

Research Items.

EARLY MAN IN AMERICA.—In the *Scientific American* for August, Mr. Harold J. Cook returns once more to the question of the antiquity of man in America. He recapitulates the circumstances of the discovery of the Nebraska tooth in the tertiary deposits of the divide between the North Platte and Niobrara Rivers near the Agate Spring Fossil Quarries. These deposits were discovered by the writer and Dr. W. D. Matthew in 1908 and have proved rich in mammalian remains of tertiary age, some showing distinct relationship with Asiatic forms. Fresh discoveries were made year by year until the owner of the land ordered the work to stop. Work by Mr. Albert Thompson, of the American Museum of Natural History, on an adjacent ranch produced from among the remains of a characteristic pliocene fauna evidences of human culture in the form of artefacts of green bone of contemporary animals. Of these implements some are drilled, many shaped or sharpened in various forms, while others have been used for pounding. Such is the result of a preliminary critical study by Prof. Fairfield Osborn and Mr. Thompson. The resemblance of these implements to those of modern Indian workmanship has already been pointed out. In January last investigations were begun on a site farther south at Frederick, Oklahoma, on a ridge of sand and gravels lying on the eroded surface of Permian Period Red Beds. The geological evidence shows that the top of the highest hill in this area was once the bed of a river. It is now one hundred feet above valley level and two hundred and eighty feet above the present Red River. Three periods of deposition on the old Red Bed floor are shown. In Bed A, associated with typical pleistocene animal remains were stone implements made by man, showing a degree of culture comparable with that of the modern Indian nomads of the plains. This evidence would, therefore, support the view that the Indian has changed little over a very long period of time, and meet the arguments of those who refuse a high antiquity to the Indian on account of the modern character of the remains, skeletal or other. This discovery is dated tentatively at a period of 365,000 years ago and affords the most conclusive evidence of Glacial Age man yet found in America.

CANCER AND ITS TREATMENT.—The Irish Radium Committee has issued its Report, compiled by Dr. Walter Stevens and Mr. Maurice Hayes, on the treatment of cases of cancer by means of radium and radium emanation during the year 1926. A large proportion of the cases was unfortunately at an advanced stage and a palliative effect only could be hoped for: in this respect the treatment is attended with considerable success. In a small number of cases, with or without operation, the treatment has apparently effected a cure. Rodent ulcer is particularly amenable, and certain non-cancerous conditions, such as ulcers, local sepsis, sciatica and others, were much benefited (*Sc. Proc. Roy. Dublin Soc.*, vol. 18, No. 39, 1927, p. 443). The Ministry of Health has issued a Report by Dr. Janet Lane-Clayton on a statistical inquiry into the results of treatment of cancer of the uterus (*Reports on Pub. Health and Med. Subjects*, No. 40). The Report is based on the examination of data published prior to March 1926, contained in 848 articles derived from sixteen different countries and dealing with some 80,000 cases of the disease. The principal findings are (1) that patients do not seek advice until an average period of 6-9 months has elapsed after the first occurrence of symptoms, (2) that rather less than

half the patients who then apply for treatment are at a stage at which effective operation is practicable, (3) that the results of operation at an early stage of the disease are roughly twice as good as those in patients whose disease is still practicable for operation but who apply late, and (4) that cancer of the cervix is not more serious in younger than in older women.

MINERS' AND QUARRYMEN'S PHTHISIS.—Inhalation of dust containing sharp particles of silica or quartz induces, in those subjected to it either a condition of fibrosis of the lungs or the same condition complicated with tuberculous infection—the true miners' phthisis. The last-named variety in the Rand mines has been the subject of a study by Mr. Mavrogordato. Down to 1905 the dust particles in the air of the mines averaged 150 mgm. per cubic metre of air, with a phthisis incidence of 30 per cent. Since then, by the compulsory use of certain measures, the dust particles were reduced to 20 mgm. in 1911, to 5 mgm. in 1913, and to 2 mgm. in 1921, with a fall in the phthisis incidence to 14 per cent. in 1915, 10 per cent. in 1916, and 3 per cent. since 1921 (*Publications of the S. African Institute for Med. Research*, No. 19, 1926). A similar effect from the inhalation of quartz particles derived from slate dust is apparently seen in the high incidence of phthisis among the slate workers in the Gwyrfaï Rural District of Carnarvonshire, which is the subject of a Report by Dr. T. W. Wade to the Ministry of Health (*Reports on Pub. Health and Med. Subjects*, No. 38, 1927). The phthisis death-rate among the slate quarrymen and workers of Gwyrfaï reaches a maximum at about sixty years of age, being then about 8 per 1000, whereas the general death-rate for males from phthisis in England and Wales at that age is only about 1.25 per 1000. Males other than slate workers of Gwyrfaï of the same age have a phthisis death-rate only a trifle more than that for England and Wales.

