from the Carnegie Institution of Washington and from the British Admiralty.

INVAR STEEL BALANCE BEAMS.—The issue of the *Proceedings of the Physical Society of London* for August 15 contains a paper by Mr. J. J. Manley on the properties of a precision balance with beams of invar steel, which was shown by Messrs. Oertling at the Exhibition of Apparatus held by the Physical and Optical Societies in January last. The great rigidity of the beam reduces the bending under load and gives a sensitivity independent of the load. The small coefficient of expansion of invar was not found to make the resting point of the beam independent of temperature, and Mr. Manley attributes this to relative movements of the knife edges themselves. The magnetic field has its effect on the beam, but any error due to this may be eliminated by using Gauss's method of double weighing. In the discussion of the paper, Mr. Gould stated that the effect of temperature changes on the invar steel balance of the National Physical Laboratory was of the same order of magnitude as that found for balances with gun-metal beams as usually made.

THEORY OF AIRSCREWS.—Recent developments in vortex theory in its application to airscrews has enabled the behaviour of a propeller under normal working conditions to be examined, but the theory breaks down in the vortex ring state and in part of the windmill brake state. Some recent empirical extensions of the theory based on general theoretical arguments have provided some information regarding the general nature of the characteristic curve. These are embodied in a report by H. Glauert (Aeronautical Research Committee, R. and M. No. 1026, H.M. Stationery Office, 3d. net). The experimental data are analysed to determine the form of the characteristic curve for those regions for which the vortex theory is inapplicable or inaccurate. An empirical form of the characteristic curve has been determined fitting the experimental data and connecting up with the theoretical curves in the propeller and windmill brake

state, but its precise form will remain somewhat uncertain until further experiments are available from an open jet tunnel. Further developments along these lines are clearly indicated in the near future.

SUPRACONDUCTIVITY.—W. Meissner, *Zeit. für Physik*, vol. 38, p. 647, 1926, has recently examined the low-temperature resistance of single crystals of cadmium, gold, and zinc, and of very pure specimens of iron, nickel, platinum, and silver in the form of wires. Although measurements were made at temperatures so low as 1.3° absolute, no indication of the phenomenon of supraconductivity was found with any of these metals. It thus appears that supraconductivity may only be exhibited by a particular group of metals, although it is still possible that at temperatures lower than 1.3° absolute the above metals may exhibit it.

THE MOLECULAR WEIGHTS OF THE PROTEINS.—Analytical and physical-chemical methods indicate that the proteins have very large molecular weights; e.g. the smallest, of egg albumin, is approximately 34,000. Recent work on the lowering of the freezing-point of phenol had yielded values between 200 and 600, and it was suggested that these values represent the true molecular weights of the units of a large aggregate which is stable in water but dissociates in phenol. This hypothesis does not agree with analytical evidence, and it is disproved by some experiments of E. J. Cohn and J. B. Conant, described in the July issue of the *Proceedings of the American National Academy of Science*. They found that the freezing-point depression depended on the method employed to dry the protein, and they therefore made use of the system phenol + anhydrous calcium chloride + hydrated calcium chloride. This has a sharp melting-point unaffected by small amounts of water and by the proteins, and it is concluded that no evidence exists for dissociation into units of low molecular weight.

MOISTURE AND SURFACE ACTION.—The current number of the Royal Society's *Proceedings*, 112, A 762, contains a communication by Prof. W. A. Bone, embodying the principal results of an inquiry, begun in 1908 and continued up to the present date, to determine whether or no moisture have any specific influence upon the combustion of carbonic oxide at a heated surface. The surfaces tried were: 1. Refractory firebrick at 500°C . 2. Granular nickel oxide at 200° . 3. Granular copper oxide at 210° . 4. Gold gauze at 240° . 5. Silver at 360° . 6. Porous porcelain at 500° . The experiments have been carried out with the exceptional care and caution characteristic of all Prof. Bone's work. It appears that the immediate consequence of progressive drying is always to increase the effect of the surface, presumably by removing the film of water molecules by which action is retarded. The ultimate effect, which is usually observed only after a prolonged drying, is to diminish greatly or even stop combustion. Although the ultimate effect of drying the metallic surfaces was practically to stop combustion, on readmitting moisture the activity of the surface was in time restored. The effect on porcelain was peculiar: ultimately not only was the influence of the catalyst greatly diminished but also it was not regained on reintroducing moisture.

A WIDE-FIELD BINOCULAR MICROSCOPE.—The advantages of binocular vision in microscopical work has led to an increased use of the binocular instrument, which consists of two juxtapositioned microscopes complete in themselves, by means of which the object

is seen with a true stereoscopic effect. The introduction of a Porro erecting system to each of the two body tubes gives the further advantage that the image is viewed in its true position and not inverted or reversed. We have recently seen a specimen of a wide-field binocular microscope of this type which has been put on the market by Messrs. Bausch and Lomb, Ltd., of 37 Hatton Garden, London, E.C. The instrument is provided with 2 pairs of eyepieces and 3 pairs of objectives, by means of which magnifications varying from 7, with a field of view of 25.4 mm., to 30, with a field of view of 8 mm., can be obtained. Each objective is provided with centering screws, and each pair is mounted in a substantial base. The achromatic eyepieces have a very high eye-point, which permits prolonged observations to be made without undue fatigue. The microscope may be detached from its horseshoe base and placed directly on any surface which it is desired to examine. It may also be mounted on the end of a counter-balanced horizontal arm, which is capable of swinging round a vertical rod attached to a solid base or clamped to a bench. By means of these attachments, the microscope may easily be brought into position over a large area under examination. The instrument is thus adaptable to a great variety of circumstances and its range of usefulness for examining specimens under comparatively low magnification is almost unlimited.

HEAT CONDUCTION IN STEEL.—It is so generally believed that a fine-grained metal is essentially isotropic, that a paper by C. Benedicks, H. Bäckström, and P. Sederholm on "Anomalies in Heat Conduction as investigated in Spherical Steel Specimens," read at the Stockholm meeting of the Iron and Steel Institute, is of more than usual interest. The variation in the temperature gradient of uniformly heated steel spheres in different directions is so great as 1:8.5; the electrical resistivity, however, showed variations in different directions not exceeding the ratio 1:1.05. These variations in the thermal conductivity, of quite a different order of magnitude from those in the electrical conductivity, are probably connected with irregularities in the macrostructure. The thermal conductivity of a solid metal must represent two independent phenomena, (1) purely thermal, and (2) thermo-electrical. The latter involves eddy currents having such directions as to facilitate heat transfer by the Thomson effect. This part of the heat conductivity must be high for a metal possessing (a) a high electrical conductivity, and (b) a high Thomson coefficient. If a considerable part of the heat conductivity of, say, carbon steel is due to an inner thermo-electrical heat transfer, even small heterogeneities will thus be able to exert considerable influence on these thermo-electric currents, and may easily direct them into special preferential paths. From a practical point of view, there are two items to be specially considered. On one hand the transfer of heat in a massive steel piece will cause temperature irregularities of a possibly unfavourable character, especially as regards corrosion. On the other hand, the total heat transfer increases considerably with increasing dimensions of the metallic object on account of this electrical heat convection. In spite of the scarcity of available data, it seems justifiable to range the added dissolved elements in steel in the following order, so far as their influence on the thermal conductivity is concerned: Nickel, manganese, hardening carbon, aluminium, silicon, indicating that the thermal conductivity of iron is lowered least by 1 atomic per cent. of nickel, more by manganese, and so on. Cementite carbon exerts only a slight influence.