

Research Items.

BETH-PHELET.—The chief work in Palestine of the British School of Archæology in Egypt during the past season is described by Sir Flinders Petrie in *Ancient Egypt* for June. The expedition has been at work on Tell Fara, 9 miles south of Gerar and 18 miles from Gaza. The thickness of the stone walling showed its importance. Overlooking the chief water supply on the road to Egypt, it became a place of escape from the desert and from the Bedawy, as its name signifies. Last season's work reached as far as eighteenth-dynasty levels. Other levels remain for future excavation. The tombs, where most of the digging was done, go back through the Jewish occupation. It was probably the town of the Pelethites, David's bodyguard. The hill is accessible only on the west, where it was guarded by a brick wall of fifteen feet thick. The bricks are of the date of Rameses III. Towards the south there was a Jewish fort. In the plain to the north were the cemeteries. All had been attacked anciently; but one tomb held a bronze bed of Mesopotamian type and a silver bowl with a ladle, also of silver, of which the handle was a girl swimming. Many beads were found, and numerous scarabs indicated the Egyptian connexion. A bronze figure of a bear and a calendar board with pegs for thirty days were among the other objects found. Much pottery, including painted Philistine ware of the twentieth-twenty-first dynasties, was in perfect condition.

SOLUTREAN SCULPTURES FROM LA CHARENTE.—In *L'Anthropologie*, t. 38, Nos. 1-2, Dr. Henri Martin continues his account of his discoveries in the cave in the Valley of the Roc in Charente from which were obtained the human remains of Chancelade type which he has recently described (See NATURE, June 16, p. 963). The discovery of several engraved objects had led to an expectation of further and more developed signs of artistic activity. The investigations of last year produced definite evidence previously lacking of Solutrean sculpture in relief. A blast brought to light on the under part of a mass of rock resting on the archæological floor, some magnificent sculptures in relief of unquestionably Solutrean age, as is shown by objects in the hard breccia still adherent to the face of the block of stone. Five masses of rock, each with sculptures, were removed. On the first was the figure of a horse and of one of the Bovidae, the head of the latter being missing from the first but found on the second stone. Two other pieces of rock carried representations of the horse, each of about the size of a dog of medium proportions. On the last block were a number of sculptures which at first were scarcely distinguishable owing to adherent matter. On clearing the stone it was found to bear a number of carvings. These exhibit a number of peculiarities of design and technique, such as a clever utilisation of a boss of stone to secure the effect of relief. A human figure has a mass of hair, in the midst of which nose and eyes can just be discerned.

EVOLUTION OF THE HUMAN FOOT.—A paper which appears in vol. 19 of *Contributions to Embryology*, (Publication No. 380, Carnegie Institution of Washington, D.C.), has a bearing on man's relationship to anthropoid apes. The author, Mr. William L. Straus, Jr., of Johns Hopkins University, has made an intensive study of the embryological changes undergone by the human foot, and finds clear evidence of its evolution from one which had been arboreal and prehensile. He finds that in the foetus of the third month the great toe or hallux is "highly divergent, and somewhat opposable," and that the tarsus is

short and the phalanges are long, as in all arboreal primates. He finds that at an early stage of development, primates have feet of a common type, and from this common type, specialised forms are produced by divergent growth. The foot of the human foetus, "in many if not in most respects, is not unlike that possessed by the adult gorilla, although in some points even more primitive than that of the largest of the anthropoid apes."

HENSEN'S NODE AND THE ORIGIN OF THE NOTOCHORD.—In an important paper published in vol. 19 of *Contributions to Embryology* (Publication No. 380, Carnegie Institution of Washington, D.C.), Dr. George L. Streeter, Director of the Department of Embryology, Carnegie Institution of Washington, discusses certain fundamental problems relating to the growth of the early vertebrate embryo. He confirms the experimental observation made by the late Dr. Richard Assheton in 1896 that the first part of the vertebrate body to become differentiated on the embryonic shield is the mid part of the head, and from this initial area of differentiation the process of growth proceeds in a backward direction. Cervical, dorsal, lumbar, and sacral regions are thus progressively intercalated between the cephalic area and the anterior end of the primitive streak. He finds it advisable to recognise only two primary layers in the embryo, the ectoderm and entoderm, applying the term 'mesoblast' to the middle layer, which may be derived from either or from both of the primary layers. Hensen's node, which appears at the anterior end of the primitive streak, is a mass of mesoblast of ectodermal origin. Dr. Streeter finds that Hensen's node produces the notochord much in the same way as a seed produces a stem. The incorporation of the notochordal plate in the roof of the archenteron is a secondary phenomenon.

