Research Items

Ethnology of Mysore. The Baron von Eichstedt, who himself has recently visited Mysore, contributes an introductory chapter on the racial history of Mysore in relation to that of India to "The Mysore Tribes and Castes", vol. 1 (Bangalore: Government Press). Mysore, like India as a whole, presents a fundamental contrast of open landscape and preponderantly mountainous jungle districts. Here also there is the same racial parallel: in the open country, settlements of a people of a progressive type, who are fair in the north of India and dark in the south and in certain refuge areas; and in the jungle districts primitive peoples who are fair in the western areas and dark in the eastern. Thus in India as a whole there are three main groups, each subdivided into two:—(1) The racially primitive peoples of the jungle region, the Ancient-Indians or Weddid racial group, divided into the Gondid race, a dark-brown curly (wide) haired people with totemistic mattock-using culture; and the Malid type, a black-brown curly (narrow) haired people with originally ancient culture. (2) The racially mixed group Black-Indians, or Melanids, divided into the black-brown progressive people in the most southern plains with strong foreign matriarchy, the southern Melanids; and a black-brown primitive people of the northern Deccan with strong foreign (totemistic and matriarchal) influence, the Kolid type. (3) The racial progressive people of the open regions, New Indians or Indid group, divided into a gracile-brown people with enforced patriarchy—Gracile-Indid race; and a coarser light brown people with possible original patriarchal herdmanship—the North Indid type. So in Mysore is found the best preserved and most primitive of the primitive inhabitants of India, the Malids, with the later Gondids intruding, pre-Aryan North Indid herdsmen in the remnant of the Todas and traces of North-Indids all over the State, mixing with the older and partly younger intruders foreign to India, Palæo-mongolids, 'West-Brachids' and orientaloid Mohammedans.

Yao Education. In a study of the Yao tribe of Nyasaland, by Father Benno Heckel (University of London Institute of Education: Studies and Reports, No. 4, Oxford University Press. Pp. 53. 2*s*. net) an account is given of the initiation of boys and girls. These ceremonies represent a real fountain of life and are the basis of continued tribal existence. Information is difficult to obtain, as the greatest secrecy about them is maintained, and any violation would entail death. Initiation of boys takes place at 14–17 years of age. Each candidate is assisted by a patron, an elder man, who acts as tutor or instructor, and there is a leader, the 'Tail-bearer', who carries a zebra tail as a mark of distinction. The period of the initiation course is prolonged to three or four months, during the whole of which the novices must live in the place of initiation and submit to a severe discipline. They bathe before sunrise and are thereafter kept hard at work for the whole day. Ineradicable habits and perfect knowledge are inculcated by songs, hymns, dances and games. The course does not consist of abstract instruction, but of a pleasing and concrete form of education up to the standard of knowledge and practice of adult life. Sanctions corresponding to duties are taught by practical demonstration; for example, if punishment is death by a lion, on a very dark night the roaring of a lion nearby will be heard and continue until the novices promise fidelity. They are taught standards of politeness, hospitality and friendship, the history of the tribe and its phratries, tribal laws, rules of marriage, the names of the plants and animals they are not allowed to eat, the duties of marriage and conjugal intercourse and the like. After a ceremonial return to the village, the novices are considered to be adult, and undertake men's duties.

Geographical Variation in Number of Teeth. The Cyprinid family of fishes includes some two hundred genera distributed in all parts of the world except South America, Australia and Madagascar. The rows of pharyngeal teeth are distributed among these genera in numbers which have a clear geographical significance (V. D. Vladykov, *Copeia*, 1934, p. 134). Thus genera with three rows of pharyngeal teeth do not occur in America and one-row genera somewhat exceed in number two-row genera. In Europe about 9 per cent of the genera have three rows, and two rows are dominant. At the other extreme, Africa has only two one-row species and 90 per cent have three rows, species been taken here for comparison since the genera are few (8). The accompanying table shows more clearly than description could show the relationships of the numbers:

Regions	Percentage Nos. of rows of pharyngeal teeth			Total No. of genera
	1	2	3	
North America	46·0	40·5	—	37
Europe	41·0	50·0	9·0	22
East Asia	23·0	23·0	49·0	57
India	8·0	12·0	68·0	25
Africa (species)	0·6	3·0	90·0	262 species

