

Research Items

Races on the North-West Frontier of India

THE physical anthropology of the inhabitants of central Asia is known only from the measurements taken by Sir Aurel Stein on his various journeys of exploration. To three series already recorded a fourth has now been added—measurements of the inhabitants of the valleys of Hunza in the Gilgit Agency and Swat in the North-West Frontier Province. These have been subjected to statistical analysis by Dr. G. B. Morant (*J. Roy. Anthropol. Inst.*, 66, Pt. 1). The series from the Swat Valley consists of 54 men of Torwali (classified on linguistic grounds as Dards) and 25 Pathans. The people of Hunza, which lies at the junction of India, Chinese Turkestan and Afghanistan, are the people speaking Burushaski, a tongue related to no known language. Part of their valley has been occupied by Wakhi. 75 Hunza men and 25 Wakhi were measured. The principal measurements are as follows: Torwali, cephalic index 75·3, nasal index 68·1, stature 1,688·8; Pathan, cephalic index 76·9, nasal index 72·0, stature 1,654·8; Hunza, cephalic index 79·6, nasal index 71·4, stature 1,688·1. Dr. Morant from his analysis of the material concludes that the Pathans differ from the Torwali in having smaller head-lengths, facial height and stature and relatively broader faces and noses. Between the Hunza and Torwali the significant differences are the head length, head breadth, and cephalic index, nasal height and nasal breadth. The men of Hunza have the smaller head length and the larger head breadth, so that the mean cephalic index is apparently the larger and nasal height and breadth the smaller. The Hunza-Pathan series differs significantly in head breadth, cephalic index, nasal height, nasal breadth, stature and facial height. The two elements in the Swat valley are more nearly akin to one another than either to the men of the Hunza valley. The Pathan is less variable than the Torwali and both are less variable than the Hunza—a remarkable and unexpected result.

Ivory Arrow-Straightener from Alaska

AN ivory arrow-straightener of considerable interest has recently been presented to the British Museum (Bloomsbury) by the Trustees of the Christy Fund. It has been described and figured by Mr. A. Digby (*Brit. Mus. Quarterly*, 11, 1). It resembles a spanner with an oblique rhomboid hole at one end. The handle terminates in a bear's head, the eyes of which are inlaid with wood; while at the other end beyond the hole are two smaller bear's heads. On all four surfaces small figures have been scratched with a stone point, or perhaps an iron nail. They depict either individual animals, seals and caribou, or scenes from Eskimo life. The back shows large and small deer, two of which leave footprints, an unusual feature in Eskimo art, and a hunting scene on the right-hand edge. A man paddling a kayak and flourishing a lance chases five caribou, while behind him are the floating carcasses of three more. On one edge of the left-hand side is a similar scene. These scenes depict a method of hunting frequently adopted in autumn. The other figures on this side are a lone caribou, a row of dancing figures, three conical tents,

such as are used in summer, and an Alaskan sledge. On the other side is a village scene showing summer tents, drying frames and human figures. A man is shooting at a row of birds represented by crosses. The front, or lower surface, is covered with figures, which may be seal or walrus. There are two human figures; at the lower end is the figure of a crawling man; and at the other end a man attacking a seal. The straightener is probably a tally recording the kill of the owner. The date is difficult to determine, but comparison with a drill bow in the Barrow Collection suggests the beginning of the nineteenth century.

Physiology of Flute Playing

THE rumour that players of wind instruments run the risk of respiratory diseases is still current in musical circles, although there has never been much scientific foundation. Jagic and Lipinfr (Wien, *Klin. Wschr.*, 32, 683 and 714; 1919) examined medically (including X-ray) 46 professional wind players who had played 4–5 hours a day for periods varying from 10 to 50 years. They found no case of emphysema or other lung disease among them. Dr. J. Roos ("The Physiology of Playing the Flute", *Arch. Néerland. Phon. Exp.*, 12, 1; 1936) reports data of interest bearing on the same question. Three professional flautists were submitted to a number of physiological tests while playing. The air pressure exerted was measured, in relation to the pitch of the note, and its loudness, on both of which factors it depends. The range of pressures was of the same order as those found by other workers for singing. The mechanism of giving air at well-regulated pressures through the lips is discussed. The velocity of the air leaving the flautist's mouth was equal to that of a hurricane, even for low notes.

