

Research Items.

Serpent Worship.—Mr. Wilfrid D. Hambly, assistant curator of African ethnology in the Field Museum of Natural History, Chicago, has made a study of serpent worship in Africa which appears as *Publication* 289 (vol. 21, No. 1 Anthropological Series) of the Museum. The study of serpent worship hitherto has been confused, but a classification of the ideas which it embodies is suggested. (1) Python worship, of which there are two unquestionable areas, one in West Africa and a smaller region in Uganda; (2) the serpent in relation to fecundity, transmigration of souls, and totemism; the only one of these with a clear geographical distribution being the reincarnated ancestor concept, which occurs continuously from the Cape to Lake Rudolph; ideas of transformation are spread over the whole continent; (3) the rainbow snake, that is, a number of stories and legends relating to snake monsters of which the basic thought is that the snake is a guardian of water, woods, ruins, or grain; (4) immunity and snake-medicines, dependent on the idea of a human soul being in communion with the snake. Evidence relating to cures of snake-bite show that the treatment is by no means entirely magical. The examination of African python worship in relation to cults and beliefs from other parts of the world provides no evidence that Africa received snake worship from extraneous sources, nor is there more than a superficial resemblance between the snake beliefs of Africa and ancient Egypt. The most fundamental ideas of all kinds of African snake belief are those of reincarnation and fecundity. The idea of the snake ancestor visiting the dwelling has a strong and clearly defined distribution from the Suk to the Zulu. Sometimes the visiting snake ancestor announces a conception. In other cases conception is inferred from the visit of any snake.

Man and the Primates.—In the *Scientific Monthly* for November, Prof. Adolf H. Schultz sets out in detail results of some of the less widely known and quite recent comparative studies on certain features pertaining chiefly to primates and their bodily proportions, which answer such questions as why the gibbon and anthropoid apes must be regarded as man's nearest relatives; whether the gaps between man and the recent anthropoids are relatively large or small when measured by the scale of differences between other primates and the like. Significant features are examined in turn. There is a tendency to increase in bodily size with advance in evolutionary development. Anthropoid apes are the only primates as large as or larger than man. Man's relative hairlessness is not unique, but an extreme manifestation of an evolutionary trend to reduce the coat of the larger primates. The nose supports the recapitulation theory. The human ear resembles most closely that of the gorilla. Man has relatively the largest head, the lower catarrhines the smallest. The high forehead of early stages of life disappears soon after birth in the apes, but is retained in man. The trunk of the higher primates has become relatively shortened by the elimination of vertebrae, allowing the pelvis to shift towards the chest, while it has become relatively short and broad. In this respect man is the missing link between apes and gibbons. In length of arm the apes, other than the mountain gorilla, have specialised to a much greater extent than man, while in length of leg man has specialised to a greater extent than the apes. The hand of man is in every respect the hand of a primate, though in breadth it is conservative when compared with that of a gorilla. The foot of man is nothing but a modification of the foot which has given rise to the foot of modern

anthropoids. It is concluded that man and the large anthropoids represent the most advanced expression in all primate evolution. In some respects man is more specialised than the apes, in others the relation is reversed.

Structural Features of the Cruciferous Flower.—Two papers on the anatomical structure of normal and abnormal flowers of Cruciferae, by Dr. Agnes Arber (*New Phyt.*, vol. 30, 1931), represent a type of investigation that is much needed to elucidate flower structure. So much of the discussion on floral morphology is based on dissections that it is time that the facts were tested with more detail and exactitude. The author is obviously not in agreement with E. R. Saunders' view of the cruciferous gynoecium, and she discusses many of her facts in relation to this argument. The fact that the placentas receive most of their vascular supply from the valve strands appears to support the bicarpellary view, but it is also shown that the lateral sepal bundles are derived from the petal bundles, showing that "vascular bundles may exhibit a complete disregard for morphological boundaries", and this makes the origin of the placental bundles carry less weight than might otherwise be the case. It would be most interesting to know the anatomical facts for the gynoecium of the two species of *Triglochin*, which would appear to be more obvious illustrations of E. R. Saunders' theory. Of less controversial nature, it is satisfactory to have confirmation of Klein's observation that the strands to the lateral sepals pass out before those of the median, thus bringing the cruciferous flower into line with the general rule for the origin of the outermost foliar structures on lateral flower or vegetative buds. The vascular supply to the inner stamens does not support the suggestion of chorisis. The squamules found in relation to young leaves and pedicels (especially in *Nasturtium officinale* R. Br.) are suggested to be "stipules of non-existent bracts". The general absence of stipules in cruciferous leaves makes one sceptical as to the stipular interpretation, though bracts may occasionally be seen subtending the lower flowers in *Cheiranthus* or *Capsella* and probably other genera also.

