

Research Items

Indians of Matto Grosso, Brazil.—Ethnographical and archaeological results of an expedition through Matto Grosso, Brazil, to the head waters of the Xingu River in 1931 are described by Mr. V. Petrucci in the *Museum Journal* (Philadelphia), vol. 23, pt. 2. A number of tribes were visited, of which one, the Tsuva, had not previously been recorded, while three, the Kalapalu, the Kuikutu, and the Naravute, had not been described. At the head waters of the Xingu, although three widely distributed linguistic stocks are represented and they are surrounded by a fourth, no appreciable difference of material culture is to be observed. The villages are composed of a few houses around a clearing. The men's house is of inferior construction, and although it is the men's meeting place, it is not used for sleeping. It serves for ceremonial uses and for the entertainment of guests only, while the men of the village sleep in their own family dwellings. Usually several families live in one dwelling; and a young man on marriage lives in the house of the bride's father until he is in a position to build a house for himself. Women are the authoritative persons of the village. Inheritance and descent proceed through them; and although the men deal with strangers, the women must be consulted and their concurrence obtained before any arrangement may be concluded. Marriage is monogamous, but only as a matter of practical and economic convenience. Headmen sometimes have two wives. Most of the groups cultivate nothing but manioc, though some have maize. The Yawalapiti keep maize effigies suspended from the rafters of their huts. These are made of an ear of maize embellished with legs, arms, a skirt, and a painted visage. Some images are in the form of birds. In one village a harpy eagle was kept in a conical structure, and every man had to share with it the proceeds of his hunting or fishing, receiving in return a feather when its plumage was ceremonially plucked.

Inherited Differences in Taste Reactions.—It has recently been shown that individuals differ in their capacity for tasting certain substances, and that these differences are inherited. The results of an experiment with phenyl-thio-carbamide, made at the New Orleans meeting of the American Association for Advancement of Science last December, are recently published by Dr. A. F. Blakeslee and Dr. A. L. Fox (*J. Heredity*, vol. 23, No. 3). Of 2550 persons tested, 65.5 per cent tasted the substance as bitter, 28 per cent found it tasteless, while 2.3 per cent found it sour, and 4.2 per cent reported another taste. Earlier tests of families had shown that the failure to taste it is inherited as a simple Mendelian recessive. When both parents are non-tasters, all the children are the same. This is found to be the case in 39 children from such parents. Individuals also differ in the threshold of stimulation, some being able to detect the taste in a few drops of a 1/500,000 solution, while some non-tasters require a hot saturated solution to perceive any taste at all. This substance, which is bitter to most people, differs from dalcin, which is three hundred times sweeter than sugar, in that an atom of oxygen is replaced by sulphur. The related *p*-ethoxy-phenyl-thio-carbamide is identical in taste, but apparently gives a slightly weaker reaction. Similarly fumar-proto-cetraric acid, a bitter constituent of certain lichens, distinguishing them from closely related species, is tasteless to some, while others find it bitter in varying degrees. The odours of certain verbenas and freesias are also found to produce various sense reactions in different individuals, some

finding particular varieties odourless. By tests of this kind, inherited differences in our sense organs are coming to light (see also *NATURE*, 129, 735, May 14, 1932).

Pig-feeding Experiments.—The first Pig-feeding Report of the Harper Adams Agricultural College summarises the experiments in pig-feeding carried out between 1926 and 1931. Briefly, these showed that a ration of cereal meals was deficient in proteins and certain minerals for the needs of a rapidly growing pig, but that extracted soya meal, supplemented by lime and salt, gave as good results as fish meal when added to a cereal ration. An average proportion of about eight per cent of soya meal was found to be adequate, this being best secured by using about twelve per cent in the ration for a newly weaned pig, and gradually reducing this to a minimum of 5 per cent at bacon weights. A mineral allowance of 1½ lb. limestone and ½ lb. salt per 100 lb. mixed meals was sufficient, and this seemed to be as effective as the more complex and expensive mixtures containing a great variety of minerals. For sty-fed pigs under normal conditions, about 3 lb. of water per 0.1 lb. meal were needed for young pigs, but this amount could be reduced to 1¾ lb. at bacon weights—a little more being allowed in hot weather. Many factors affect the economic value of milk in pig-feeding, and although whole milk gave a higher rate of gain than separated milk, yet the financial returns were lower than those obtainable by feeding separated milk, in conjunction with butter-making or cream-selling.