A New Nemertine

IN 1931, W. J. Dakin and M. G. C. Fordham announced the discovery of a new type of nemertine worm with a multibranching proboscis, *Gorgonorrhynchus repens*. Now a complete description of this unusual animal is furnished by the same authors (*Proc. Zool. Soc.*, 1936). It is shown that while it undoubtedly represents a new and remarkable genus, it is a member of the family Lineidae of the Heteronemertini. When introverted, the proboscis lies in a closed cavity, the rhynchocoelom, on the dorsal side of the alimentary canal. When everted, the proboscis is a hollow dichotomously branched dendriform structure. At the beginning of the eversion, a single stump appears; this divides into two, four and finally a large number of fine branches. The tips of fine ends can be seen during retraction through the transparent walls. It is this much-branched proboscis, without parallel in the nemertines, that is the outstanding feature of the species. In spite of this, however, the general structure of *G. repens* shows clearly its relationship. The first specimens were found on the coast of New South Wales but afterwards from farther north on the same coast, from islands in the Great Barrier Reef, from India, and recently a worm of the same genus, if not indeed conspecific, has been sent to the authors from Bermuda.

Pycnogonids from Puget Sound

THE above is the title of a paper by Harriet I. Exline (*Proc. United States Nat. Mus.*, 83, No. 2991; 1936) in which five species are described, three of which are new. All were collected on dredging expeditions of the University of Washington's research ship *Catalyst*. Pycnogonids are not commonly dredged in Puget Sound, but they are sometimes found in large numbers in certain isolated localities. In the waters around the San Juan Islands, which have been quite thoroughly investigated, probably only half a dozen specimens have been collected in the past ten years. On the other hand, with the investigation of the waters south of the San Juan, especially in the vicinity of McNeils Island, pycnogonids have been collected in large numbers among hydroids dredged from rocky bottoms. Two of the new species belong to the genus *Nymphon* and one to *Ammonothea*.

Virus Diseases of the Potato

THE number of virus diseases which attack the potato, with their permutations and combinations, render the study of this branch of science rather complicated. Viruses are, fortunately, capable of classification into definite groups, and with exchange of material between the workers in Holland, Great Britain and America, the relations of the different virus complexes are gradually being elucidated. A recent paper by Prof. P. A. Murphy and J. B. Loughnane (*Sci. Proc. Roy. Dub. Soc.*, 21, No. 40; Sept. 1936) compares some Dutch and Irish potato mosaic viruses. The diseases from Holland show the presence of the viruses designated X, B, Y, A, F, and vein-bending virus, and they occur either alone or in combinations. Slight variants from the forms A and Y were found, and the viruses X, Y and F did not always produce symptoms upon their hosts. Complex-diseases included veinal mosaic (Y or A), rugose mosaic or leaf-drop (X + Y), crinkle (X + A), and interveinal mosaic (X + F). The paper should make a material contribution to an international understanding of potato virus nomenclature. It should be read in conjunction with the American work upon the same subject (K. Koch and J. Johnson, *Ann. App. Biol.*, 22, 37; 1935). The potato virus known as aucuba mosaic has received detailed study from Dr. Phyllis Clinch, J. B. Loughnane and Prof. P. A. Murphy (*Sci. Proc. Roy. Dub. Soc.*, 21, No. 41; Sept. 1936). The aucuba virus produces a typical yellow mottle upon the leaves, but this type of symptom also appears with two other viruses, namely, the 'tuber-blotch' virus, and a virus latent in the Dutch potato *Monocraat*. These last two are probably identical, and it is proposed to designate them virus F, whilst virus G shall denote the active principle of aucuba mosaic.

