Research Items.

THE DIVINITY OF THE GUEST.—In the *Ceylon Journal of Science*, vol. 1, Pt. 3, Mr. A. M. Hocart discusses the position of the guest and his relation to his host in ancient Greece, in India, and in Fiji. In ancient Greece no distinction was made between a stranger, a host, and a guest, as they were not distinguishable. Further, not only was the god present with the stranger, and Zeus the patron of strangers, but also he was often regarded either as a god or actually was a god, as is shown in the manner in which Odysseus was addressed in Phaeacia. The exchange of gifts and the return of hospitality, potential or actual, created a bond of hereditary guest friendship out of which grew the consular system in historical times. The idea that the god accompanied strangers was evidently a check on an unhospitable age. In India, in the Atharvaveda the divine character of the guest is worked out in detail, every act of hospitality being identified with some phase of the sacrifice to a god. In the Anguttara Nikaya, the offerings to the Manes include a reception of guests, who are selected either as being learned or virtuous Brahmans, or as being relations through females. In Fiji, various ceremonial observances towards strangers, including the making of gifts, point to their sacred or heavenly character. In Fiji, however, intercourse takes place only through kinsmen, the kinship being either actual or, in case of necessity, fictitious. It is reckoned through the female. There was also a system of official guest friends. It is suggested that the Homeric system may have developed from some such archaic form as the Fijian, India being the common link in which the offerings to kinsmen and guests are distinguished, while in Fiji the recipients are identical; but in both countries divine honours were accorded to guests. The resulting hypothesis is that the divinity of the guest grows out of the divinity of the kinsman, who stands in cross relationship to the host, and this is extended fictitiously to any stranger.

WEAPONS AND ARMOUR OF THE PHILIPPINE ISLANDS.—A description by Mr. Herbert W. Krieger of the collection of primitive weapons and armour of the Philippine Islands in the United States National Museum, which appears as No. 137 of the Museum's *Bulletin*, is of a wider ethnological scope than its title might suggest. The author, in his introductory remarks, deals not only with the history of the collection, which is derived from a variety of sources, and has been given at different times, but also with the development of the types of weapons of the Islands and of their tribal cultures. The various types preserved in metal, bone, wood, and horn, bear traces of the several waves of civilisation that have reached the Philippines. They extend from the primitive digging stick, which may be a club or, with slight adaptations, an axe, a spear, a sword, a knife, or a hoe, down to the cannon of brass and firearms of Spanish manufacture in the possession of insurrectionary native troops. Tribal groups and nationalities manifest in their weapon production and types of body armour and shields a nearness to, or remoteness from, foreign culture influences. No one group has retained exclusively any one type of material culture. Some elements survive from a primitive Melanesian strain; other tribes show borrowings from the aboriginal Negrito; the Batak use the blowgun, a typical Malay weapon, while the Negritos of Zambales and the Luzon east coast use the Malay shield. Fine iron and steel blades, which have come to be recognised as characteristic of the Mohammedanised Moros, show a decorative design on the blade and a blade form invariably of Hindu or Arab character. Although the Spaniards found a crude crucible of stone in use for crushing gold ore and quartz, there appears to have been no stone age in the Philippines. Bamboo furnished in early days all the material required for implements and weapons until those made of iron were introduced from Borneo.

CLASSIFICATION OF HEMIPTERA.—The greater part of Vol. 7 published by the Connecticut State Geological and Natural History Survey, 1923–1925, is occupied by an extensive memoir of more than 800 pages forming Bulletin 34 of the Survey and entitled "The Hemiptera or Sucking Insects of Connecticut." Its author, Dr. W. E. Britton, in collaboration with a number of specialists in different families of the order, has provided a trustworthy and authoritative guide to the classification of Hemiptera, which will be found useful to entomologists in many countries. The bulletin is virtually a text-book on its subject and is well illustrated and provided with a full index.

