Research Items.

New Social Survey of London.—It is now more than forty years since Mr. Charles Booth began his great social survey of London, which occupied seventeen years and was published in a number of volumes. It is of importance to assess the social changes that have taken place in the intervening period and to extend the scope of the work. A new social survey has now been started by the London School of Economics. Some account of the scope, methods, and aims of the work are given in a paper by Sir H. Llewellyn-Smith in the *Journal of the Royal Statistical Society*, vol. 92, pt. 2. The area to be included does not correspond accurately with any administrative area, for these have little relation to present urban growths. North of the Thames it has to be pushed beyond the county of London. As a whole it includes, on the basis of the 1921 census, a population of 5½ millions, of which 4½ millions were then within the county. The methods of the important survey of poverty differ from those used by Booth inasmuch as intensive methods on the lines of Prof. Bowley's 'sampling' will be combined with the older extensive system of indirect information from schools, police, and clergy. Other branches of the survey will deal with industries, especially clothing, boot, shoe, and furniture trades, to which Booth gave special attention; crime; occupations; wealth and the use of leisure. Considerable progress has already been made with the poverty survey.

Birds of a Prehistoric Kitchen Midden in California.—The levelling of the Emeryville shell-mound on San Francisco Bay, in connexion with building operations, gave an opportunity for a detailed study of its contents (*Univ. Calif. Pub. Zoo.*, vol. 32, 1929, p. 301). The mound was the kitchen-midden of a prehistoric Indian settlement, and its remaining portion measured 150 ft. and 250 ft. in diameter and 22 ft. in height. A very considerable age is indicated by the size of this accumulation of food refuse, as well as by the fact that the lowest level of the mound was 2 ft. below high tide mark, and although the age cannot be definitely determined, it may be roughly 1000 or more years old. The bird remains were represented by 6700 specimens, of which 4155 were identifiable. Fifty species of birds were recognised, although no discrimination was made in the species of ducks or of gulls. Forty-five of the identified species occur to-day in the San Francisco Bay region, which contains in addition twenty species not represented in the mound. Four species are now absent from the region, though there are records of their presence in historic times, and only one species (*Grus mexicana*) has not hitherto been found in the area. The bones of summer and winter birds show that the habitation of the site continued all the year round, bones of nestling cormorants that an island rookery was raided; the general ensemble suggests that the Indians restricted their hunting to their immediate vicinity, and broken bones indicate either cookery methods or some attempt at making artefacts.

Measures against White Fly.—A novel scheme for combating the greenhouse pest, white fly, is being carried out by the Cheshunt Research Station, Herts, under the auspices of the Empire Marketing Board and the Ministry of Agriculture. It consists of the introduction into the infected house of a chalcid wasp (*Encarsia formosa*), which lays its eggs within the young stages of the fly known as 'scales'. The mature wasp is a very minute insect, the female being pale yellow and the male dark in colour. It is entirely harmless to plants. Tomato shoots, bearing scales already parasitised, will be forwarded *free of charge* to any grower experiencing trouble with white fly, on application to the entomologist at the Station. The size of the house is immaterial, but the number of houses and the type of plant infected should be stated. The shoots are tied into bunches and hung up for three weeks, preferably in the shade. If the average temperature is about 70° F., black scales, showing by their colour that they have been parasitised, may be expected after fourteen to twenty-one days on the under side of the infected foliage. At low temperatures the wasp does not lay its eggs so readily on many plants and the percentage of parasitism is accordingly smaller. The most suitable time for starting the parasite is from late March to early June, and unless the greenhouse is kept heated and well stocked with plants throughout the winter, it is not advisable to apply for parasites after the end of July. Should the infestation be very severe, immediate fumigation may be necessary. For this purpose ⅛ oz. sodium cyanide dropped into a jar containing ½ fluid oz. of 33 per cent sulphuric acid per 1000 cubic feet is recommended, since it kills the flies, but is harmless to the scales and the parasites within them.