Economic Effects of Sugar Cane Streak Disease

WHEREVER the effects of a virus disease upon a crop of economic importance have been investigated, some striking figures are brought to light. Messrs. A. P. D. McClean and R. H. Halse have made a large-scale survey of the sugar-cane districts of South Africa, which should leave no one in any doubt about the economic significance of the streak disease (*Proc. S. Afr. Sugar Technologists' Assoc.*, 1936). Approximately 241,220 tons of cane, with a value of £170,864, were lost in 1934-35, as a result of its

ravages. Zululand had the heaviest infection, more than ninety per cent, the Natal districts south of Durban had 62 per cent on ratoon cane, and 48 per cent on plant cane. North of Durban, the disease was less severe, with 26 per cent and 19 per cent on ratoon and plant cane, respectively. The paper also makes some constructive investigation of several of the new varieties which have recently found favour in commercial practice. Those designated Co 290 and POJ 2725 are moderately resistant, whilst the POJ varieties 2714, 2722, and 2878, with Co 281, are highly resistant. One is left with the impression that the streak disease may well be controlled in the near future.

Time Discharge of Condensers

EVERYONE who has experimented with electric condensers knows that some types absorb a certain amount of electricity which does not come back immediately when the condenser is discharged. It is gradually liberated and accumulates on the plates as a residual discharge. This 'oozing out' effect is sometimes explained by assuming that a process analogous to viscous action is taking place, and that this prevents the immediate return to the normal state. The amount of the residual charge and the relaxation rate at which it is freed are of importance to the telephone engineer owing to the large number of condensers used in telephone apparatus. The explanation of the effect usually given starts with the assumption that dielectric absorption is due to an action of the molecular structure which takes place uniformly throughout the material. In a paper on this subject by W. A. Yager in the *Bell Laboratories Record* of November, it is shown that the relaxation effect is much too complicated to be explained in this simple way. The results show that the residual current involves a combination of relaxation times. A successful explanation has been made by K. W. Wagner, who postulates that the number and magnitude of the relaxation times are determined by the laws of chance. For the simple theory we get fair agreement for dielectrics, like pure liquids, of relatively simple constitution. But for dielectrics of even moderate complexity the simple formula is practically worthless. Wagner's equations appear to be applicable to systems of all degrees of complexity and it is concluded that a helpful advance in the theory of dielectric action has been made.

High-Permeability "Furukawa Magnetic Alloy"

IN the September issue of the quarterly journal *Nippon Electrical Communication Engineering*, published in English by the Institute of Telegraph and Telephone Engineers of Japan, there is an important article on the new high-permeability magnetic alloy made by the Furukawa Electric Co., Ltd. In low magnetic fields it is known that this new alloy has a much higher permeability than the English mumetal. Its composition is now described, and we are told that its manufacture is protected by Japanese patents. It is manufactured in four grades called A, B, C and D respectively, each being suitable for specific purposes. These alloys are uniform and easy to work at any temperature. They can be rolled into transformer sheets as thin as 0.1 mm. or drawn into very fine wire. The time required for the heat treatment of these alloys is very short, and after taking the metal from the furnace it can be cooled

in the air. The *A* alloy is of very high electric resistance, and is specially suited for the magnetic core of high-frequency devices. The characteristics of the *B* and *C* alloys show that they would be very suitable for use with audio-frequency transformers. The alloy *D* has extraordinarily high permeability, and is highly recommended for the iron cores of very sensitive relays and ammeters for use in electric power lines. By using the alloys for the cores of the transformers employed in aeroplanes, their weight has been reduced to one fifth of the ordinary values. A photograph is shown of a transformer core made of stalloy having a weight of 1,010 gm. and of another made of the new magnetic alloy fulfilling the same functions and weighing only 75 gm.

Atomic Weight of Arsenic

IN 1933 Baxter and Shafer carried out two series of estimations of the atomic weight of arsenic by analysis of the tribromide and obtained the values 74.919 and 74.901 respectively. This led to the acceptance of the value 74.91 for the atomic weight of arsenic. This is 0.02 units below that found by Křepelka in 1930, which was adopted at the time by the International Committee for Atomic Weights. Křepelka and Kočnar have now (*Coll. Czech. Chem. Comm.*, 8, 485; 1936) synthesized arsenic tribromide from specially pure bromine and arsenic, and from determinations of the ratios $\text{AsBr}_3 : 3\text{Ag}$ and $\text{AsBr}_3 : 3\text{AgBr}$ they arrive at the new value 74.923, which thus lies between what were hitherto regarded as the most trustworthy determinations. This new value agrees better with Aston's value derived from the mass spectrum ($\text{As} = 74.934$, or 74.925 according to Babcock and Naudé) than the value found by Baxter and his collaborators. Křepelka and Kočnar have taken every precaution to use highly purified materials throughout their work, and whilst the new value lessens the discrepancy between the earlier values of Křepelka and Baxter respectively, there is still a difference of 0.01 unit. The same journal contains a paper from Prof. Moles of the Madrid Instituto Nacional de Física y Química dealing with the atomic weight of iodine and advocating the value $I = 126.917$.