Systematics of the Penæids. Mr. Martin David Burkenroad discusses the littoral and sub-littoral penæids of the world, the present studies being mainly centred about American Penæinæ and Eusicyoninæ ("Littoral Penaeidae chiefly from the Bingham Oceanographic Collection, with a Revision of *Penaeopsis* and Description of two New Genera and Eleven new American Species" (*Bull. Bingham Oceanographic Coll.*, **4**, Sept. 1934). In further work he proposes to continue this revision to complete a monographic account of the group. The tropical west coast of America is found to be extraordinarily rich in penæids, ten of the eleven new species described in the present paper coming from the Pacific, one belonging to a new genus; and much that is new and interesting is shown in the distribution of the various species. A systematic revision was evidently much needed and the present account is full of careful comparative work based on the examination of material from different sources, necessitating certain alterations in the existing classification. Special attention is given to the petasma, for which a generally applicable terminology is prepared, and the internal morphology, homologies and probable mode of operation of the thelycum in a number of the Penæinæ are described, including a discussion of certain methods of separation of the entrance and exit to the sperm receptacles; a series of excellent text figures of these structures is given.

Amœboid Cells in Invertebrates. A useful summary of the different kinds of amœbocytes and allied cells in invertebrates has been prepared by Isabel Haughton (*J. Roy. Micro. Soc.*, 54, Pt. 4, Dec. 1934). The blood cells of invertebrates show types of stages corresponding with those found in vertebrates, but in addition are others, such as the adipo-spherical cells (spherical cells filled with fat globules and protein spheres) found free in the cœlomic fluid of Annelida or aggregated into a tissue in insects, which do not correspond with any cells found in vertebrates. Amœboid movement is common in the leucocytes of invertebrates, but the property of thigmotaxis—the spreading of the corpuscles when they come into contact with a foreign body—which is irreversible, has often been mistaken for amœboid movement which is reversible, for the pseudopodia can be withdrawn. The leucocytes often exhibit phagocytosis, and they play a large part in digestion and excretion, especially in the bivalve molluscs, in which they ingest food material, as they lie between the epithelial cells in the wall of the stomach, and transport it thence to the connective tissue where they digest the food. Coagulation of blood is found among invertebrates only in some Crustacea; the formation of clots in other invertebrates is due to agglutination or clumping of the blood cells. In the examples studied, phagocytes are widely distributed throughout the body, especially in connexion with the digestive organs and in the connective tissue. Lymph glands have been demonstrated only in very few invertebrates and therefore the origin of the amœbocytes and blood cells is obscure. Mitosis has been observed in the small hyaline cells, and the general impression is that from this the other types are developed by acquisition of granules.

Development of a Braconid Parasite. Mr. P. M. Glover, of the Indian Lac Research Institute, Ranchi, India, has recently published a paper on the development of *Bracon tachardiæ*, Cam. (*Bull. Entomol. Res.*, December 1934). The species in question is an ecto-parasite of the larva of the moth *Eublemma amabilis*, which is an important predator on the lac insect. The first five larval instars of *Bracon* are described and certain structures are figured in some detail, while an analysis of their growth phases is given. It is found that head-width is a safe indication of a given instar since extremes rarely occur: the widths calculated on Dyar's principle also approximate sufficiently closely to the observed widths to preclude the overlooking of an ecdysis. The length of the mandible is identical in a given instar and its exuviæ, and allows of their grouping, particularly if averages be taken: the range for a given instar is wide, but the extremes do not overlap. The factors for increase of head-width and mandible-length are fairly similar, falling near to 1·26. The growth of the body of the larva from instar to instar is independent of head growth, larvæ increasing in weight and volume by a figure lying between 3 and 4 times, from instar to instar, and closely approaches the theoretical figure for volume (3·6). It is suggested that similar observations may be true for other ectoparasitic Braconidæ.

