

Research Items.

Jemdet Nasr.—An account by Mr. Ernest Mackay of the archaeology of Jemdet Nasr, Iraq, excavated by the joint Field Museum—Oxford Expedition, is published as *Anthropological Memoirs*, vol. 1, No. 3, of the Field Museum of Natural History, Chicago. The site, which is situated about fifteen miles north-east of Kish, has now been identified as the ancient Kid-Nun-(ki). It consists of a chain of mounds running east-north-east by west-south-west, about 850 metres long by 180 metres wide, the largest mound being roughly 360 metres by 180 metres. The pottery and small antiquities point to a close kinship with the lower levels of Susa and Musyan. Thus, the identity or close similarity in the design of seals of unusual or curious type is explicable only as due to a close connexion; resemblances in methods of working vessels of stone, and in the shapes of several types of pottery, point in the same direction. The painted pottery of Jemdet Nasr is probably rather later than that of Musyan and Susa ii.; but, on the other hand, it is earlier than the time of Cemetery A, at Kish. Notwithstanding the absence of burials, the objects found prove the existence of an advanced chalcolithic civilisation in Babylonia at an early period. The system of writing had barely emerged from the pictographic stage, but weaving, fishing, agriculture, and pottery-making, in which the inhabitants excelled, were practised. The brick-making is superior to any other in pre-Sargonic times; but in size and shape the bricks are peculiar, being flat instead of plano-convex. Many objects from the Indus valley resemble those of Jemdet Nasr. It is concluded that the inhabitants were not Sumerian but a people conquered by the Sumerians. Prof. Langdon, however, relying to a certain extent on later evidence, says it is impossible not to regard them as Sumerians. Taking 3500 B.C. as the date of the destruction of Jemdet Nasr by fire, he thinks occupation of the site may go so far back as 4000 B.C.

Pneumonia on the Rand.—Pneumonia used to be a formidable disease among the native workers in the Rand mines of South Africa. Following the use of preventive inoculation with pneumococcal vaccine, a marked diminution in the pneumonia incidence resulted. However, we learn from the annual report for 1930 of the South African Institute for Medical Research, that since 1926 this vaccine has apparently been exerting a somewhat lessened influence in preventing the disease, the mortality rate per 1000 population rising from 2.52 in 1926 to 3.60 in 1930. A study of the disease shows that the original strain of infecting pneumococcus, the causative micro-organism, has been largely replaced by other strains against which the original vaccine is less effective, and these new strains are therefore being incorporated in the preventive vaccine. Further, in a large proportion of the cases the pneumococcus is no longer the principal infecting agent, various other micro-organisms taking its place.

Antlers of Deer.—In a new analysis of the weights of the antlers and the bodies of various species of deer, Prof. Julian Huxley carries further the comparison which he began in a former paper (*Proc. Zool. Soc.*, p. 820; 1931). In the mass, the 527 adult examples of red deer show that antler-weight bears to body-weight a constant relationship, which includes a steady relative increase in the weight of the antlers. Although a close analysis of individuals, grouped according to the regions of their origin, does not support this result, probably because the examples are extreme, it is confirmed by an examination of regional groups

as a whole. On the other hand, roe deer definitely show a reverse correlation, for in them, judging from 405 wild adult individuals, relative antler-weight decreases with increasing body-weight. When we turn to New Zealand red deer, originally imported from Great Britain, we find exceptionally high relative antler-weights associated with exceptionally heavy body-weights, the former due to the latter, and the latter due to a particularly favourable environment. It seems probable, therefore, that diagnoses of species or sub-species of deer based upon absolute size or relative size of parts cannot be regarded as valid, until it has been shown that the characters selected as diagnostic are genetic and not direct environmental modifications.

Morphology of the Insect Abdomen.—Under the above title, Dr. R. E. Snodgrass of the United States Bureau of Entomology has published an important paper in the Smithsonian Miscellaneous Collections for 1931 (vol. 85, No. 6). It is generally accepted that the insect abdomen consists primarily of twelve segments, the first eleven of which are true somites and the last is the telson. The eighth and ninth segments are the genital segments and bear the gonopods. The genital opening in the female is located, typically, behind the eighth sternum and that of the male behind the ninth. The abdominal appendages of adult and larval insects are serially homologous with the legs and mouth-parts. Each consists of a basis and one or two movable appendicular processes. The basis appears to comprise the coxal and subcoxal regions of a typical appendage. The basis of an abdominal limb usually is incorporated as a plate of the body-wall or united with the sterna. The appendicular processes are very commonly (in the lower insects) the styli or their derivatives, including the clasping organs borne by the male gonopods of the higher insects. The other processes are the gonapophyses. No positive evidence can be adduced from the known facts of anatomy or embryology to establish the homology of either the stylus or gonapophysis. The author inclines to the view that the stylus is the telopodite of the appendage and that the gonapophysis is an endite process of the basis. The main objection to the view that the styli of *Machilis* are the homologues of telopodites is the fact that very similar organs are borne by the thoracic legs. The similarity in the two cases may be misleading, and there seems to be nothing to show that the leg styli are not merely coxal spines resembling in form the abdominal organs bearing the same name.