X-Ray Analysis of Slate.—An application of the X-ray diffraction method to the elucidation of the real nature of slate has been made by H. V. Anderson and K. C. Chesley, and their results and conclusions are presented in the *Amer. Jour. Sci.*, August 1931, pp. 103-112. Seven slates from different localities were examined, and a table is given showing the interplanar spacings in angstrom units, as obtained by the powder method, together with the principal spacings for the minerals found to be present. Evidence is forthcoming which indicates that former analyses reporting kaolin or andalusite in slate are in error, and that the probable aluminium silicate present is kyanite. The preponderance of quartz, corundum, kyanite, and mica in slates is established, and small quantities of other minerals are indicated. An attempt is made to correlate structural differences with grain size, and further work along this line is in progress. X-ray analysis confirms the fact that the cleavage is due to the orientation of the mica during its crystallisation under pressure.

Light Transmission through Fog.—Owing to the increasing importance of commercial aviation, much experimental work is being done on the transmission of visible light through fog. In the *Physical Review* for July 1931, H. G. Houghton gives an interesting account of experiments in this connexion which he has

made. He produced a fog by condensing low-pressure steam in a zinc-lined wooden chamber 300 cm. long and 25 cm. square. At one end was located the source of light—an incandescent lamp—and the necessary optical systems and filters for obtaining various bands of wave-lengths in the visible spectrum. The detecting apparatus consisted of a photoelectric cell, a two-stage direct current vacuum tube amplifier, and a sensitive milliammeter. The only difference between the artificial fog and natural fog was the size of the fog droplets. It was found that the artificial fog was composed of smaller particles of more uniform size. After some difficulty, a cell was obtained which was sensitive over the entire visible spectrum. It was found that no type of visible radiation possesses any very marked fog penetrating powers. The coloured beam of wave-length 0.490μ , however, transmitted a definite maximum percentage of light. The author concludes that the attenuation is probably due more to scattering than to absorption. The shape of the curve showing the transmission at various fog densities indicates that it is largely dependent on the size of the particles of the fog used. Hence any transmission curve is applicable only to the particular fog on which the measurements were made. The author's results apply only to a fog or haze where the particles are small. In the same journal, in conjunction with J. A. Stratton, it is proved mathematically that the particle size of the fog is a controlling factor in the transmission characteristics.

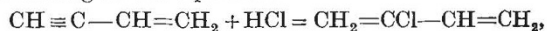
Abnormality of Radio Signals passing through High Latitudes.—Modern developments of short wave wireless communication have brought to light many interesting phenomena, such as the existence of round-the-earth echoes and echoes of long delay. Another peculiarity of such high-frequency transmission has recently been reported to us by S. Namba from the Electrotechnical Laboratory, Ministry of Communications, Tokyo, Japan. It has been noted that the signals from the New York stations received in Japan exhibit certain peculiarities which are probably attributable to the fact that the great circle passing through New York and Tokyo traverses auroral and polar regions. The New York signals are characterised by a continuous fluctuation in carrier wave frequency and a marked blurring in audible morse reception. Since it is known that the frequency emitted by the sending station is kept constant within narrow limits by piezo-electric control, the observed fluctuations in the received signal must be attributed to the influence of the transmission path. The variations in the frequency of the carrier wave are attributed to a pronounced Doppler effect, which has already been noticed to a lesser degree on signals arriving in other directions. As the main ionising agent in the polar regions is considered to be charged corpuscles shot out from the sun and deflected to the magnetic polar region under the influence of the earth's magnetic field, the ionisation in the polar atmosphere may be expected to exhibit greater fluctuations than that in non-polar regions where the main ionising agent is ultra-violet radiation. Both Doppler effect and blurred signals may therefore be abnormally marked for signals passing through high latitudes.