Cutaneous Sense Organs in Fishes.—Mr. Denzaburo Miyadi, in a paper entitled "Notes on the Skin and Cutaneous Sense Organs of some Cobitoid and Gasterostoid Fishes, with Special Reference to the Rudimentary Nature of the Lateral Canal System" (*Memoirs of the College of Science*, Kyoto Imperial University, Series B, vol. 4, No. 2, article 4, 1929), describes his observations on *Misgurnus anguillicaudatus*, *Cobitis buwœ* and other Cobitoid fishes; also on the stickleback *Pungitius Kaibarœ*. In all these fishes he finds that the canal system is rudimentary or absent and probably degenerate, being represented in the *Misgurnus* species and in *Cobitis buwœ* by a short canal or vestiges of a canal on the anterior portion of the trunk only, as is the case in the European stickleback described by Plate. It is a general rule in the development of the lateral canal that the head precedes the trunk both ontogenetically and phylogenetically and, as the author found that in the Japanese stickleback the canal in the head is formed very early when the fish is only 1·5-2 cm. in length, whilst that of the trunk appears only after it has grown to 2·5 cm. or more, he regards it as highly probable that the case of the European stickleback is due to a degenerative process similar to that in the Cobitidæ, and suggests that "In both families Cobitidæ and Gasterosteidæ, when the degeneration of the canal system takes place, it is in the anterior portion of the trunk that this process occurs last of all".

Snakes and Termites—a New Example of Symbiosis.—Certain snakes have been found to occur in the nests of termites; even great pythons as well as a species of *Typhlops* occasionally inhabit the mounds of *Termes bellicosus* on the Gold Coast and elsewhere. Lizards have gone even further, and several South American species are known to deposit their eggs in or on termitaries suspended in trees. Up to the present, the egg-laying habit has not been observed in termitophile snakes, and Dr. F. Kopstein's discovery, during an expedition to West Java, adds a notable item of information (*Treubia*, June 1929, p. 467). From a nest of the termite, *Lacessititermes sordidus*, found on

© 1929 Nature Publishing Group

a tree 3 metres from the ground, he saw a small newly hatched snake issue, and in the course of the evening four were found to leave the nest. The snake belonged to a rare species, *Dipsadomorphus jaspideus*, and its newly hatched young had probably never been seen before, but the most interesting point was the association with the termitary. An examination showed that in the centre of the nest, which measured 20 cm. in diameter, were six egg-membranes which still contained fresh white-of-egg. Each egg lay in a cell of its own, encased in a capsule of the material used in the building of the nest. The outer layers of the nest showed no trace of an opening through which a snake of the size of the adult could have entered to deposit the eggs, and the author is of opinion that the eggs were laid in the nest at an early stage of its growth, the termites continuing to build their structure around them. The advantages to the snake are obvious: a high temperature, high and constant humidity for the development of the eggs, and for the young snakes abundant food if they chose to live upon termites, which is not at all certain.

Chinese Reptiles.—An account of the reptiles of the mountainous province of Fukien and neighbouring areas has enabled Clifford H. Pope to state many facts and conclusions of wide interest (*Bull. Amer. Mus. Nat. Hist.*, vol. 58, Sept. 1929, p. 335). The collection of 2749 reptiles yielded 6 forms of turtles, 19 of lizards, and 71 of snakes—a remarkably rich fauna for so limited an area. It contains three elements: widely distributed reptiles found throughout great tracts of south-eastern Asia, forms common in Central China, and tropical and semi-tropical forms found on the coastal plains. The general aspect is that of the fauna of China, except for the absence of the desert forms of Mongolia, and a close relationship is evident with the Formosan fauna. Examination of the stomach contents showed that snakes had decided food preferences. Of the aquatic forms some preferred frogs, others added fish to their diet, but closely related species might show distinct differences, *Enhydris chinensis*, for example, being a fish eater, while *E. plumbea* was content with frogs. Amongst the land forms birds, rats, and other mammals, and even snakes, were common diets; but while earthworms formed a natural food supply for burrowing and nocturnal species, such as *Tapinophis* and *Trirhinopholis*, it was less easy to understand why a large diurnal snake like *Liopeltis major* should select the same fare. It is noted that with age a general fading of the most contrasted elements of the colour pattern may take place, and this may produce so different an emphasis upon the different elements in the pattern as to suggest that young and old belong to distinct species.

Fauna of Streams.—Few contributions have been made in Britain to the study of the ecology of streams, so that the work of E. Percival and H. Whitehead is specially welcome (*Jour. Ecology*, Aug. 1929, p. 282). They have classified the stream-bed faunas, which they have investigated in the West Riding of Yorkshire, into seven categories according to the nature of the bottom, and this is connected with the general succession of conditions in passing down a stream, and therefore with the speed of flow of the stream itself. Detailed analyses are given of the main constituents of the fauna, for it was discovered that the bulk of the population was made up of a few types of organisms which varied with the environment. Accordingly, the variations have been correlated with the conditions as they affected the density of the population. The chief controlling factor in clean runs of water was the rate of flow, the slackening of the current coinciding with an increase in the number of genera. A very interesting table shows the ecological relationship of the organisms to each other and to the fundamental foods. From this it is evident that conditions favouring the growth of unicellular and filamentous algæ, that is, a stable substratum, aid in the development of a considerable insect fauna, and the reason is that, judging by food contents, 75-90 per cent of the organisms feed mainly upon algæ. Many of the organisms thought to be almost the sole source of food of fish, such as *Limnæa peregra*, *Gammarus pulex*, and *Ephemera* spp., have been found to contribute, in many places, either no part or very little part of the total fauna.