Effect of Ultra-Violet Light on Plants.—The production of a glass which allows the passage of ultra-violet light, and the discovery of the antirachitic properties of foods exposed to such radiations, has quickened interest in the effects of these rays on plant life. Experiments have been carried out by W. E. Tottingham and J. G. Moore (*Journal of Agricultural Research*, 43, p. 133) to compare the development, and to some extent the composition, of twelve species of economic plants grown under ordinary and vita glass, and to determine whether the use of the latter is of any commercial advantage. The heating effects with vita glass, due to its relatively high transparency to infra-red rays, were largely compensated for by ventilation, but it is realised that some of the results obtained may be attributable to increased temperatures. Marquis wheat developed a darker colour and more erect habit under vita glass, and seed production also benefited. Such differences were not found with

all varieties of wheat, however, nor under all seasonal conditions. Maize and tomato attained a larger size, and in the case of tomato produced more succulent fruit under vita glass, but with both species these larger plants were less hardy towards frost. Soy beans showed an increase in reproductive activity, together with earlier maturation, than plants grown under ordinary glass. As regards the rooting of cuttings, the results were somewhat inconclusive, but the balance was slightly in favour of vita glass in the case of chrysanthemums. The lipide content of the dry matter was in many instances higher in the vita glass plants, but alterations in the protein also occurred in some cases. Although practical application of the results from the commercial point of view seems as yet distinctly limited, there are indications that further investigations along these lines may lead to enhancement of the medicinal potency of plants.

Cultivation of Mushrooms.—The application of scientific methods to the practice of horticulture proceeds slowly but surely. It is nearly thirty years since the idea of using a pure culture of mushroom spores propagated on sterile manure was introduced. The gardener is now beginning to use it. The introduction of Bulletin No. 34, "Mushroom Growing", by the Ministry of Agriculture and Fisheries, is therefore very opportune, especially as it describes the new processes in simple language and compares them with the old. The preparation of mushroom beds, spawning, 'casing', and other treatment are all dealt with fully, and there is a section on harvesting and marketing. Perhaps the most valuable section of the book is that on diseases and pests. The grower and the student have long waited for some authoritative collection of the information about these subjects, and in the book under review the latest work on the Mycogone disease is summarised. A list of the important works on cultivation and diseases is appended, and will be of great value to the advanced grower and the student.

Termites in the Formation of Spongy Ironstone in Africa.—Peculiar outcrops of brown ironstone (limonite) of a spongy texture form a feature of the higher regions of Central Africa, particularly of Angola. Livingstone was the first author to direct attention to them so far back as 1857, and white residents in these parts of Africa found them an excellent building material. Dr. Malcolm Burr and Mr. P. S. Nazaroff, who have recently travelled in Angola, came to the conclusion (*Geol. Mag.*, vol. 68, 1931) that the ironstones present nothing else than subfossil remains of termitaria. The process of ferruginisation of termitaria can be observed even now, being independent from the activities of insects themselves, and is clearly a process of deposition of iron from rain water soaked through soil. When nests are near rocks rich in silica, such as quartzose sandstones, an analogous process of silicification occurs, and the old termitaria are converted into a completely silicified but spongy rock.

Luminous Phenomena accompanying Earthquakes.—The luminous phenomena of earthquakes have been described as forming the darkest chapter of seismology. Though many writers have been sceptical as to their reality, their existence has been established by Mr. K. Musya, who collected about fifteen hundred observations during the Idu earthquake of Nov. 26, 1930 (*NATURE*, vol. 128, p. 155). Prof. T. Terada has recently studied about forty examples noticed in Japan (*Earthq. Res. Inst. Bull.*, vol. 9, pp. 225-255; 1931). They have indeed been seen with all recent great earthquakes in that country. In the Idu earthquake, they were observed to a distance of 50 miles east of the epicentre, 68 miles north, and 43 miles

west. At some distance, as in Tokyo, the lights were not unlike sheet lightning. The first flash was seen immediately after the first shock, then three or four others followed at intervals of from one to ten seconds, but the duration of each flash was longer than that of sheet lightning. Close to the epicentre, the light assumed more definite forms, in one case of a straight row of round masses. The colour was usually pale blue or white, and, even in Tokyo, the lights were bright enough to illuminate the objects in a room. Prof. Terada concludes that the phenomena are real, and suggests several causes, such as landslides, to which they may be due.