Quantum Theory of Electrolysis.—A new application of the quantum theory has been made by Dr. R. W. Gurney in a paper in the November issue of the *Proceedings of the Royal Society*, entitled "The Quantum Mechanics of Electrolysis". The fundamental idea in this is that the quantum mechanics does not require the same intimate contact between particles for a transfer of charge between them that is pictured on classical theory. This conception has

already been employed in several problems, such as those encountered in connexion with the neutralisation of positive ions at the cathode of a discharge tube, and is here applied in particular to the electrode phenomena in solutions to which a potential less than that required to effect decomposition has been applied. Bowden and others have recently made a careful study of the small currents which pass under such conditions, and have embodied the results of their experiments in a number of simple relations. By modifying the theory of neutralisation at a gas-solid interface to allow for the hydration of the ions and other effects peculiar to electrolytes, Dr. Gurney has now been able to obtain all Bowden's results theoretically, and to obtain both qualitative agreement and excellent numerical values for the coefficients in Bowden's expressions. Dr. Gurney has actually developed his theory as if the hydrated ions were molecules in the spectroscopic sense, but this specialisation of the problem is a matter of convenience and not a necessary feature of his work.

Combination of Hydrogen and Oxygen.—When a mixture of hydrogen and oxygen is exposed to a hot quartz surface a reaction occurs which is gentle or explosive according to the conditions of the experiment. W. L. Garstang and H. L. Hinshelwood have given an account of some investigations on the kinetics of the change when it is catalysed in this way in a paper published in the November number of the *Proceedings of the Royal Society*. They have been able to show by a few relatively simple experiments that the active centres on the solid, which are responsible for much of what occurs, are chiefly concerned with the reacting oxygen in the first instance. The centres have, in fact, been shown to absorb oxygen with great rapidity to a kind of saturation state, whereas they remain only sparsely populated with hydrogen. If an aluminium vessel is substituted for one of quartz no low-pressure explosion occurs, but a vigorous reaction still takes place on the surface.

Artificial Rubber.—The production of artificial rubber by the chemists of the E. I. du Pont de Nemours is announced in the November *Journal of the American Chemical Society*, some additional details being given in the news edition of *Industrial and Engineering Chemistry*. The process depends on the addition of hydrochloric acid in aqueous solutions containing cuprous and ammonium chlorides, to monovinylacetylene, with the production of chloro-2-butadiene-1,3 according to the equation:



the product (which is closely related to isoprene) being called chloroprene. The chlorine atom in the molecule is very firmly bound. By the controlled polymerisation of chloroprene, which takes place very rapidly and easily, a rubber-like material is obtained to which the trade name 'duprene' is applied. This is the synthetic rubber. Although the cost of production of duprene will be many times greater than the present market price of natural rubber, the material is to be manufactured, since it is believed that commercial uses will be found for it because of its unique properties. The material formed by the polymerisation of chloroprene is fully vulcanised without any additions, and the polymerisation can be stopped at an intermediate point with the production of a plastic polymer having the general properties of unvulcanised rubber, which may be mixed with fillers, diluents, etc., and the vulcanisation completed by heating at $110^\circ-130^\circ\text{C}$. for a short time. An artificial latex was also prepared. Duprene is denser and more resilient than natural rubber, but is not plastic. It resists the action of many liquids which attack rubber. The X-ray structure of

stretched duprene, unlike that of polymerisation products of isoprene, resembles that of natural rubber, giving a fully developed fibre diagram showing a number of definite layer lines, the identity period along the fibre axis being 4.8 Å., identical with that of β -gutta-percha.

Saccharification of Wood.—In a communication to the Society of Chemical Industry on Nov. 1, Drs. H. A. Auden and W. P. Joshua described a process for the transformation of wood cellulose into fermentable products on an industrial scale. With an improved method they have succeeded in obtaining thirty-five to forty gallons of alcohol per ton of dry sawdust. This makes the process commercially profitable where the cost per ton of dry sawdust is not more than five shillings and a supply of 200 tons per twenty-four hours is available. The method was worked out in the Research Laboratory of the Distillers' Company, Epsom. It consists in forcing acidulated water (containing two parts per thousand of sulphuric acid), at a temperature of 180° C. and twelve atmospheres pressure, through sawdust packed in lead-lined vessels. Under these conditions 45-50 per cent of the sawdust is changed into fermentable sugars. The molasses thus obtained are fermented with yeast in order to obtain alcohol. A preliminary treatment of the sawdust with superheated steam has

been found advantageous, because it removes resins and other undesirable constituents and also helps the hydrolysis.