Mexican Earthquake Sea-Waves of June 16, 1928.—During the afternoon of June 16, 1928, a strong earthquake occurred off the coast of Mexico. The epicentre was in the Acapulco Deep, about 125 miles south of the Mexican state of Oaxaca. Though the origin was so distant, the coast towns in this region suffered considerable damage. The sea-waves that swept over the shores and added to the destruction were recorded at Hilo (*Hawaiian Volcano Observatory Monthly Bulletin* for June 1928). The first waves reached that station on June 17, 8 hr. 29 min. after the occurrence of the earthquake, the maximum range of the movement being about 16 inches, and the period at first about 22 minutes, or approximately the same as the period of the natural water oscillation of Hilo Bay. The distance of the origin from Hilo being 3860 miles, it follows that the mean velocity of the sea-waves was 455 miles per hour, a figure that agrees closely with the values obtained for other sea-waves across the Pacific, namely, 453 miles per hour for the Japanese earthquake of 1896 and 465 miles per hour for the Valparaiso earthquake of 1906.

Earth-Tilting by Tidal Loading.—A valuable contribution to our knowledge of the tilting of the earth's crust caused by tidal loading has lately been made by Mr. R. Takahasi (*Earthq. Res. Inst. Bull.*, vol. 6, pp. 85-108, and vol. 7, pp. 95-101; 1929). Two of Prof. Ishimoto's tiltmeters, constructed entirely of silica, were placed on a concrete platform on the floor of a cave cut in Mesozoic rock at Misaki near the southern end of the Miura peninsula, Sagami Bay. The cave is covered with a thick growth of weeds and a forest of pine-trees, and is so effectually shaded from solar radiation that variations of temperature in the cave are too small to be recorded by the ordinary thermograph. The instrument is 28 feet above mean sea-level, 25 yards from the nearest beach-line, and less than a quarter of a mile from the tide-gauge station of Aburatubo Bay. Mr. Takahasi shows that the tilting of the crust follows quite faithfully the ebb and flow of the oceanic tides, a rise of 13 inches in the sea-level at Aburatubo producing a tilt of 0·22″ at Misaki. The observed tilting is almost entirely the effect of tidal loading, other causes leading to a deflection of less than 0·01″. In the Bay of Aburatubo, remarkable seiches with a period of 15 minutes are sometimes observed, and the record of the tiltmeter is then serrated by minute indentations with a mean period of 15 minutes. The seiches were recorded at various points of the Bay, and it was found that the tiltmeter record follows the curve of seiches obtained at a point 25 yards from the station, but not one at a point 160 yards distant. In other words, the load that is really effective in promoting tilting is that applied at a distance of less than 160 yards.

Copper Deposits of Michigan.—*Prof. Paper* 144 of the U.S. Geological Survey, by B. S. Butler and W. S. Burbank, deals with this important subject. The

© 1929 Nature Publishing Group

Michigan copper region is on the southern rim of the Lake Superior basin, which was probably formed during Keweenawan time. Since 1845 the output has been about 35 million tons of copper. In late pre-Cambrian times a series of basaltic flows accumulated to a depth of thousands of feet. The dense rock that forms the greater part of the main flows is everywhere overlain by more open-textured 'amygdaloid'. The tops of nearly all the flows are distinctly red, and it is thought that the oxidation and concentration of the iron were accomplished in large part by the gases given off during the solidification of the lavas. Examination of the freshest flows confirms previous observations that they contain both native copper and chalcopyrite in small amount. It therefore seems probable that at least part of the copper is a primary constituent. The workable deposits are of two main classes—lode deposits and fissure deposits. The former are mineralised beds of either (*a*) felsite-conglomerate interbedded with the lava flows, or (*b*) vesicular or brecciated amygdaloid 'tops'. The fissure deposits are narrow tabular veins along fractures parallel or transverse to the beds. The hypothesis of origin from descending waters is shown to be untenable. The authors favour the view that the copper was derived from sulphide-bearing solutions originating in the underlying Duluth gabbro-magma.