A Fresh-water Medusa from China.—T. Fujiwara (*J. Science*, Hiroshima Univ., Ser. B, Div. 1, vol. 1, 1932) collected, in August 1930, specimens of a fresh-water medusa from a pool about fifty miles south-south-west of Shanghai. They were all males and were present in large numbers, but the hydroid stage was not found. The author considers that the sex of the medusæ is not dependent, as has been suggested, on the temperature of the water but on that of the hydroid stocks. He reviews the records of fresh-water medusæ in eastern Asia and gives an account of the principal characters of his specimens, dealing in some detail with the statocyst, and he states that the ring-nerve is single. He does not actually state the species of his medusa, but remarks that it agrees in a good many points with *Craspedacusta sowerbyi*, var. *kawaii* (Oka, 1907), which he considers should be separated as a species *C. kawaii* from *C. sowerbyi*.

Chromosome Cycles and Sexuality in Sporozoa.—In a memoir (*Mém. Soc. de Phys. et d'Hist. Nat., Genève*, vol. 41, fasc. I. 1-223, 150 text-figures, 1931) on the Sporozoa with special reference to their chromosome cycles and their sexuality, André Naville gives an account of the present knowledge on the life-cycles and cytology of the Neosporidia and the Telosporidia. In a discussion on the fundamental distinctions between the Protista and the Metazoa, he expresses the view that this appears to consist in the absence in the Protista of autonomous somatic elements, but he points out that in the Myxosporidia and the Actinomyxidia there are non-generative cells which may be regarded as somatic. There are no corresponding cells in the Telosporidia, a difference which confirms the prevalent view that these two groups are distinct. In the last part of the work the author states his views, rather as a working hypothesis than as a real theory, on sexual polarity, not only in the Sporozoa but also in other animals and in plants. As an example of this polarity in the Sporozoa may be

cited the Adeleida, in which the polarised gametoblast produces a number of gametocytes at each of its two extremities—one group male and the other female. In the Metazoa, among the examples considered are *Hydra*, *Ctenophora*, and *Sagitta*. The author adds a glossary of special terms and three synoptic tables in which the life-cycles and the conditions as to haploidy and diploidy, so far as they are known, are summarised for the Neosporidia, the Gregarinida, and the Coccidiomorpha respectively.

Tetraploid Tomato Plants.—Tetraploid plants of the common tomato, *Lycopersicon esculentum*, have been produced by several workers by decapitating the stem of a diploid. Some of the shoots which grow out from the callus are found to be tetraploid. Such plants show a variable amount of association of their chromosomes in fours and a certain amount of sterility. This was greatest in a tetraploid produced from a doubled haploid, and its fruits were smaller than in the diploid. Prof. E. W. Lindstrom, continuing this method (*J. Heredity*, vol. 23, No. 3), has recently produced a tetraploid from the currant type tomato, *L. pimpinellifolium*. This species and *L. esculentum* have the same chromosome number ($n=12$) and cross readily, although the hybrids show gametic sterility in F_1 and F_2 . The tetraploid from *L. pimpinellifolium* is not only larger than the diploid in all parts, such as seeds, cotyledons, leaves, and fruits, but also it is highly self-fertile, although completely sterile in crosses with the diploid of either species. From it have been derived 248 mature plants in four generations. These segregated for red *v.* yellow fruits in the ratio 20 : 1, which suggests that random assortment of the eight chromatids may be taking place in meiosis. The origin of the yellow factor is uncertain, but may possibly have been from *esculentum*, as three later tetraploids of *L. pimpinellifolium* had somewhat smaller fruits than the first.

Oscillation of the Earth's Atmosphere.—In a recent memoir of the Royal Meteorological Society (No. 35, vol. 4), G. I. Taylor examines a suggestion that has been made to explain a discrepancy observed between the velocity of a free gravity wave in the earth's atmosphere given by tidal theory, namely 910 feet per second, and the values found by direct calculation and by observations of the air wave caused by the Krakatoa volcanic eruption or explosion of 1883, which come to about 1050 feet per second. The suggestion is that the discrepancy might be explained by supposing that rapid pressure changes take place adiabatically while those like the semi-diurnal pressure wave of the atmosphere are more nearly isothermal; it has been put forward by Prof. Taylor and by three other writers—Chapman, Pramanik, and Topping—who have discussed the theory of the oscillations of the earth's atmosphere in relation to observational evidence. Taylor shows that the above mentioned supposition is untenable because the transference of heat by radiation and conduction required to introduce an important difference in the speed of the wave from that consistent with adiabatic pressure changes must lead to so much damping that the amplification by resonance, required to give the observed semi-diurnal variation, even if the free period of oscillation were taken to be 12 hours instead of the customary period of 11 hours 56 minutes, becomes impossible. He finds, further, that the required resonance can only be arrived at if the time taken for an inequality of temperature to be reduced in the ratio e to 1 is greater than 76 hours. The upshot of this investigation is that the cause of the discrepancy between the theoretical value of the free period and the value 12 hours remains at the moment unidentified.

