

Research Items

Excavations at Kuala Selinsing, Perak. Mr. Ivor H. N. Evans, having carried out further excavations on the Tanjong Rawa site, Kuala Selinsing, Perak, Malay Peninsula, has now summarised his conclusions in an account of this later work (*J. Fed. Malay States Museums*, vol. 15, pt. 3). The inhabitants were not Mohammedans, and were traders in beads of semi-precious stones and glass. Some of these were of local manufacture. The stone beads probably came from India; others show affinities with Borneo and Sarawak, and with ancient beads found among Kachins and Chins, these in the latter instance being derived ultimately from both China and India, sources with which the Selinsing people may have been in touch. A piece of yellow lead slag may point to a connexion with the southern Shan States. The beads from Kuala Selinsing belong to a late iron age to early porcelain age culture that existed in India, the Malay Peninsula, Borneo and the Philippines. The people were almost certainly Hindus, as a definitely Hindu type of gold object has been found in the lower layer of the excavations; while a cornelian seal with a Pallava inscription (one of the most remarkable objects found in Malayan excavations in recent years) points to a connexion with southern India. The village would appear to have been built originally over the water, but accumulations of household refuse produced an island above the level of the highest tides. Burials took place under or among the houses, the bodies being placed in canoes and broken porcelain strewn over them. There are many types of pottery, mostly wheel-made with patterns akin to ancient Korean and Chinese. The settlement appears to have come to a violent end soon after A.D. 960, a date indicated by the presence of celadon wares. The earliest date suggested for the seal is about A.D. 400, but it was not found in the lowest level and may have been treasured for hundreds of years after the date of its manufacture, or perhaps be a survival of a script obsolete in India.

Shamans and Spiritism on the Mosquito Coast, Honduras. In an ethnographical survey of the Miskito and Sumu Indians of Honduras and Nicaragua (Bull. 106, Bureau of American Ethnology), Dr. Eduard Conzemius describes religious manifestations which have appeared among these peoples within the last forty years. These Indians are inhabitants of the tract of land once familiar under the name of the Mosquito Coast. The Miskito, who number about 15,000, are largely mixed with negro blood, as they intermarry freely with foreigners and assimilate all races readily. The Sumu, on the other hand, are exclusive. They number about 3,000 only and are decreasing. Many of the tribes, of which the names are preserved, have died out. Their language has many variants, some of which are mutually unintelligible. The shamans play a great part in the lives of these peoples, acting as medicine-men, doctors, augurs, rain-makers, conjurers, wizards, and the like. Their opinions carry great weight in tribal assemblies. According to tradition, their art was introduced from the east by a white man. The Sumu have only one class of medicine man, the sukya, whose office is hereditary. Nearly every village has its sukya. Among the Miskito, however, there is also a higher type, the okuli; but of these there should not be more than

one at a time. He is a special representative of the Thunder God, and controls the elements. The new movement in religious manifestations is not unlike the nyalism of the Jamaican negro. It is a form of possession which seizes on the people when they are engaged in earnest prayer. They claim that they then have no control over their movements, which are due to the presence of the Holy Ghost. They are believed to be able to cure the sick by the laying on of hands, and to have revelations from God during their dreams. Obeah, brought from Africa by slaves, still exists.

Spread of the Great Crested Grebe in Britain. A very thorough collection of information relating to the great crested grebe in Britain has been made by T. H. Harrison and P. A. D. Hollom with the help of 1,300 collaborators, and this together with the analysis of the data makes a most important account of the history of the species (*British Birds*, Aug. to Nov., 1932). In 1860, following a period of slaughter for the sake of the feathers, only about 42 pairs were left in England; but a continuous and progressively rapid increase has raised the number in 1931 to about 1,154–1,161 breeding pairs and a total population of some 2,650 adults. The spread has in general been from east to west, and there can be no doubt that the Wild Birds Protection Acts of 1880 and earlier have been a main factor in the increase, although the fact that increases have also occurred on the Continent points to a widespread influence. There too, however, increasing protection by law has to be reckoned with. In spite of protection, human interference is still the main cause of recorded deaths (36 per cent). The authors have estimated that a pair of grebes and their young consume 300–630 lb. of fish in the course of a summer; which gives a total fish consumption from England and Wales of 900,000 lb. a year. A careful analysis is made of mortality factors, and it is pointed out that the habits of covering the eggs when the nest is left and of carrying the chicks upon the back have been important acquisitions in reducing mortality from the attacks of egg-eating birds and of pike.