MIGRATION IN APHIDES.—In *Science Progress* for April and July, Dr. J. Davidson, of the Rothamsted Experimental Station, discusses the biological and ecological aspects of migration in aphides. True aphides of the family Aphididae (as distinct from the Psylloxeridae) may be separated into non-migrating species, whose whole life-cycle is spent upon one type of plant, and migrating species. In the latter case one portion of the life-cycle occurs on one type of plant (primary host) on which the fertilised eggs are laid, while the remainder of the life-cycle consists only of parthenogenetic generations which occur in association with other types of plants (intermediate hosts). The primary hosts are trees or shrubs, while the intermediate hosts may be herbaceous plants or other trees and shrubs. The complete life-cycle is practically confined to species occurring in temperate climates. In warmer countries such as Formosa, Java, and the southern United States the sexual phase is frequently suppressed, and continuous parthenogenetic reproduction is the rule. The migrating habit seems to have developed in relation with changes in the world's flora. Those species which are primarily non-migrating, such as members of the tribes Lachnini and Callipterini, exhibit certain primitive characters. The migrating species, on the other hand, exhibit varying degrees of specialisation in habit and form correlated with the extent to which the migratory habit has developed. In general, those species associated with herbaceous plants represent the most recent development in aphid evolution.

THE CONTROL OF THE TSETSE-FLY.—In the *Bulletin of Entomological Research* for June 1927, Drs. L. J. Howard, W. B. Johnson, and P. H. Rawson have an important paper dealing with experiments in the control of the Tsetse-fly in Northern Nigeria. An interesting experiment was carried out in which wild game was excluded from a good secondary focus of Tsetse-fly by means of a strong fence. This set up a state of starvation in the case of the species *morsitans* and to some extent in *tachinoides*. There was marked reduction in abundance of both species of the Tsetse, especially of *morsitans*. It is considered that game destruction, if it could be effectually accomplished, would lead to the disappearance of the latter species, but not *tachinoides*. It is for this reason that a policy of game destruction is not recommended; it is suggested, on the other hand, that a policy of *laissez-faire* towards the game in Northern Nigeria so that the increase of wild Ungulata is checked, would tend to restrain the increase and spread of the Tsetse. A successful experiment in deferred grass burning is described. The late sweeping fire was found to result in a great mortality of the flies and their pupæ in both the species of Tsetse. It scarcely affected the growth of established thicket, but probably checked the expansion of such and the formation of new thicket. It is considered that late grass burning, well organised, might have a good effect in Tsetse reduction in Northern Nigeria, but there are great difficulties involved.

ANIMAL LIFE IN HOT SPRINGS.—Prof. C. T. Brues has summarised *Quart. Review of Biology*, vol. 2, No. 2, 1927, the main facts relating to animal life in hot springs. Thermal waters contain only a small amount of dissolved oxygen and they are often impregnated with salts in solution, usually either calcium carbonate or silica. Compared with plants, animals have considerably less power of adjustment to high temperatures, and even the most resistant forms of animal life are unable to endure the degree of heat at which certain plants thrive. Of the insects which occur in hot springs the author refers to beetles, some of which have been reported from water at 115° F., and to the larvæ of Chironomus, which he found abundant in the mud of a shallow thermal pool at a temperature of 120° F. in Yellowstone Park. A few Crustacea have adopted a thermal habitat, e.g. species of Gammarus and of Cyclops and an isopod (Exospharoma). This last is especially interesting, because a closely related extinct genus is preserved in hot spring deposits of lower Oligocene age, indicating a long thermal ancestry. Molluscs such as Physa and Linnæa are also known to inhabit hot springs. Tadpoles of a frog were found in Yellowstone Park in water at a temperature of 104°–106° F., that is, several degrees above the temperature at which unacclimatised tadpoles of the frog and the toad die.