LOBSTER REARING IN NORWAY.—A very interesting account of experiments in rearing lobsters is given by Mr. Alf Dannevig in his paper entitled "The Rearing of Lobster Larvæ at Flødevigen" (*Report on Norwegian Fisheries and Marine Investigations*, vol. 3, No. 9; 1928). These experiments have been going on for some years in the Flødevig Sea Fish Hatchery, and have now given very successful results. The following conditions are found to be obligatory: (1) quick renewal of the water, (2) cleanliness, (3) suitable food. Berried lobsters are placed in wooden boxes divided into compartments on a slight slope, so that there is a gentle flow of water from one to the other, the larvæ being collected in the last compartment with a silk bottom. Before the larvæ are hatched the lobsters are fed on fresh fish, and twice a week are lifted out and the compartments scrubbed. Whilst hatching her eggs the mother puts her head down and tail up, and sets up a current with her pleopods, so that the young are naturally whirled away to the surface, where they are caught by the current and carried down to the collecting box. For rearing, boxes of cement and iron are used, with special circulation directed in such a way that the water mass will circulate round a horizontal axis without forming eddies in the corners. The water is let out through celluloid filters. The boxes are divided so that there is a spare room for the larvæ when the main compartments are being cleaned, into which they are automatically carried by a special current at that time. These are cleaned (scrubbed) at least three times a week. The food previously given was *Cancer pagurus*, but supplies of this crab

failing, *Mytilus edulis* and boiled egg were tried, but without success. Finally, beef liver was given, with good results, the larvæ being fed every two hours day and night. From 160 berried lobsters nearly 200,000 larvæ were collected, out of which 154,455 were used for rearing experiments, the rest being liberated when hatched or preserved for investigations. Out of those used for rearing experiments, 21,290 were reared to the fourth (lobsterling) stage, and liberated into the sea. In the most successful experiments where liver was used as food, 25,110 larvæ gave 8087 lobsterlings.

THE IDENTIFICATION OF BRITISH CRABS.—No attempt has been made for many years to simplify the identification of British crabs, so that shore-collectors or workers at marine stations might be able easily and rapidly to determine their captures. A key provided by Michael Perkins (*Scottish Naturalist*, 1928, p. 53 and p. 87) provides by simple dichotomous characters such an aid. It follows the practice adopted by Mortensen in his recent work on British echinoderms, of including far more than the Brachyura which have actually been found within the British area. The lack of definite boundaries in a sea area and the possibility of invasion by individuals belonging to species outside but bordering the area, have led the author to include all the crabs which have been found in the north-east Atlantic from Gibraltar to the Arctic Circle. The British species, however, are specially indicated. The key, which has been constructed so far as possible on non-technical lines, should prove a boon to the shore naturalist.

INSECTS OF NEW YORK.—*Memoir* 101 (published January 1928) of the Cornell University Agricultural Experiment Station is a bulky publication of 1121 pages devoted to a list of the insects, spiders, and certain other allied groups found within the confines of New York State. In his introduction Mr. M. D. Leonard, the editor-in-chief, states that the memoir is the outcome of a project originated about twelve years ago by a committee of specialists, and we may add that all concerned in the production of this laborious and valuable catalogue must view its completion with evident satisfaction. Dr. W. T. M. Forbes contributes a general account of the faunal districts of the State and an elaborate map accompanies the memoir, which thereby enables the numerous localities quoted to be found. The list comprises 31 orders, 430 families, 4797 genera, and more than 16,000 species of insects, Arachnida, Chilopoda, and Diplopoda—no less than 15,449 of these species being insects. The different sections of the work are the result of the energies of more than 150 specialists and collectors, and under each species the known localities and dates of appearance are given wherever possible. In point of view of species the Coleoptera head the list with 4546 representatives, Diptera following second with 3615. Some orders such as the Thysanoptera, with only 77 species, are evidently, as yet, only but little worked out. It is difficult to estimate to what degree the list approximates to the actual number of existing species of the various groups dealt with. As is pointed out in the introduction, in many parts of the State but little collecting has yet been done, and it is not unlikely that more intensive observations will increase the total by at least 25 per cent.

WEST AMERICAN SPECIES OF THE GENUS PHASIANELLA.—A review of the West American species of the molluscan genus *Phasianella*, derived from a large number of sources, is presented by A. M. Strong (*Proc. Calif. Acad. Sci.*, Ser. IV, vol. 17). The

author summarises the previous literature bearing on the subject and describes 11 species, of which one is supposed to be new, while one receives a new name. There is a plate of illustrations from photographs so taken by Dr. G. Dallas Hanna as to represent, he says, the true black and white values of the colours of the objects, which, alas, is not the same thing as a good coloured plate would have been.