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Composite Dyke of Breven, Sweden.—A detailed and stimulating investigation of the great Breven dyke has been published by T. Krokström (*Bull. Geol. Inst., Upsala*, 1932, pp. 243-330). The dyke has a length of 30 km., and ranges in width from 0.3 km. to 1.2 km. It is concluded from the results of geological, petrological, and chemical work that the exposures of the Breven dyke now visible represent a section of intermediate depth through a fissure that originally served as a channel for a series of extrusions all belonging to the same volcanic cycle. The material brought up by the successive eruptions probably emanated from a common magma reservoir, the different types of magma being along the normal line of differentiation within the reservoir (possibly accompanied by assimilation of the granite roof or walls). In chronological order the magmas corresponded to (a) olivine-dolerite; (b) olivine-free dolerite; (c) granophyre; (d) olivine-dolerite. During its ascent the granophyre altered the dolerite (b) by pneumatolytic action into an amphibole-rich, biotite-bearing intermediate type for which the name epidolerite is suggested. The latest olivine-dolerite is a restricted extrusion which took place after an epoch of denudation that uncovered the more deep-seated types of the dyke.

Intensities of Nebular Lines.—Bowen's conclusion that the characteristic spectra of nebulae and certain novae arise from improbable, but not completely forbidden, transitions in some light atoms and ions receives additional confirmation and some amplification from a theoretical investigation of the transitions by A. F. Stevenson (*Proc. Roy. Soc.*, August), in which their probability is calculated by approximate quantum mechanical methods. This is of particular interest as leading to an estimate of the density of the gas in the nebulae, on the assumption that it must be sufficiently small to make the time between the collisions of atoms or ions at least the mean theoretical time for the lives of the initial atomic states involved in the radiation. The numbers so obtained seem reasonable, the required time being at least about twenty-six seconds in regions where the so-called nebularium lines are emitted, and at least about three minutes where the red lines $\lambda 6583.6$ and $\lambda 6548.1$ originate, but it has to be remembered that one important 'forbidden' line, the celebrated $\lambda 5577$ of the aurora, can be readily produced in the laboratory at pressures of the comparatively high order of a thousandth of an atmosphere.

Diurnal Variations in Cosmic Radiation.—Prof. A. H. Compton and a number of collaborators have given an account in the second July number of the *Physical Review* of the results obtained in measurements made on cosmic rays hourly for ten consecutive days, at an altitude of 3900 metres. The rays were recorded by the ionisation produced in a steel sphere of 10 cm. internal diameter, filled with air at 30 atmospheres pressure. The measurements were made relative to the effect of a radium source, a procedure which automatically eliminated a number of errors, and were finally averaged over the ten days and corrected for some pressure and temperature effects. It then appeared that the ionisation was 1.5 ± 0.25 per cent more between 8 A.M. and 4 P.M. than between 8 P.M. and 4 A.M., a result considered in satisfactory agreement with the results of other observers, if the variation is due to a soft component of the rays. It is suggested as a consequence that the inference previously made by Millikan and Cameron that the energy in the universe in the form of cosmic rays is comparable with that in the form of light is of doubtful validity.

Velocity of Light in a Magnetic Field.—It has been established with considerable accuracy by C. C. Farr and C. J. Banwell (*Proc. Roy. Soc.*, August) that the velocity of light in a vacuum of approximately one hundredth of a millimetre of mercury is unaffected by a transverse magnetic field. The optical system employed was a Jamin interferometer, in which the light paths were in fields of different strengths, one very small and the other of the order of 20,000 gauss. The whole apparatus was set up so as to minimise spurious shifts of the fringes, the position of which was watched by a number of observers as the field was established and switched off. The sensitivity of the apparatus was such that a relative change in speed of 1 part in 2×10^7 could have been apparent. By working with polarised light it was further shown that it was immaterial whether the direction of vibration lay in or at right angles to the applied magnetic field.