Bihar Earthquake of 1934. At the meeting of the Geological Society of London on February 6, a lecture on the Bihar-Nepal earthquake of January 15, 1934, was given by Dr. J. A. Dunn, who directed the study of the earthquake on behalf of the Geological Survey of India. The fracturing that caused the earthquake lay beneath the deep alluvium of the Gangetic plains. The direction of oscillation was usually parallel to the trend of the epicentral region, not radial to it, suggesting that the initial movement was principally along the strike of the fault. The total duration of the earthquake was about five minutes, most of the damage being done during the latter half of the disturbance. Surface undulations, 6–12 ft. long and perhaps 6 in. high, were seen even at a distance of 200 miles from the epicentral area. An interesting feature of the map of isoseismal lines is the occurrence of alternating zones of less and greater intensity outwards from the central tract, due probably to displacements along secondary lines of weakness. Within the central isoseismals lay a belt, 190 miles long, in which tilting of buildings and collapse with subsidence of the ground was more marked than actual destruction by vibration. The belt probably lay over that part of the fracture along which differential movement was greatest.

Soil Survey in Berkshire. The University of Reading has already published a soil survey of the county of Berkshire, but it was clear that an intensive study of certain areas with the use of more modern methods was desirable if an explanation was to be obtained as to why fruit-growing had been able to establish itself as an important industry in a certain part of the Vale of the White Horse. A detailed survey of this area has, therefore, been recently carried out by Dr. F. F. Kay and the results published by the University of Reading as Bulletin 48, "A Soil Survey of the Eastern Portion of the Vale of the White Horse". The district was found to fall into four natural areas, which are described in detail, and the soils, classified on the basis of their soil profile characteristics, grouped into twenty soil series, the appropriate weed flora being described for each. The calcareous nature of the majority of the soils necessitated the use of certain modifications of the usual methods of analysis especially in connexion with mechanical analyses and the determination of exchangeable potassium. High figures for potassium saturation were correlated with a siliceous type of clay and free drainage conditions, and a classification of base-saturated calcareous soils is suggested on the basis of the nature of the clay fraction. The most useful fruit soils were characterised by free drainage conditions, a high degree of potassium saturation and a siliceous type of clay. Excellent cherries could be produced on the Blewbury and Harwell series and very good quality apples grown on the Hendred and Harwell series. Potash manuring was shown to be essential on the light loams of the Corallian.

Dust in the Air. The January issue of the *Review of Scientific Instruments* contains a description of an instrument for taking direct photographs of dust in the air, devised by Messrs. L. H. Ott and J. B. Ficklen, of the Sloan Physics Laboratory of Yale. The usual methods of collecting the dust in water or allowing it to settle on a plate of glass, or making the air containing it impinge on a glass surface to which the dust adheres, they consider unsatisfactory, and have found that by using strong illumination they can photograph the dust particles. The air to be tested is drawn into the lower portion of a vertical tube which is then closed. The upper part contains a camera directed downwards and focused on a thin horizontal band of the air, which can be strongly

illuminated for an instant through a window in the side of the tube by a photographic flash-lamp outside the tube. A supersensitive panchromatic film is used and the whole apparatus weighs only 5 lb. A photograph of chalk dust particles which vary in size from 1×10^{-3} to 5×10^{-3} cm. is reproduced.

Theory of the Auger Effect. E. H. S. Burhop (*Proc. Roy. Soc.*, A, Feb. 1) has investigated theoretically the radiationless transformation by which an atom ionised in, say, the K shell, may re-arrange itself by an electron falling in from another shell and giving up its excess energy to another electron, which is expelled from the atom. The quantum mechanical approach is similar to that used by Hulme to consider the internal conversion of γ-rays. Hydrogen-like wave functions were used to represent the two electrons, the nucleus being supposed to be screened according to Slater's rules. The probability of transition between the initial state and the final state (one electron in the K shell and one electron unquantised) is calculated by means of a formula of Dirac, an allowance being made for the fact that either of two electrons may fall into the K shell, the other being ejected. There is no means of distinguishing these processes experimentally. The intensity of the K radiation is also calculated so that the probability of radiative and radiationless transformation may be compared. Numerical calculations are carried out and compared with experimental results. The variation of the internal conversion with atomic number is satisfactorily given, and the variation of intensity among different transitions in the atom is also obtained in agreement with experiment.