New British Copepod. Mr. D. J. Scourfield has discovered at Tenby a new species of *Cyclops* which he describes in a paper entitled "A New Species of *Cyclops* found on the Cliff-face at Tenby (*Cyclops* (*Bryocyclops*) *demetiensis*, sp.n.)" (*Ann. and Mag. Nat. Hist.*, ser. 10, vol. 10, p. 559, December 1932). It is an event of importance when British copepods new to science are found because this group is one of the best known. The present species was found, at first one specimen only, in some wet greenish earthy material from a spot on the cliff-face of the North Bay at Tenby, Pembrokeshire, where a minute trickle of water came oozing out of a small fissure in the rocks. Later on, further specimens were found in the same place but where there was a slight admixture of moss. Only this one restricted locality yielded the copepods. This find is specially interesting because all other known *Bryocyclops* are tropical, coming from Java and the New Hebrides, living in wet moss, cups formed by the leaves of plants or in empty coconut shells. Mr. Scourfield is of the opinion that his new species is not truly a moss-dweller but

rather than its true habitat is in the fissures in the rocks. *Cyclops (Bryocyclops) demetiensis* is a pretty little copepod with a peculiar eye of very unusual form surrounded by a mass of black granules in three parts, one dorsal and two lateral. It is possible that the form of the eye may have something to do with its mode of life in dark places. It is an active swimmer. Although no ovisacs were seen, a few nauplii were discovered in the bottle containing the copepods. These nauplii showed a separation of the eye parts which is very characteristic.

Mites of Fruit Trees. Literature dealing with the mites attacking fruit trees is not very accessible to the general horticulturalist, so that a lengthy synopsis by Mr. A. M. Massee is very acceptable (*J. Pomol. and Hort. Sci.*, vol. 10, No. 2, 1932, pp. 106-129, "Some Injurious and Beneficial Mites on Top and Soft Fruits"). The mites are dealt with according to the trees they attack, and apples, pears, plums and damsons, cherries, peaches, nectarines and apricots, nuts, walnuts, quinces, currants, gooseberries, raspberries, blackberries and strawberries are mentioned. It is interesting to note that there are several beneficial mites which are either predaceous, like the red velvet mite of apples which feeds on woolly aphis or they may feed on moss and lichen, as the flat scarlet mite (*Tenuipalpus glaber*) or the beetle mite (*Euzetes lapidarius*). The control methods which are given for the injurious species include many new treatments and it is interesting to note that the application of tar distillate winter washes is not an unmixed blessing, for it kills off many beneficial mites.

Inheritance of Flower-Size. There are very few published studies showing how flower-size is inherited in crosses between species with large or small flowers. The memorial volume to the late Prof. Jurius Philiptschenko (*Bull. Lab. Genetics, Leningrad*, No. 9.) contains a paper on this subject by Prof. Ruggles Gates. He has tabulated some thousands of measurements of petal length in four generations of hybrids descended from *Oenothera novae-scotiae* × a strain of *E. rubricalyx*. The former species has a mean petal length of about 12 mm., and the latter about 36 mm. This applies to flowers on the main stem. Those on the lateral branches always fluctuate about a mean 2-4 mm. less. The mean petal length of the F_1 hybrids was 18 mm., thus showing incomplete dominance of the small flower. Later generations showed striking segregation in flower-size, the modes for different plants of one culture ranging from 17 mm. to 30 mm. The number of factors for flower-size involved has not been determined, but must be two or perhaps more. Heterozygous plants, which will produce some larger flowered descendants, can be recognised since they show an exceptionally wide range of fluctuation which is generally bimodal. The segregants may breed true or they may again segregate. By tabulating the daily measurements from pure strains, the graphs of fluctuating flower-size can be compared with the changing meteorological conditions. In this way it is shown that a correlation exists between mean flower-size and the weather conditions on the day the flowers opened.