Spectra of Negative Ions.—In a paper in the *Zeitschrift für Physik* for Oct. 14, Prof. R. Mecke makes the interesting suggestion that certain band spectra which appear when arcs are run in hydrogen between beryllium or magnesium poles, which had previously been supposed to be emitted from positive ions of the hydrides BeH and MgH, actually come from the negative ions of these compounds. His argument is based on the so-called displacement rule, which applies both to atoms and molecules, and states, for the latter, that molecules which possess the same number of electrons similarly arranged have closely similar spectra. If the bands of magnesium hydride in question were due to the positive ion, they should thus be similar to those of neutral sodium hydride, whereas they are in fact much more like those of neutral aluminium hydride. The beryllium hydride bands likewise resemble those of neutral boron hydride more closely than those of lithium hydride. The evidence presented is so striking that it seems that the only alternative to accepting these spectra as having their origin in molecules which have acquired an extra electron is to reject the displacement rule in relation to molecules. The importance of Prof. Mecke's discovery, if substantiated, is not merely spectroscopic, as it suggests that it may be profitable to investigate the quantum theory and chemical behaviour of negative ions, subjects which have received little attention.

Crystal Photocells.—The first November number of the *Physikalische Zeitschrift* contains an article by Prof. W. Schottky on the electrical properties of crystals of cuprous oxide held in contact with a metal. This system can be used either as a rectifier for small alternating currents or as a photoelectric device, but whilst the former effect has been widely employed in crystal detectors, it was not known until quite recently that the contact could be disturbed by illumination, and that a current would flow under the influence of light even without an applied potential difference. As is shown in a number of other papers in this and the following number of the same journal, the effect depends both upon temperature and the frequency of the radiation, and it appears that it is primarily due to properties of the crystal rather than to those of the metal. It is not entirely a contact action, since Prof. Schottky has shown that the active layer of crystal is probably not less than 1μ in thickness; the large free paths for electrons which this calls for are, however, also required by other crystal phenomena, and can be readily accounted for on the wave mechanics.

Viscosity of Nitrogen at High Pressure.—Some measurements of the viscosity of nitrogen are described by A. Michels and R. O. Gibson in the November number of the *Proceedings of the Royal Society*, which show how the properties of the gas approach those of a liquid when the density of the gas is made large compared with its atmospheric value. The measurements were made by the usual method of forcing gas through a capillary tube, but the apparatus was constructed so that it could be used at pressures

up to 1000 atmospheres. The results demonstrate immediately that the gas law (viscosity is independent of pressure) ceases to be valid at a few atmospheres pressure, the value of the viscosity changing by a factor of 2.5 over the whole range considered. Moreover, at pressures above about three hundred atmospheres the viscosity acquires the typical liquid property of increasing with decreasing temperatures if it is considered as a function of the pressure, although it continues to increase with increase in temperature if it is considered as a function of the density. A theory of the viscosity which has been proposed by Enskog can be tested from the results of these experiments, and leads to values for the diameter of the nitrogen molecule which lie consistently between 2.9×10^{-8} cm. and 3.0×10^{-8} cm.

Crystalline Rubber.—A short communication from E. W. Washburn in the first November number of the *Physical Review* contains the announcement that a group of workers at the United States Bureau of Standards have succeeded in obtaining a well crystallised hydrocarbon from typically colloidal rubber. This has been accomplished by dissolving purified rubber in a suitable solvent to form a dilute solution, and crystallising it out at rather low temperature. A photomicrograph is shown of some crystals which were grown at -55° from a 0.05 per cent solution in ether. Their melting point has not yet been fixed definitely, but lies between -35° and 0° C. The molten product has the appearance of ordinary rubber, and contains hydrogen and carbon with an atomic ratio closely eight to five. It has also been found possible to distil the rubber hydrocarbon, but fractionation by this process is relatively slow.