Transmutation of Sodium by Deutons. E. O. Lawrence (*Phys. Rev.*, Jan. 1) has made an extensive study of the nuclear reactions produced in sodium by H^{2+} ions having energies of 1·7 million volts. The following transmutations take place:

The production of radio-sodium

$$_{11}Na^{23} + {}_1D^2 \rightarrow {}_{11}Na^{24} + {}_1H^1,$$

followed by

$$_{11}Na^{24} \rightarrow {}_{12}Mg^{24} + e;$$

alternatively

$$_{11}Na^{23} + {}_1D^2 \rightarrow {}_{12}Mg^{24} + {}_0n^1,$$

and possibly

$$_{11}Na^{23} + {}_1D^2 \rightarrow {}_{10}Ne^{21} + {}_2He^4.$$

The radio-sodium was produced in considerable quantity (equivalent to about ⅓ mgm. radium) and it is suggested that it may be produced in this way for biological work. Its decay period was measured with an electroscope, and gave a value of 15·5 hours, similar to that of the radio-sodium obtained by Fermi by a different process. Absorption measurements were made on the β-rays, giving a probable maximum energy of about 1·2 mv. About one γ-ray was found to accompany each β-transformation, the γ-rays being probably monochromatic and of energy of the order of 5½ mv. These γ-rays should be valuable, for example, in the study of electron-positron pair production. The protons accompanying the activation of sodium were identified and their energy distribution studied. The Gamow theory was found to account for the variation of radio-sodium yield with bombarding potential. Neutrons and α-particles corresponding to the alternative reactions above were also found.

NO_3F. By the action of fluorine on moderately concentrated nitric acid, an explosive colourless gas of the formula NO_3F is produced (G. H. Cady, *J. Amer. Chem. Soc.*, **56**, 2635; 1934). The vapour density is about 82, the boiling point about − 42°. The gas is fairly stable at room temperature, but explodes on heating. It has an irritating odour. NO_3F is moderately soluble in water, with which it reacts slowly, liberating oxygen. It liberates iodine from potassium iodide, forming a nitrate and fluoride, and reacts with potassium hydroxide according to the equation $NO_3F + 2OH' = \frac{1}{2}O_2 + F' + NO_3' + H_2O$.

Mechanism of the Biological Oxidation of Ammonia. Messrs. Gopala Rao and K. M. Pandalai, writing from the chemical laboratories of the Andhra University, Waltair, India, state that they have investigated the possibility of the formation of hydroxylamine as an intermediate product in the oxidation of ammonia by nitrifying bacteria. Various tests for hydroxylamine were employed, but always with negative results. There was no difficulty in detecting its presence after addition of small quantities to the cultures. The positive results recorded by Mumford (1914) are attributed to the use of impure cultures, and the confirmation given by Mazé (1921), Kluyver and Donker (1926) and Fowler (1934) is not based on experimental evidence.

A New Cold-Cathode Amplifying Valve. A paper entitled "An Electron Multiplier" describing a new type of cold-cathode amplifying valve developed by P. T. Farnsworth of the Television Laboratories, Ltd., U.S.A., has recently been received (*Electronics*, August 1934). This new valve is a high-vacuum amplifier, which promises to find considerable application in television and other aspects of radio communication. The valve is cylindrical in shape and contains two cold cathodes, one at each end, with a metal ring anode mounted centrally between them. An electron produced photo-electrically is accelerated towards the anode, which is maintained at a high positive potential relative to the cathodes. A longitudinal magnetic field, produced by an external circuit, deflects the electrons, so that they miss the anode and strike the second cathode, where they produce secondary emission. The additional electrons so produced then travel in the reverse direction and the whole process is repeated. In order to ensure that the electrons arrive at the cathodes with sufficient velocity to dislodge further electrons, a potential difference of the order 25–90 volts at a frequency of 50 megacycles per second is applied between the two cathodes from a circuit tuned to this frequency. As the secondary emission process builds up, the current in this tuned circuit increases; and this current can be controlled by the external magnetic field and by the steady voltage applied to the anode. A maximum effect is obtained when this steady voltage is such that the transit time of the electrons between the cathodes is an odd multiple of half the period of the oscillations. It is stated that the actual current magnification obtained is enormous, since the electrons may make as many as a hundred complete transits of the tube, each time producing as many as six secondary electrons per original carrier. Different types of valves have been produced for amplification and oscillation, but much further research appears to be needed on the problem of making the valves uniform and efficient.