Earthquake Series at Nagasa, Japan. Messrs. A. Imamura, T. Kodaira and H. Imamura have described what they call an "earthquake-swarm" at and near Nagasa on the west coast of the Kii peninsula

(*Earthq. Res. Inst. Bull.*, 10, 636-647; 1932). At Wakayama, which lies about three miles to the north of this district, the average number of sensible earthquakes recorded each year from 1911 to 1919 was 14. In 1920, the number rose to 104, increasing to 299 in 1923, and then declining to 142 in 1927. At Hikata, close to the central area, the total number of shocks in the swarm was 934. In May 1929, a network of seismological stations was arranged around the central area, and, from the records obtained at them, the positions of 91 origins were determined. The shocks were all local, few of them were felt more than 12 miles from the centre, and only two or three of the strongest cracked plaster or threw down stone fences. The shocks originated at various places within an area of about twelve miles in diameter in Wakaura Bay, and at depths that seldom exceeded $2\frac{1}{2}$ miles. Two series of levellings along the west coast of the Kii peninsula, separated by an interval of thirty years, reveal a marked change in the level of the land. A block, about six miles wide, from Wakayama to Siotu, has bulged upwards. The maximum uplift is only $3\frac{1}{2}$ in., but the summit of the dome is occupied by a fault along which most of the earthquakes occurred. The uplift is due to lateral pressure acting from north and south, and, with a persistence of the pressure, may end in a fracture. As the Kii peninsula has been the seat of devastating convulsions in the past (for example, in 1854), it is obvious that these earthquakes, weak though they may now be, require careful study.

Earth-Magnetic Effect and the Corpuscular Nature of (Cosmic) Ultra-Radiation. In an important paper with this title (Part 4), read by Prof. J. Clay before the Amsterdam Academy of Sciences on December 17 last, an account is given of a valuable series of observations on the intensity of the cosmic rays, made for him by Dr. J. Berlage on a vessel proceeding from Genoa to Batavia. The ionisation chamber filled with 22 litres of carbon dioxide at a pressure of 11 atmospheres was maintained at 130 volts, and shielded by 13 cm. of iron. The integrated ionisation current during each hour was registered photographically, using an electrometer. The results show a marked decrease from the Amsterdam value ($I=1.83$) to Genoa (1.75), and thence to the magnetic equator (1.56), with a small subsequent rise to Batavia and Bandoeng (about 1.62). Combining these with other recent results, Clay concludes that I is nearly constant from the poles to about magnetic latitude 46° (Amsterdam), and decreases by 16 per cent from there to the magnetic equator. He infers from this and other evidence, which he reviews, that the cosmic rays are corpuscular, having a Maxwellian energy distribution at the hardest end, with a mean energy of 3×10^{10} volts, which is cut off at the lower limit of 4×10^9 volts by the atmosphere; he attributes the reduction of intensity below about 50° magnetic latitude to the exclusion from this region (according to Størmer's theory) of the less hard components of the radiation. This view implies that the hardness of the observed rays should increase towards the equator, and he quotes observations in support of this.

Relativity of Time. An experiment has been carried out by Kennedy and Thorndike (*Phys. Rev.*, Nov. 1) to verify directly the restricted relativity expression for time in a moving system. Homogeneous light is split into two pencils which traverse paths of different length and are then allowed to interfere.

Assuming the null result of the Michelson-Morley experiment, it is possible to show that the phase relationship of the interfering systems depends on the translational velocity of the system unless the time is given by the Lorentz-Einstein transformation. The experiment therefore consists in building a very stable interferometer and observing the fringes at different parts of the sidereal day, the circumferential velocity of the earth being alternately added to and subtracted from the motion of the solar system in the universe. The interferometer was built entirely of fused silica and was kept in a vacuum in a constant temperature bath. The 5461 line of mercury was excited in a special lamp to give very homogeneous light and a path difference of about 30 cm. was used. Special methods were used to measure the photographs of the interference pattern to 1/1,000 of a fringe. The result showed that the relativity expression was verified, provided that the velocity of the solar system is not less than a few kilometres per second. The apparatus was found to be stable enough to enable comparisons to be made over an interval of six months and thus to utilise the orbital velocity of the earth; and here it was found that an effectively null result was obtained. Since internebular velocities run in thousands of kilometres a second, this is interpreted as meaning that time—as measured by the radiation from a mercury atom—varies according to the Lorentz-Einstein law.