NEW OLIGOCENE MOLLUSCA FROM MEXICO.—Mr. C. Wythe Cooke describes a series of fossil mollusca from the Alazan Clay at, and near, the type locality on Rio Buena Vista in Vera Cruz, Mexico (*Bull. U.S. Nat. Mus.*, vol. 73, art. 10). Although the Alazan Clay has hitherto been placed in the Upper Eocene, the author is convinced from a study of its molluscan fauna that it is of Vicksburg (Oligocene) age and doubtless equivalent to the Mint Spring Marl member of the Marianna limestone. Brief notes on the localities at which the fossils were obtained by Dr. T. Wayland Vaughan in November 1920, are followed by descriptions of 17 new species and one new genus, *Protonema*. These new forms are figured on two clear plates from retouched photographs.

ATMOSPHERIC POTENTIAL GRADIENT.—In No. 38 of the *Geophysical Memoirs of the Meteorological Office* (1928, London: H.M. Stationery Office. 1s. 6d. net) R. A. Watson discusses the "Electric Potential Gradient Measurements at Eskdalemuir, 1913-23," covering a complete sunspot period. The three parts of the memoir deal with the method of measurement, the potential gradient on quiet days, and the connexion between the wind and the potential gradient. In the second part it is shown that, contrary to L. A. Bauer's conclusion from the first eight years' data from Eskdalemuir, there is no significant indication of a connexion between sunspot numbers and the departure of the mean potential gradient in any month from its eleven-year mean for that month. The last part is an attempt to elucidate the close but intricate connexion of the potential gradient with purely local meteorological events. It is concluded that the gradient depends largely on the wind speed, high gradients being generally associated with light winds, and conversely; but though very high gradients never coincide with strong winds, low gradients sometimes occur with light winds. Special cases of this are considered in detail. A theory of the connexion between gradient and wind is outlined, and it is shown that neighbouring masses of air of different history may have very different electrical contents; one can in fact speak of 'electrical fronts' in the atmosphere by analogy with cold or polar fronts.

ROCKETS FOR UPPER AIR EXPLORATION.—The March issue of *L'Astronomie* is wholly devoted to an exposition by M. R. Esnault-Pelterie of his researches on the exploration of the upper atmosphere by means of rockets, and on the possibility of inter-planetary voyages in the same way. The matter was the subject of a lecture on June 8 of last year before the Société Astronomique de France, the president of which, General Ferrié, contributes a commendatory preface to the printed report. The subject, which M. Esnault-Pelterie has studied for twenty years, has also been independently investigated more recently by Oberth, Hohmann, Valier, and Goddard; the latter had in mind particularly the projection of a small mass of magnesium powder to the moon, and has made experiments on the propelling power of various explosives. M. Esnault-Pelterie considers the conditions of ejection, both neglecting and taking into account the resistance offered by the earth's atmo-

sphere. Like Goddard, he concludes that it is already practicable to send exploratory apparatus of small mass to heights of some hundreds of kilometres, but that it is not at present practicable to eject enclosures large enough to contain human beings, with all the necessaries for their existence on a journey outside the earth's region of attraction, together with a sufficient supply of the propellant explosive to ensure their safe return. One principal difficulty is that the necessary initial mass is so many times the 'useful' mass; the ratio is 300-600 for small 'useful' masses, and far greater for habitable projectiles. The power required consequently increases with enormous rapidity as the useful mass is raised.

TIME CONSTANTS OF BRANCHED CIRCUITS.—In the issue of the *Faraday House Journal* for the summer term, Dr. A. Russell extends the idea of the time constant T of a circuit of self inductance L and resistance R where $T=L/R$, to the general case in which there are n branches in parallel with self inductances L_{1p} , resistances R_p , and mutual inductances L_{rp} . The generalised time constant of the branch p is then

$$T_p = \frac{L_{1p}}{R_1} + \frac{L_{2p}}{R_2} + \dots + \frac{L_{np}}{R_n}$$

and the quantity of electricity prevented by induction from passing through the branch p during the growth of the current in that branch from zero to its final value $E/\Sigma(1/R)$ is $T_p E/R_p$. It will be seen that T_p may by suitable choice of the resistances be either positive, zero, or negative, and that the transient current in a branch may be made to reverse, a property which may be of use in radio telegraphic circuits.