Stream Lining in Locomotives and Motor Cars.—Dr. O. G. Tietjens contributes an interesting paper on stream line locomotive and car design to the fourth quarterly issue for 1931 of the *Westinghouse International*. He is a research engineer to the company, and his experiments on small locomotives and cars, accurate to the minutest detail, bring out very clearly the importance of stream line design. He finds that an electric locomotive travelling at eighty miles an hour requires five times as much power as when travelling at forty miles an hour. Even higher speeds are contemplated because the competition of aeroplanes and motor cars makes high speeds imperative. In the case of a heavy locomotive and two heavy coaches, stream line design saves thirteen per cent of the power at a speed of 35 miles an hour and thirty-two per cent at a speed of 75 miles an hour. It requires 286 horse-power to drive an interurban street car at a speed of 80 miles an hour. Tests made in the Westinghouse wind tunnel indicate that the same type of car constructed with stream line design can be driven at 80 miles an hour with only 140 horse-power. The power required in the latter case is less than one-half that required in the former. A method is shown of converting the modern American tram-car with its blunt ends, sharp corners, and hundreds of air pockets into a stream line car. A new front and a new rear are given to it, the roof is made smooth, the sides are extended downwards, and the recesses for the windows are eliminated. This reduces the wind resistance to one-third its former value. The new styles of high-speed locomotives and cars will probably soon become common, revolutionising the appearance of the car and greatly increasing its economy and efficiency in operation.

Astronomical Topics.

Astronomical Phenomena for January.—Occultation of Pleiades Jan. 18; η Tauri disappears 17^h 4^m, reappears 18^h 3^m; 27 and 28 Tauri disappear at 17^h 45^m and 17^h 50^m respectively.

Venus is an evening star, with about five-sixths of the disc illuminated; its meridian passage changes from 14^h 5^m to 14^h 29^m during the month.

Jupiter is approaching opposition, and is observable for most of the night. Mutual eclipses of the satellites (visible in England) occur on Jan. 3, 5, 7, 10, 12, 23, 24: details are given in the B.A.A. Handbook.

Neptune is about 15° east of Jupiter, so it is also observable: it reaches opposition late in February.

Minima of Algol, at convenient hours of observation, occur on Jan. 4, at 22.7^h; Jan. 7, 19.6^h; Jan. 27, 21.3^h; Jan. 30, 18.1^h. Each eclipse begins about 4.7^h before these times, and ends 4.7^h after them. The interval between minima is 2^d 21^h.

Moving Pictures of Celestial Objects.—When the cinematograph was invented it was seen that it might be usefully applied to celestial phenomena. Mr. Maskelyne took a film of the total solar eclipse of 1900, which was exhibited at the Royal Astronomical Society, and the idea has been repeated at some later eclipses, especially at that of 1927.

The University of Michigan has founded an Observatory, known as the McMath Hulbert Observatory, at Lake Angelus, Michigan, which devotes itself to the production of moving pictures of celestial phenomena. Vol. 4, No. 4, of the *Publications* of the University gives a description of the methods and results. The driving clock of the equatorial has a very accurate electrical control; there are arrangements for varying the speed of the film within large limits, as the objects photographed range from sunspots to faint variable

stars. There are devices for varying the clock drive, and giving motion in declination for films of moving objects such as the moon. These are also available for correcting for the variation of refraction as the altitude changes; some tables for this purpose are given in the report.

The possibilities of the method were well brought out in a film that was exhibited at the Royal Astronomical Society a few years ago, in which Jupiter was shown in rotation, and the approach of a satellite to the planet was also recorded. It would seem that a comet like that of Morehouse of 1908, in which the tail showed rapid changes, would afford a fruitful field for work with the instrument; unfortunately, such comets are rare.

“Annuaire” of the Belgrade Observatory for 1932.—This volume is issued by Dr. V. V. Michkovitch, the director of the Observatory, being the fourth of the series. It has the honour of anticipating by a year the British Nautical Almanac in the introduction of the nutation terms of short period in the ephemeris of sidereal time at Greenwich midnight; the time is also given to the third decimal of a second: these changes are consequential on the great improvements in clocks that have been made in recent years. The volume also contains ephemerides, at intervals of ten days, of 189 stars from Eichelberger's standard catalogue; these are not contained in other almanacs, and were calculated at Belgrade. Another feature, which must have been troublesome to compile, is a list of the 169 minor planets discovered between Nov. 2, 1929, and June 30, 1931; the dates and discoverers are given, also the dates of subsequent observations, and indications of those for which orbits have been computed.