DISTRIBUTION OF FOOD FISHES IN THE NORTH SEA.—In *Fishery Investigations* (Min. Agric. Fish.) ser. 2, vol. 9, No. 4, 1926, Mr. J. O. Borley provides a series of most instructive charts portraying the quantitative distribution of the marketable sizes of the principal food fishes in the North Sea during the years 1923 and 1924. It should be noted that only fish taken by the trawl are treated; species such as the herring, which are very largely caught in other nets, are dealt with only in so far as they are trawled. The charts are drawn up from the landings of British steam-trawlers, referred to the place of capture. The areas to which landings are referred are small rectangles each 1° of longitude by 30′ of latitude; these vary somewhat in extent with latitude, from 1500 square miles in the southern bight of the North Sea to approximately 1200 square miles in the region of the Shetlands. Each chart depicts a set of contours which indicate the relative frequency of occurrence of one particular trade category of fish, in grades of abundance from less than 1 cwt. to more than 100 cwt. per 100 hours of fishing. A loose key-chart, printed on transparent paper and showing the approximate position and names of some of the chief fishing grounds, is provided, which may be superimposed on the others as desired. The whole work demonstrates very clearly the scientific value of the carefully compiled statistics of commercial landings at British ports. Some notes on the natural history of the fishes dealt with in the charts, prepared by Miss Thursby Pelham from a variety of sources, form a supplement to this publication.

FLEAS AND PLAGUE.—Vol. I., Pt. 4, of the *Ceylon Journal of Science* (Dec. 1926) is devoted to the results of researches by Dr. L. Fabian Hirst on the parasitology of plague. He has returned to the important problem of the transmission of plague by the fleas *Xenopsylla cheopis* and *X. astia*. All attempts to transmit plague between rats, mice, and guinea-pigs by means of *X. astia*—596 fleas and a variety of methods were employed—at room temperature in Colombo during four plague seasons gave negative results. Plague was successfully transmitted to twelve rodents by means of 95 *X. cheopis* in the course of six separate experiments at room temperature. Plague was successfully transmitted from mouse to rat at an artificially reduced temperature (70° F.) by means of *X. astia*; a female flea of this species with "blocked"

proventriculus transmitted plague to two out of four of the rats on which its bites were observed. Rise of temperature may exert an unequal effect on the transmitting power of two different species of rat-flea. The second part of the work deals with the bionomics of the two species of fleas—egg-laying, life-history, longevity (that of the female being greater), factors which influence biting, etc. A useful list of the rat fleas of the world is given, and appended is a brief account, with seven plates, by Stanley Hirst, of the principal species of Acari parasitic on rats.

POLLINATION EXPERIMENTS WITH PEAS.—More detailed observation of Mendelian ratios is revealing consistent departures from expectation, which have to be explained by differences in the conditions under which the pollen tubes grow down the style of a flower or in the viability and rate of growth of pollen tubes, as well as by reference to other features of flower structure. Dr. C. J. Bond (*Jour. of Genetics*, vol. 17, No. 3) has experimented on these points by pollination of the F_2 hybrids between pea varieties having respectively round yellow and wrinkled green seeds. By pollinating immature stigmas, he finds an increase in the recessives resulting, presumably because the pollen grains bearing the recessive factors, and probably containing more sugar, are more viable or grow faster when the stigma is finally ripe. He also finds a small increase in the proportion of recessives when minimal pollination, *i.e.* only a few pollen grains on the stigma, is used. The explanation of this probably lies in the ovules, as the effect is more marked when the seed-parent carries the recessive characters. Dr. Bond thinks he also gets evidence that the functional ovules in flowers on different parts of the plant bear somewhat different proportions of the dominant and recessive factors. Such results are to be expected with a more detailed knowledge of the physiology of the ovule and pollen development in the plant.

SPONTANEOUS COMBUSTION OF HAYSTACKS.—The losses to agriculture due to the spontaneous combustion of haystacks prove to be considerable. In *Matériaux pour l'étude des calamités* for July-September 1926, Mr. G. Laupper goes into the problem at length and shows from statistics drawn from Switzerland and Germany that such fires are commonest after a good hay season and are least frequent in poor hay years. The monthly incidence also shows a clear maximum in July and August, with high figures for October and November. The summer maximum he associates naturally with the initial high temperature of the hay after its thorough exposure to solar rays before and after being made into ricks, while a good hay season means that the hay is rich in hydrocarbons, the decomposition of which is at the root of the trouble. The yearly loss to agriculture through stack fires in Germany is calculated to be about one million pounds and in Switzerland to be little less. No sure means of prevention have been discovered. Layers of straw or salt in the ricks have been proved valueless, and ventilation is not a certain cure. The only measure that can be recommended is spreading the hay as soon as abnormal temperature is noticed.