ELECTRIC PROPULSION OF SHIPS.—In discussing the merits of the electric drive of the propellers on board ship, engineers have usually been content to give merely the relative efficiencies of the mechanical and electrical drive. The mechanical drive being some five per cent more efficient than the electrical, it is concluded that it is the best to use in all cases. In *World Power* for July, Mr. Regnauld points out that many other factors have to be taken into consideration. For example, the simplicity with which reversing and manoeuvring can be effected in an electrically propelled ship is a very great advantage. In small craft like harbour tugs the entire operation of the propelling motors can be controlled from the bridge. This eliminates the risk of error and the time lag essential when dual control is employed. It is well known that in order to obtain the last knot to a vessel's speed it is necessary almost to double the propelling power. As the efficiency falls off rapidly with the load, the vessel is only running economically at her maximum speed. When electric propulsion is used and there are several turbo-alternators, then by shutting down some of them the remainder can run at maximum efficiency. It is significant that the P. and O. Company have recently placed an order for a 19,000-ton twin-screw passenger liner which will be equipped with electrical propelling machinery. The vessel will be employed on the London-Bombay mail service, for which two distinct speeds are required. From London to Marseilles, where the mails are taken on board, the speed is 16 knots. From Marseilles to Bombay it is 18 knots. The use of the electrical drive enables the maximum economy in fuel consumption to be obtained at both speeds. Another advantage of electricity is the superior economy with which the auxiliary machinery on board can be operated. On some types of ship, such as a refrigerated cargo boat, an oil tanker, or a dredger, the auxiliary load is appreciably in excess of that required for the propulsion of the

ship. In this case the doubling of the size of the electric generators would increase their efficiency.

SELENIUM TETRAFLUORIDE.—By the action of fluorine on selenium Lebeau (1907) prepared two compounds, a gas, SeF_6 , and a colourless liquid which he considered to be SeF_4 . The composition of this liquid was not altogether certain, since it closely resembled the oxyfluoride SeOF_2 , and the mixture $\text{SeO}_2 + 4\text{HF}$ in some of its properties. Selenium tetrafluoride has now been obtained by the interaction of selenium tetrachloride and silver fluoride and an account of its properties is given in the *Journal of the Chemical Society* for June by E. B. R. Prideaux and C. B. Cox. The tetrafluoride strongly attacks glass, but has practically no action on clean copper. It reacts directly with silicon and red phosphorus and is completely hydrolysed by water.

NEOCYANINE.—The cyanine group of dyes are remarkable for their properties as photographic sensitizers. The constitutions of fifteen of the sixteen types so far described are known, and in the *Journal of the Chemical Society* for June, F. M. Hamer gives an account of the properties and preparation of the remaining one, neocyanine, and suggests a formula and the probable mechanism of its formation. Three neocyanine dyes have been prepared, and each has a higher melting-point and smaller solubility than the corresponding 4:4' carbocyanine kryptocyanine, indicating a greater molecular weight. This conclusion is further supported by the fact that the neocyanines sensitise further into the red than the kryptocyanines.

DETERIORATION OF STRUCTURES IN SEA WATER.—The eighth Interim Report of the Committee of the Institution of Civil Engineers on this subject has been issued by the Department of Scientific and Industrial Research (London: H.M.S.O.). In addition to the periodical examinations of immersed specimens, the report contains a final examination of the first series of specimens of iron and steel exposed at Halifax and at Auckland for five years. The series exposed at Plymouth and at Colombo for the same period have also been removed, but have not yet been reported on. In general, the agreement between the Halifax and Auckland series is good. There is little difference between wrought iron and mild steel, although the appearance of the bars after corrosion is, as might be expected, decidedly different, the fibrous structure of the wrought iron being strongly brought out. Bars which had the mill scale produced in manufacture left on the surface were found to be much less pitted than bars which had been cleaned, although the loss of weight was sometimes higher and sometimes lower. This fact emphasises, as the facts contained in previous reports have done, the comparative worthlessness of loss of weight tests, observations of the manner of corrosion being much more valuable. On the whole, the attention given to the mechanism of corrosion in the report is disappointing. In the light of modern knowledge as to the effects of differential aeration and other factors, a more scientific study of the observations should be possible. Moreover, conclusions based on comparisons between single bars are rarely trustworthy, the erratic nature of corrosion being well known. The most interesting fact among the observations on timber is the indifference of *Limnoria*, on account of the construction of its stomach, to arsenical poisons used to impregnate the wood, so that a means of defence against this destructive organism is still unknown.