Climate of the Dutch East Indies.—The Koninklijk Magnetisch en Meteorologisch Observatorium in Batavia has now published vol. 2, pt. 3 of the monograph on the climate of the Dutch East Indies. This completes the detailed discussion of the meteorological conditions of the islands, and covers Borneo, the Celebes, the Moluccas, New Guinea, and smaller islands. Some of the accounts are necessarily incomplete for want of data, but, taken as a whole, the monograph is most comprehensive. The editor, Dr. C. Braak, promises a third volume, with climatological tables, in the course of time. The monograph is naturally in Dutch, but the English summaries added to all chapters are so full as almost to contribute a condensed monograph in English.

Flow of Swedish Rivers.—Some instructive charts illustrating the amount of discharge of Swedish rivers are published in a paper by G. Slettenmark in *Meddelanden från Statens Meteorologisk-Hydrografiska Anstalt*, Bd. 4, No. 5. One chart shows the mean flow of all the rivers that have a discharge of at least 5 m.c. per second. The breadth of the river is made proportional to the flow. The next two charts show the mean flow of the chief rivers at high and low water respectively. The final chart shows the area of the lakes in the drainage area of each river basin. It appears that in spite of the number of rivers in Sweden, 74 per cent of the total drainage is supplied by fourteen rivers. Details of the flow of the principal rivers are given in tables.

Recombination of Gaseous Ions.—In the September issue of the *Journal of the Franklin Institute*, Profs. Loeb and Marshall, of the University of California, discuss the bearing of recent research on the theory of the mechanism which determines the recombination of gaseous ions. According to Langevin, it is mainly the attraction of the two oppositely charged ions which determines their recombination. The authors show that recent observations do not accord with this view, but give some support to the Thomson theory that recombination is due mainly to the random movements of the ions due to their heat energy. They point out that the theory is incomplete owing to our want of knowledge of the masses of the ions and therefore of their speeds. They believe that these masses are to a great extent determined by the impurities in the gas, such as organic molecules from the stopcock greases, and that this accounts for the rates of recombination in different gases being found experimentally nearly alike, although from the constitutions of the gases we should expect them to differ.

Diffraction in Spectrometers.—Prof. A. G. Shenstone points out in a paper in the first September number of the *Physical Review* (p. 726), that the optical system of a spectrometer is one which is very well suited for the production of diffraction fringes round the positions of maximum intensity—the 'lines' of the spectrum—on the recording plate, and some photographs which he has reproduced show that such fringes are actually present in a well-adjusted instrument. A theory applicable to this effect was given many years ago by the late Lord Rayleigh, but does not appear to cover the numerous anomalies in relative intensity and spacing of the fringes which occur, and these Prof. Shenstone consequently attributes to peculiar forms of aberration in the lenses of modern spectrographs. The presence of the fringes is of considerable practical importance; they prevent the ideal resolving power of an instrument from being attained in the separation of two neighbouring lines of unequal intensities, and could also be easily mistaken for fine structure components of feeble intensity with an echelon spectrograph, whilst in the study of scattered radiation exactly the condition which makes it possible to photograph Raman lines near the exciting line is the condition that brings out the fringes, namely, great homogeneity of the unmodified radiation. In interpreting Raman spectra it is thus essential that the existence of the fringes should not be forgotten.

Electrical Resistance in Metals.—The Institute of Metals has published in pamphlet form (price 5*s*.) the interesting May lecture delivered by Sir Oliver Lodge this year. The title of the lecture, "States of Mind which make and miss Discoveries, with some Ideas about Metals", well describes its contents. Zeeman's discovery and Lodge's own failure to discover the Hall effect are convincingly told. Faraday wholly failed to find any relation between gravitation on one hand and electricity and magnetism on the other. Einstein and others are now finding it theoretically and not by experiment. It has to be remembered that the fact that light would be deflected by a gravitational field was first predicted by theory and then verified. The splendid discovery made by Kammerlingh Onnes at Leyden that a few metals became perfect conductors at an excessively low temperature is admittedly of the first theoretical importance. How can a metal offer such a small resistance to an electric current that a current induced in a loop of it, which usually dies out in a fraction of a second at ordinary temperatures, takes hours or even days to die away when the temperature is sufficiently low? Lodge suggests that the crystalline metal arranges itself in chains from one end of the rod to the other. Unobstructed interstices are left along which the electronic 'gas' moves freely instead of being constantly checked and hampered by encountering the nuclei of atoms in its path. In free space an electron can go on for ever, and this is what the amperean currents which constitute magnetism are always doing. It is surmised that there is a perpetual flow of some kind along every magnetic line of force. Methods of experiment which produce intense magnetic fields, such as those used by Kapitza, may lead to the discovery of an actual etheric circulation.

© 1929 Nature Publishing Group