THE SURVEY OF INDIA.—The General and Map Publication Reports of the Survey of India for 1925–26 have been published. The total area of new surveys of all kinds completed during the year was 42,489 square miles. About 45 per cent. of the total area assigned to the department has now been surveyed. Work for the new geodetic level net of India made steady progress. Tidal observations were continued as in past years. Map publication included five new sheets of the one-million map of India and adjacent countries, which is now nearing completion except for Arabia; twenty-seven new 'degree' sheets, sixty-nine half-inch and 127 one-inch sheets. The modern topographical map of India thus grows steadily, though only a little more than one-third of the total number of sheets have yet been published. The reports contain full index maps to the sheets available.

SIZE AND FIGURE OF THE EARTH.—Newton's theory of gravitation was held up for several years on account of lack of accurate knowledge of the size of the earth, and Newton himself first estimated the earth's figure from its speed of rotation. The determination of the size and figure of the earth has during the last two centuries exacted enormous labour from geodesists. It is generally assumed that the earth is approximately an ellipsoid of revolution, so that only the equatorial radius and the flattening have to be determined. Observations made in different regions of the globe are, however, rather discordant, the differences amounting to several parts in 100,000 as to the size and about 1 per cent. in the flattening. The labour which the observations have involved is so great that every effort should be made to make the fullest use of them. One difficulty in utilising the separate arcs which have been measured results from the fact that they have been discussed with respect to different figures. The figure of Clarke (1880) suits the European observations well, but a considerably different figure was deduced by Hayford from American observations, and this latter was adopted at the Madrid meeting of the Union of Geodesy and Geophysics as the reference figure for future calculations. To simplify comparisons, particularly with Clarke's spheroid, accurate tables have been computed for the Royal Geographical Society, and by means of these Mr. A. R. Hinks has discussed the principal geodetic surveys. He shows the impossibility of separating the two unknowns from arcs near the equator, and shows that different arcs fit different spheroids, and that those in India and South Africa do not fit any spheroid well. The difference in the results cannot arise from errors in the geodetic observations, but the astronomical observations may be effected to a considerable extent by local attraction, as in India. The probability is, however, that the approximation of the earth to a spheroid is only rough. Mr. Hinks points out that gravity observations can also be treated by a graphical process, and that they likewise indicate departure from a common spheroid when different regions of the earth are considered.

HELIUM CONTENT OF JAPANESE MINERALS.—On heating certain minerals containing helium, approximately 50 per cent. is evolved, and the method has been used by J. Sasaki to determine the helium contents of some Japanese minerals. The gases obtained by heating the powdered substances in an evacuated quartz-glass tube are passed over solid potash, red-hot copper oxide, and soda-lime to remove carbon dioxide and hydrogen. By sparking with oxygen in a eudiometer, nitrogen is converted into nitric oxide, which is absorbed by moist potash floating on the surface of the mercury, and the excess of oxygen is allowed to combine with melted phosphorus. The remaining impurities are removed when the residual gas is subjected to a discharge in a modified Geissler tube with liquid electrodes of a sodium-potassium alloy, and to the action of charcoal cooled in liquid air. Estimates of the geological ages of two of the minerals have been calculated by

Rutherford's method and appear together with the other data in the December issue of the *Bulletin of the Chemical Society of Japan*. The figure for monazite is 90 million years, and that for fergusonite 150 million years.

MAGNETIC ELEMENTS IN THE UNITED STATES.—The United States Coast and Geodetic Survey has recently issued two small pamphlets (Nos. 353, 360, price 10 cents each), one detailing the results of magnetic observations by the Survey during 1925, the other giving a chart, for the whole of the United States, of magnetic declination and its secular change per year, for the epoch 1925. The Survey issues such isogonic charts and secular-change data every five years, suitable stations being reoccupied during the intervening periods, in order to obtain the data necessary to carry the charts forward. With the chart is a full explanation of its construction and use to surveyors, also instructions to enable a surveyor to determine the declination with the aid of a compass and observations of the sun or stars. Tables are given for use in connexion with such celestial observations, and also tables of secular change in declination for a large number of stations, at intervals from 1750 to 1925. The first pamphlet (No. 353) gives observations of declination, dip, and intensity at respectively 330, 123, and 121 stations, widely scattered throughout the States, and including also some in the Philippines, Greenland, and the Aleutian Islands.