Locomotive Fuel Economy

INVESTIGATIONS into the problems of combustion in locomotive boilers and prevention of fuel wastage have in the past been hampered by lack of a method for determination of unburnt fuel loss. A suitable technique has, however, now been evolved on the basis of a suggestion put forward by A. C. G. Egerton, and this was described in a paper by Dr. P. Lewis-Dale at a meeting of the Institute of Fuel on November 25. The principle of the technique is to carry out experiments similar to those usually employed for stationary boilers on the locomotive boiler while it is actually in service. This involves analysis of the exhaust gas, measurements of rate of combustion, amount of unburnt carbon and temperature of exhaust gases. In addition, analyses of the coal used, weighing and analysis of the ashpan ashes and various temperature measurements are essential to accurate interpretation of results. The investigation is in every case designed to last throughout a complete journey of the engine, and thus varying conditions of gradient, curves and wind are taken into account. A number of valuable observations have been made

as a result of investigations of this description, the most valuable conclusion reached being that under certain working conditions the loss of heat due to unburnt carbon approximates 30 per cent of the heat which would have been generated by complete combustion of all coal fed to the furnace.

Automatic Starting Resistances

ON switching on electrical machines, very large currents may be obtained initially unless suitable starting 'resisters' are used. These resisters are varied by hand, being large resistance at the start when the counter electromotive force due to the rotating armature is zero and being all cut out when the machine is running at full speed. In the *Philips Technical Review* (Eindhoven) of July a description is given of new automatic starting resistances manufactured by the firm. The starting tubes, which have the trade name of 'starto' tubes, have a large negative resistance coefficient, that is, the higher their temperature the less their resistance. In this respect they are similar to the filament of an electric lamp or to a glass rod, which at ordinary temperatures has a very high resistance but when red hot has comparatively a very low one. These tubes work on the exactly opposite principle to the hydrogen-filled iron filament resisters, sometimes used as regulators, the resistance of which increases rapidly with the temperature. In starto tubes the semi-conductor used is a mixture of silicon and a ceramic 'binder'. The silicon itself does not possess a pronounced negative temperature coefficient, but on diluting with a suitable binder it has a large negative resistance coefficient. The resistance material is formed in the shape of a rod which is fixed inside a glass tube filled with argon. This filling is required because the silicon of the rod reacts with oxygen and hydrogen. The tubes are designed for different maximum currents of between one and a hundred amperes. On full load the rod is raised to red heat and its temperature is then about 800° C. Starting tubes can also be used to switch on lamps automatically when it is desired, as in theatres and cinemas, to light them up gradually. These starting tubes can be used for many other applications in electrical working.

The Galaxy

IN the issue of *Scientia* of December, Dr. J. S. Plaskett, of the Astrophysical Laboratory, Victoria, British Columbia, describes the progress made recently in our knowledge of the extent of, and the distribution of stars in, the Galaxy, and sums up the results obtained. In its main features it resembles the Andromeda Nebula—that is, a flat disk nearly circular 30,000 parsecs (each $3\frac{1}{2}$ light years) in diameter and 1,000–2,000 parsecs in thickness, in rotation about its axis and containing about ninety per cent of the total mass. Within this disk the star density decreases from centre to circumference and rapidly near the edge. Throughout the disk and for 5,000 parsecs beyond its edge and 10,000 parsecs on either side of it are scattered high-velocity stars and clusters, and near its central plane is a light-absorbing medium 500 parsecs in thickness. The sun is situated in the central plane 10,000 parsecs from the centre (in a direction away from Vega?) and has a velocity of 275 kilometres per second, which would give the period of rotation of the Galaxy as 224 million years.