Hæmocyanin of *Octopus vulgaris*. Svedberg and Eriksson (*J. Amer. Chem. Soc.*, Dec. 1932) have

determined the molecular weight of the hæmocyanin of *Octopus vulgaris*, the chemical and physico-chemical properties of which have been much investigated. The sedimentation method was used and it was found that solutions of the crystallised hæmocyanin contained two constituents, for one of which (called *B*) the sedimentation constant varied strongly with the hydrogen-ion concentration of the solution whilst the sedimentation constant of the other is independent of hydrogen-ion concentration. This second component, called *Ao*-hæmocyanin, is regarded as a definite molecular species, like the hæmocyanins of snails (*Helix*, *Limulus*) previously investigated. It has a molecular weight of about two million, thus resembling the other hæmocyanins, and differing markedly from other proteins. The molecule is not spherical in shape. The molecular weight is the same in the oxygenated and in the reduced state. The results show that the *A* and *B* components are not two different proteins but represent two different kinds of aggregation in equilibrium, the change from *A* to *B* being reversible. This peculiar behaviour with regard to its dependence on hydrogen ion concentration is without parallel in the other proteins so far investigated by the ultra-centrifuge method. The hæmocyanin from octopus gave a titration curve with three inflection points, one at pH 4.8, the isoelectric point, one at 6.3 and one at 7.5, the first two being characterised by great change in hydrogen ion concentration when the amount of acid or alkali present is but slightly changed.

Astronomical Topics

Astronomical Notes for February. Jupiter, Mars and Neptune are all near opposition, and are observable for most of the night. The northern hemisphere of Mars is turned towards us; this is less well known than the southern hemisphere, being turned to us at aphelion oppositions. The diameter of Mars increases during February from 12" to nearly 14". There is an eclipse of Jupiter IV on February 12; the disappearance is at 8.11 P.M. when Jupiter will be too low; but the re-appearance at 11.54 P.M. is observable. Two stars in the Pleiades are occulted by the moon on February 3, disappearing at 8.43 and 9.34 P.M.

Minima of Algol occur conveniently for observation on February 17 at 11.24 P.M. and February 20 at 8.18 P.M. It should be noted that the times in the B.A.A. Handbook are one day too great from February 18 until the end of April. Mira Ceti reaches maximum towards the end of February, and should be watched; it is only observable very early in the night. Its magnitude at maximum is subject to fluctuations, so comparisons with other stars are useful.

February and March are the best months for observing the zodiacal light in the evening; it should be looked for along the ecliptic as soon as it is dark when the moon is absent.

The central line of the annular eclipse of February 24 crosses Africa; a small partial eclipse is visible in southern Sicily and Greece.

Tidal Shifts in the Earth's Crust. Dr. Hecker announced about twenty years ago that the crust of the earth has tides of a few feet in height. Drs. H. T. Stetson

and A. L. Loomis suggested the existence of a much larger shift in a paper read at the recent meeting of the American Astronomical Society at Atlantic City. They have discussed the differences between the time-signals distributed by wireless from the leading observatories of Europe and America, and find discordances between them that are considerably larger than the probable errors of observation. If the whole discordance be ascribed to an actual change in the distance between Europe and America, it would correspond to an oscillation of 63 feet every 12 hours. They also note that the time of transmission of the wireless waves is longer than the light-time for the distance, nearly in the ratio of two to one; they infer that the waves travel by a zigzag route, with about thirty reflections between the Heaviside layer and the surface of the earth or ocean.

Stars of the μ -Cephei Type. Mr. W. Zessewitsch, of Leningrad University Observatory, has sent a note dealing with the double periodicity of stars of the above type. He tabulates for nine stars of the type the shorter period *P*, the longer period *M*, the ratio *M/P* and the logarithm of *P*. From these data he deduces the following empirical relation between *M* and *P*:

$$M/P = 80.2 - 44.5 \log P + 6.7 (\log P)^2.$$

P ranges from 16.5 days to 907 days; *M* from 600 to 6,200. The above equation gives sufficiently small residuals to suggest that some such equation exists between the two periods. He states that stars of the RR Lyrae type give a similar formula and expresses the hope that it will give a clue to the nature of the pulsations.