INDOOR ELECTRICAL ILLUMINATION.—It was stated by Mr. J. W. T. Walsh, of the National Physical Laboratory, in a paper on illuminating engineering which he read to the Institution of Electrical Engineers on Mar. 3, that 90 per cent. of the people in Great Britain carry on their work after daylight hours by an inadequate illumination and an unsuitable system of lighting. To quadruple the illumination and distribute it properly would result in better health and higher efficiency. The sources of illumination used in the early days cast unpleasant shadows. To get over this defect the indirect system of lighting, in which all the light from the source was reflected upwards to the ceiling and was then diffused over the room, was devised. The result was an almost complete absence of shadow, which, although suitable for a few special purposes, such as drawing-office work, was found to be most inconvenient for other work, such as sewing, where the shadows cast by the individual threads are a help. As a consequence of this defect, the modern semi-indirect system of lighting has been evolved. In this system part of the light is transmitted downwards through a bowl of diffusing material, while the remainder is emitted upwards to the ceiling as in the indirect system. The author considers that each of the three systems has its own field of usefulness. He thinks that in a lecture theatre, the totally indirect system has a tendency to appear lifeless and gloomy even though the amount of the illumination is ample. Some direct sources of light ought therefore to be provided in addition. The reflexion of a bright source of light from a polished surface or from a glossy paint or enamel often causes an objectionable glare. Methods should always be devised to obviate this.

ELECTRICITY SUPPLY.—In the *Journal of the Institution of Electrical Engineers* for March, Mr. J. R. Beard gives a report of the progress made in the transmission and distribution of electricity during the past year. He mentions that for many years the installation of transformer substations out-of-doors has been common abroad, and now, owing to the high cost of buildings, it is becoming common in Great Britain. Until recently all substations for converting from alternating to direct current were manually operated. Owing mainly to the increase in the rates of wages, automatic apparatus for starting up, shutting down, and controlling the apparatus in these stations is now largely used. Experience has shown that automatic control gives greater security than manual control. A recent development is 'supervisory control,' in which the operation of a number of automatic substations can be regulated from a central control point. This combines the accuracy of automatic control with the intelligence of manual control. All the substations on the 170-mile 3000-volt main line electric railway in Natal are operated automatically. Mr. Beard mentions one curious fact in connexion with low-voltage supply in Great Britain and the United States, namely, that while a pressure of about 230 volts is general in the former, a voltage of 115 is used in the latter. The reason seems to be that in the early days the life of the low-voltage lamps was much longer and their efficiency was much higher than that of high-voltage lamps. It is almost the universal custom in America for the supply authorities to supervise and maintain consumers' lamps. In Great Britain this is left to the consumer. Twenty years ago the low-voltage lamps were much cheaper to maintain, and so the over-all efficiency with their use was greater than that with high-voltage lamps. This, combined with the cheaper wiring systems used, explains why 115 volts is still the standard pressure in the United States. Mr. Beard sums up in favour of alternating current distributed in the three-phase four-wire system.

DOPES AND DETONATIONS.—A second communication from the Air Ministry Laboratory by Prof. H. L. Callendar and collaborators, dealing with the effect of antiknock compounds on engine 'knock,' appeared in February issues of *Engineering* (pp. 147, 182, 209). The previous report (Reports and Memoranda, No. 1013) led to the conclusions that detonation was due to the presence of nuclear drops in the charge in the cylinder during explosion, and that 'antiknock' concentrated in the drops, decomposed and protected them from oxidation by the formation of a metallic film or, in the case of the organic dopes, by dilution with a substance of high critical temperature. Such an explanation being inadequate to explain the different behaviour of various dopes, the present communication extends the work on the chemical side. It is found that detonation in paraffin fuels and ether is due to the accumulation of peroxide in the nuclear drops during rapid compression. The amount of peroxide formed would not in itself be sufficient to cause the detonation observed, but acts as a primer causing simultaneous ignition of the drops. The metallic dopes are considered to act by reducing the peroxides as fast as they are formed, preventing their accumulation, and thus delaying the ignition of the drops. The processes of slow combustion of various fuels are investigated by observing the temperature at which combustion becomes appreciable, the dopes being shown in this way to delay oxidation by preventing peroxidation of the fuel. A striking experiment is described, showing the difference in the kind of ignition obtained when the vapour of paraffin is ignited in a hot tube as compared with paraffin spray. In the former case the vapour burns with a quiet flame; in the latter the mixture burns with slight explosions and flashes of flame. The present communication adds to our knowledge of the behaviour of combustible mixtures.