Extensibility of Protoplasm.—A communication on the effects of salts on the extensibility of protoplasm, by Prof. William Seifriz and Janet Plowe, appears in the *Journal of Rheology*, vol. 11, No. 3 (Easton, Penn.). The elastic properties of protoplasm are important because of their close relation to other properties of living matter, for example, imbibition, contractility, and structure, and to biological processes like cell-division and amœboid movement. By means of the microdissection method Prof. Seifriz has determined the maximum distance to which protoplasm can be stretched. Strips of the upper epidermis of the bulb scales of *Allium cepa* were first placed in aqueous solutions of the nitrates of potassium, sodium, calcium, etc. Afterwards the cells were plasmolysed in sugar solution so that the cell-wall could be cut without injuring the protoplasm, and the protoplasm was drawn out by means of the micro-needle. It was found that treatment with calcium, strontium, and magnesium increases the elastic limit of the protoplasm, while potassium, sodium, and lithium decrease it. Their relative action may be expressed by the series $Ca > Sr > Mg > K > Li > Na$.

Astronomical Topics.

Eclipse Observations and the Einstein Shift.—Prof. E. Freundlich gave an account of his observations of the Einstein bending of light by the sun's gravitation at the meeting of the Royal Astronomical Society on Dec. 11. Notes on a similar lecture delivered at Oxford on Dec. 2 appeared in NATURE of Dec. 12, p. 993. Prof. Freundlich was probably the very first to attempt observations on the problem; he went to Russia in August 1914 with that end in view, but the outbreak of war caused obstacles to be put in his way, and nothing could be done. Abortive attempts were made at subsequent eclipses; at last he attained full success in Sumatra in the eclipse of 1929. Many precautions, suggested by the experience of others, were taken; in particular, a field of stars at a distance from the sun was photographed during totality, as well as the eclipse field; the two fields were again photographed simultaneously at a later date.

The measures and reductions were made in several different ways, but all agreed in giving a shift at the sun's limb of about 2.25", which is half a second greater than the Einstein theoretical value. Freundlich also rediscussed the measures made at previous eclipses, and expressed the opinion that they are better satisfied by his value than by the Einstein one, and that the excess is a real phenomenon, though its cause is unknown.

Most of the speakers in the discussion showed unwillingness to depart from the Einstein value; Sir Arthur Eddington, however, admitted that the views of the nature of light that are now held make it more complicated than was formerly supposed, so that it is possible that the Einstein equations may not give a complete account of its behaviour.

The Origin of Comets of Short Period.—About half a century ago, R. A. Proctor pointed out that the theory of the capture of these comets by the giant planets involved many serious difficulties. There would not be enough close approaches of comets to Jupiter to provide it with such a large family of comets. This is still more the case than Proctor realised, since convincing proofs have been deduced that the life of these comets is short (of the order of a few centuries), so that the supply must be frequently replenished.

Very few astronomers have supported Proctor's view that these comets were erupted by the giant planets, but *Astr. Nach.* 5826 contains a long paper by S. Vessviatsky which reaches a similar conclusion, and extends the suggestion to include those of the minor planets that have orbits close to that of Jupiter. Many American astronomers favour the suggestion that minor planets are associated with comets in their origin. One of Proctor's arguments was based on the Leonid meteors. Le Verrier had suggested that Tempel's Comet, which formerly contained the meteors, made a near approach to Uranus in A.D. 126, and had its orbit changed from a parabola to an ellipse. Proctor pointed out that an extremely close approach to Uranus would be necessary, and that the cometary mass would need to be condensed to an extent far beyond what we observe in comets; otherwise different portions of it would experience different perturbations, whereas observation shows that the orbits of all the meteors are nearly identical.

Catalogue of Double Stars.—A further instalment of the large catalogue of double stars that is being formed at the Union Observatory, Johannesburg, is published in *Circular* 85 of the observatory. It contains 2017 measures of 488 pairs made in the years 1928-30. The limits of Right Ascension are 13^h to 24^h. As a rule, measures of each star were made on four nights, the separate results and means being given. There are interesting notes on sixty-five pairs; five of them are proved to be merely optical pairs, but the great majority are true binaries. Other notes give comparisons with previous measures, or with ephemerides, where these have been calculated. The pair Innes 600, in south decl. 60°, may have the short period 14 years, or 28 years if the quadrant of the 1913 measure should need reversal. The pair Hussey 298 has described nearly a revolution in thirty years, but apparently its orbit has not been computed yet. A note on a Centauri states that photography gives better results than visual measures; the recent measures give as the correction to Finsen's ephemeris, published in 1926, angle +0.30°, distance -0.08". The great majority of the measures in the catalogue were made with the 26-inch refractor, but a few were made with the 9-inch.