Diamagnetism of Bismuth.—Bismuth, which has always been of interest from its generally anomalous physical properties, has been the subject of much

study recently in the form of single crystals. Goetz has confirmed in this way very strikingly the presence of an intermediate structure between the atomic lattice and the macroscopic crystals, giving for the average size of the discontinuities with which it is associated a few thousandths of a millimetre. In the April number of the *Indian Journal of Physics* it is pointed out by S. M. Rao that the existence of these sub-units of structure is in accord with the magnetic properties of the substance. Bismuth is diamagnetic, but the susceptibility depends upon the size of the particles used. Colloidal bismuth, when melted and recrystallised, shows an increase of up to thirty per cent in susceptibility, the change persisting even when allowance is made for contamination with oxide. The change of susceptibility with particle diameter is small for particles greater than about 1μ in diameter, but below this size falls off rapidly to the lower values, and for the smallest particles considered is still decreasing. The change in susceptibility thus occurs from about the particle size associated from other experiments with the mosaic structure, and affords confirmatory evidence for the reality of this.

Astronomical Topics

The Lunar Eclipse of Sept. 14—This was the first lunar eclipse of considerable size that was observable in London under clear skies for a good many years. Lunar eclipses are of interest from the fact that they give a good idea of the general state of the earth's atmosphere, or at least of the portions of it over the regions where the moon is on the horizon. The amount of illumination within the shadow varies to a notable extent. In 1884 the moon could be seen only with great difficulty, while in 1895 the maria and other surface markings could be observed with ease. The late eclipse did not attain either of these extremes, but was perhaps somewhat darker than the average eclipse. The limb was discernible in the telescope without difficulty at all the stages of the eclipse, also the crater Aristarchus, which is the brightest point of the disc. The outlines of the maria, however, were not easily seen until the maximum phase was nearly reached; this is an effect of the darkening sky; when there is bright sky light over the eclipsed region, contrasts are more difficult to detect.

The part of the disc that was nearest the centre of the shadow was coppery in tint, but the parts nearer the edge of the shadow tended rather to bluish grey. There was a specially bright region at the north-east limb of the moon. As the moon traversed the northern portion of the earth's shadow, there was not much opportunity to test whether the air in the southern hemisphere was rendered opaque by dust from the recent eruptions in the Andes. The southern region of the moon was carefully watched; it did not appear that there was any greater darkening there than that to be expected from deeper immersion in the shadow. The next total eclipse at which the moon will be high, in Great Britain, is on Nov. 7, 1938.

Capture of Comets by Planets.—The theory that all the comets of short period have had their orbits changed from parabolas to ellipses by near approaches to the great planets has been subjected to adverse criticism lately; in particular, Mr. S. Vessviatsky, in the *Observatory* for May last, indicated many points in which the theory gave results that did not accord with observed facts. M. Jean Bosler contributed another paper on the subject to the *Journal les Observateurs* for January last. It examines what proportion of the comets that make close approaches

to Jupiter would have their orbits transformed into ellipses and hyperbolas respectively. He finds that the ratio between the two is nearly one of equality, but with a slight preponderance for hyperbolas. This is clearly a further argument, though not a very strong one, against the theory; for it had already been shown that even if all the close approaches had led to elliptical orbits, there would not be enough to maintain the supply of short-period comets; reduction of the number of ellipses by more than half would render the insufficiency still more marked.

It is not, of course, denied that such approaches may at times take place; but merely that they are insufficient to explain the large family of short-period comets. In fact, a case seems to have taken place recently; Ryves's comet, that was under observation a year ago, was shown to have approached Jupiter within a few million miles about a year earlier. A definitive orbit of Ryves's comet has not yet been computed; but those that are to hand make it somewhat probable that the orbit, after passing Jupiter, was hyperbolic.

A New Stellar Photometer.—Dr. W. H. Steavenson describes, in *Monthly Notices, R.A.S.*, for June, a simple form of photometer which has lately been inserted in his reflector. A plate of glass about a tenth of an inch thick is placed in the focal plane. Some small dents in its surface were made with a diamond, and illuminated by an electric bulb placed at the side of the tube, in the plane of the glass. The remaining light of the bulb is totally reflected in the plate, and does not reach the eye. The illuminated dents have a stellar appearance; their brightness can be adjusted by a rheostat to approximate equality with the star to be measured; the remaining difference is measured by a sliding wedge. The wedge projects beyond the eyepiece; its position for equality of light is recorded by marking on a card the distance of the end of the wedge from the tube, so that no artificial light is needed during the comparison. Ultimately the artificial star is compared with a known star in the north polar sequence. The different dents in the glass plate appear of different brightness, so that one can be selected near the magnitude of the object to be measured. Dr. Steavenson's extensive work on old novæ, etc., is well known. The new photometer should render the comparisons still more accurate.