PLANKTON PRODUCTION.—There is an obvious need for some quick method of estimating the production of plankton in the sea to supplant the present laborious process of counting the diatoms themselves. It seems possible that such a method may be found in a study of the oxygen content of sea-water and its relation to the photosynthesis of the diatoms present. To this end preliminary observations were carried out by T. Gaarder and H. H. Gran in an investigation of the production of plankton in the Oslo Fjord in 1916 and 1917 (*Cons. Internat. Rap. et Proc. Verb.*, 42, 1927). Hydrographic and plankton observations were made, and at the same time, by suspending flasks of sea water with its contained plankton at different depths, artificial cultural experiments were set up. Results obtained in the open waters could not be regarded as

conclusive on account of the constant changing of the water masses in the fjord brought about by currents. In the flasks the greatest reproduction among the diatoms in March took place at 2 m. and 5 m., and there was still sufficient increase at 10 m. for the oxygen output to balance the uptake through respiration. In March the necessary nutritive substances occurred in the sea water in sufficient quantities in proportion to the consumption by the diatoms, but in September they were insufficient to produce a profuse development of diatoms. Addition of phosphates and nitrates to the water in the flasks in September caused a rapid production of 100,000 cells per litre in 3 days.

PLANT CHIMÆRAS.—Numerous chimæras have been produced by Messrs. Jorgensen and Crane (*Jour. Genetics*, vol. 18, No. 2) in Solanum, using the well-known methods of Winkler. The species grafted together were *S. lycopersicum*, *S. sisymbri-folium*, *S. nigrum*, and *S. guineense*. These species have different multiples of twelve chromosomes as Winkler originally showed for some of them, so that the parental tissues can be identified in the chimæra by means of the dividing cells. A new result is the discovery that in many forms, which were regarded as sectorial chimæras only, the superficial layers of a sector belonged to the other species. Such forms are really incomplete periclinals, and it is proposed to call them mericlinals. The morphology of the various chimæras is described, and it is shown that the periclinals generally show somatic instability, reverting to the pure form which forms the core. In one case, however, in *S. lycopersicum-luteum*, in which there were probably three or four outer layers of *luteum*, reversion took place through transitional stages to the pure *luteum*.

CHROMOSOME ATTRACTIONS IN PLANTS.—The arrangements of the chromosomes at reduction have been studied by Dr. Belling (*Jour. Genetics*, vol. 18, No. 2) in *Datura* and other plants, especially in triploid trisomic, and haploid plants. In haploid individuals the chromosomes show no mutual attractions. In diploids, corresponding ends of chromosomes attract each other, while the two ends of the same chromosome show different attractions. Long chromosomes may also show attractions at other points. From a study of triploids in which trivalent chromosomes are formed, the three members show the five expected arrangements. The fact that the triangle configuration does not normally occur indicates that the attractions of the two ends of a chromosome are different. On this hypothesis, eight configurations would be expected in tetraploids and they have been found. The trisomic ($2n+1$) mutations of *Datura* give rise to certain secondary forms in which one of the chromosomes of the trivalent has the same attraction at both ends and consequently forms a small circlet. It is suggested that this has arisen through crossing-over in the middle between two homologous chromosomes lying parallel but with reversed orientation. There is also a suggestion of crossing-over between non-homologous chromosomes, producing an isomorphic strain which in crosses combines to form a ring of four chromosomes. These are further steps in showing that genetical variations have a cytological foundation.

TERTIARY CEPHALOPODA FROM JAPAN.—Cephalopod remains are rare in the Tertiary rocks of Japan, only three species having hitherto been described. Two new forms, *Aturia aturi*, var. *tokunagai*, and *Nautilus (s.s.) japonicus*, are now added to the list by S. Shimizu, while a species hitherto identified with *Aturia zigzag* has been given separate rank as *A. yokoyamai* by

T. Nagao (*Science Repts., Tôhoku Imp. Univ., Sendai, Ser. 2, vol. 9, No. 2*). Excellent plates accompany both papers.

INDIAN TERTIARY MOLLUSCA.—In 1909 the first part of Cossman and Pissarro's work on the Mollusca of the Ranikhet Series, comprising the Cephalopoda and Gastropoda, was published in the *Palaeontologia Indica* (New Series, vol. 3, pt. 1). The second portion on the Brachiopoda and Lamellibranchiata (with some species from the *Cardita beaumonti* beds) has now, after many vicissitudes, been issued (*Pal. Ind., New Ser., vol. 6, mem. 2*). A translation was made by the late Dr. E. Vredenburg from the original French and the two MSS. sent to M. Cossman for revision in 1915, but were lost without trace, probably sunk with other mails. Fortunately a duplicate translation was found among Dr. Vredenburg's literary remains, and from that the present part has been prepared. One brachiopod and twenty-five lamellibranchs, nine of which belong to the Cretaceous *Cardita beaumonti* beds, are described, including eighteen believed to be new species, and figured on four plates.

OIL IN AUSTRALIA.—The vexed question of petroleum in Australia is once again mooted by the appearance of another report, this time dealing with portions of the Kimberley Division of West Australia, with special reference to the possible occurrence of mineral oil in the Fitzroy Basin, and written by Mr. T. Blatchford, Assistant State Mining Engineer. While we have nothing but praise for the painstaking efforts and perseverance of the many experts in their search for petroleum in this continent, the prospect of ultimate location of commercial oil-pools, especially in the West, seems inevitably slight, if on first principles alone, and a perusal of this report of another possible area does not incline one to a change of opinion. In the present instance the most likely beds would seem to be those of Cambrian age, with which some discovered bitumen outcrops are apparently connected, more particularly the Upper Cambrian beds overlying basalt flows. The author states that suitable structures exist in the area, and other conditions are favourable, though proving the presence of oil will necessitate boring probably to 4000 or 5000 feet. Two trial borings through similar rocks in a contiguous district, at Mt. Wynne and the Ord River Basin, were unsuccessful, the Mt. Wynne boring being abandoned at 2400 feet without meeting oil-bearing beds, the Ord River bore being shut down in basalt.

PHOTOMETRIC MEASUREMENTS DURING THE TOTAL SOLAR ECLIPSE OF JUNE 29.—During the total solar eclipse on June 29, Mr. J. S. Dow made many photometric observations of the total illumination. Although he was not quite in the centre of the belt of totality, he was favourably situated to observe the phenomena. He had previously made photometric observations of the partial eclipse of 1912 under excellent weather conditions and so knew exactly what to expect. He publishes his results in the *Illuminating Engineer* for August. When he began his observations about 5.20 A.M. the sky was clearing of clouds. This led to an actual increase in illumination notwithstanding that the eclipse had begun. At 6.10 the sun emerged from the cloud as a watery crescent, but it disappeared again just before totality and did not appear again until totality was over. At totality the illumination fell with great rapidity for a few seconds and then rose with equal rapidity. The lowest illumination recorded was about half a foot candle. It then rapidly rose to more than 2000 foot candles, due partly to the passing of the eclipse

and the fact that the altitude of the sun was increasing. Owing to the clouds it was impossible to forecast accurately what the illumination would be, but the agreement between calculated and observed values in the 1912 eclipse was excellent. Apparently values of the illumination so low as a fiftieth of a candle foot were obtained by an observer at Southport. It is practically impossible at present to predetermine the illumination resulting from a total eclipse. It would be necessary to have accurate data of the candle power of the corona. Quite apart from the interference of clouds, the illumination probably varies with the width of the band of totality and the position of the observer on it.

A NEW SOURCE OF ARSENIC.—A paper has been published by R. E. Pennington in the *Journal of the American Chemical Society* for June directing attention to a hitherto unsuspected source of arsenic in the human body. The author has examined a large number of brands of smoking and plug tobacco by means of the micro-Marsh method, and has found amounts varying from six to thirty parts per million. These are many times in excess of the quantities permitted in foods. Nearly half of the arsenic in smoking tobacco is evolved in the smoke and about half of the arsenic in plug tobacco is soluble in water. The results show very clearly that a considerable part of the arsenic in tobacco may find its way into the body, and experiments are now being carried out to test this possibility conclusively.

THE PASSIVITY OF METALS.—The unusual properties of iron and other metals which have been rendered passive by oxidising treatment have been attributed by many investigators to a protective film of oxide or other material. This explanation has been rejected by some chemists, since no film is usually visible, while iron which has been covered with a visible film by heating is often not passive. The presence of very thin films, too thin to give interference tints, has been proved by the work of U. R. Evans, which has been published in the May issue of the *Journal of the Chemical Society*. He has found it possible to render these films visible by dissolving away the metal below them by anodic treatment or by means of iodine. The envelope of the iron electrode after anodic treatment consisted of two thin transparent parallel membranes of ferric oxide united at the two edges. There seems to be little doubt that this film is the cause of passivity; where the film is broken or contains cracks the metal is active.

FOG PRODUCTION ON THE NEUTRALISATION OF HALOGEN HALIDES.—It has been noticed that when a current of air containing phosgene or phosphorus oxychloride is passed through charcoal and aqueous alcoholic potash, a fog develops in the vessel containing the alkali as soon as the charcoal is saturated. H. O. Askew has shown that both hydrochloric and hydrobromic acid vapours when passed into various alkaline solutions are capable of producing similar effects, more especially in the presence of colloids and dyes. A complete investigation of this subject is described in the *Journal of the Chemical Society* for May. It has been found that the relation between the amount of fog produced and the alkali concentration, and also the amount of fog and the concentrations of the added active materials, are of the same form as the adsorption isotherm. The concentration of the acid in the fog particles and the water vapour pressure are constant and independent of the amount of fog formed, but the sizes of the particles decrease as the fogs become denser. The particles appear to have no electrical charges.