

Research Items

Norwich Woodhenge

SOME further results of the excavation of the recently discovered 'Woodhenge' (see NATURE of September 7, p. 365) are described by Mr. J. G. D. Clark in *Antiquity* of December. When excavation began in August last, two rings were observable, of which the inner was interrupted by what was evidently a causeway; but the central area showed no signs of post-holes or other features. An eleven foot section was cut from outside the circle, this running for a distance of 100 ft. in all. Both the inner and the outer ditch proved to be shallow relatively to their width, and between them were the remains of a bank, much ploughed down. The outer ditch produced some third century Romano-British sherds from above a sterile layer overlying the primary silting. The inner ditch produced stratigraphical evidence of importance. Below three feet of infilling, ploughed in when chalk was used to marl the ground, down to the bottom of a black zone, were quantities of early iron age pottery, yet to be examined, and a strong admixture of Romano-British material, which appears to date from the third century of the Christian era. Evidently the iron age levels had been disturbed in Romano-British times. Below the iron age level was a sterile zone of primary infilling on a thin charcoal stratum on the floor of the ditch. This produced sixteen sherds of pottery and three or four 'crumbs' of the same ware, resembling 'beaker' on the inside and decorated in rusticated finger-nail style on the outer surface. The central area was stripped to the gravel and sand. There proved to be eight, not nine, post-holes, the timber part of the monument being on the horse-shoe plan, resembling the arrangement of the inner horse-shoe of blue-stones and of the trilithons at Stonehenge. The set of the ramps of the post-holes points to the erection of the timber uprights before the construction of the inner ditch.

Wild Cat and Domestic Cat

As the result of the measurement of a large number of Scottish wild cats (*Felis sylvestris*), including 42 specimens received complete in the flesh and 70 skulls, John C. Kirk publishes a useful comparison between the wild and domestic cats (*Scottish Naturalist*, 161; 1935). Domestic cats which have run wild soon assume the characters of the wild race, developing longer and coarser fur, longer limb-bones and larger teeth, and after two or three generations in a wild state would be scarcely distinguishable from the true wild cats, and the author thinks that probably there is a certain amount of domestic blood in the wild cat of the present day. In spite of these difficulties and of the fact that no single feature in the skull of the wild cat may not occasionally be duplicated in the domestic cat, the author gives a series of distinguishing marks which can generally be relied upon. On the whole, while the lower jaw is more strongly developed and the muscular ridges of the skull are strongest in the wild cat, the bones of the cranium are generally lighter and thinner than in domestic cats. The wild cat has longer limbs, longer and coarser fur, larger teeth, but shorter small intestine (43-51 in. against 58-66 in.).

Light as a Factor in the Growth of Barnacles

A STUDY of the distribution of the common barnacle (*Balanus balanoides*) upon the different sides of the wharf of the Atlantic Biological Station has led Prof. A. Brooker Klugh and Curtis L. Newcombe to correlate the differences with amount of sunlight (*Canadian J. Res.*, 13, 39, Sept. 1935). A significant correspondence was found between the rate of growth of the barnacles and the amount of illumination. Moreover, the difference between the amount of growth at widely separated vertical levels was similar to the difference in areas on the same level where there was wide variation in the amount of illumination.

Zoology of the Voyage of the *Belgica*

Two recent monographs (Expedition Antarctique belge, Resultats du Voyage de la Belgica en 1897-99 sous le Commandement de A. de Gerlache de Gomery. Rapports Scientifiques. Zoologie. Anvers, 1935) deal with the Pycnogonida (by Louis Giltray) and the Oligochaeta by (Leon Černosvitov). There are few pycnogonids, but these are interesting and include a new species of *Nymphon*, *N. gerlachei*, an abyssal form from 460 m. depth, associated with *N. longicoxa*, Hoek, from Banquisi, lat. 71° 5' S., long. 89° 3' W. *N. gerlachei* has a very thin body and long thin legs, probably walking on fine mud. Only one specimen was found—a male. The Oligochaeta collected by the expedition consist of eight species, all known forms. A new variety of *Chilota corralensis* is described, living under mosses covering rocks and dead leaves from Lapataia, Terra del Fuego. The type is only known from Corral in Chile, and the present variety, var. *belgicae*, differs from it in several particulars, especially in colour, form of the body and the situation of the genital papillae. Immature individuals were also found among roots of plants growing on the rocks near a waterfall in the Island of Londonderry.

A New Family of Sawflies and the Genera of the Cephidae

MR. ROBERT B. BENSON (*Ann. Mag. Nat. Hist.*, (10), 16, Nov. 1935) has erected a new family, Syntexidae, for a very interesting species of sawfly, *Syntexis libocedrii*, Rohwer. The species is at present only represented by two adult specimens in the United States National Museum and a few larvæ found boring in the wood of the incense cedar (*Libocedrus decurrens*, Wrr.) in California. The family is placed between the Xiphydriidae and Cephidae; but it is really very distinct from either, though heretofore included in the Cephidae. In dealing with the Cephidae of the world, five new genera are described; one of these, *Athetocephus*, is erected to contain two peculiar species from Madagascar, only the third and fourth known sawflies from that island. Many new characters used in the keys are illustrated in the twenty line drawings by the author. Attention is directed to the fact that the Cephidae are not an unspecialised family as is generally supposed, but on the contrary, very highly specialised. In some respects, such as in the presence of a marked constriction at the apex of the basal segment of the abdomen, they show an approach to the formation of a propodeum characteristic of the other great sub-order of the Hymenoptera, the Apocrita.

Histology of Sponges

D. A. WEBB (*Quart. J. Micr. Sci.*, 78, Part 1, Oct. 1935) gives in an article of eighteen pages a useful resume of the literature published since the beginning of 1914 on the histology, cytology and embryology of sponges. The different kinds of cells and the cytoplasmic inclusions are considered, and the second half of the article is devoted to gametogenesis, fertilisation and embryology. It is remarkable that stages in spermatogenesis are so rare, so that this "process still remains rather a mystery". Authors are, however, agreed that the spermatozoa of sponges are of an ordinary filiform type similar to those of most other animals. The transport of the spermatozoon to the oocyte in *Grantia* by means of an intermediary carrier-cell, as first described by Gatenby, has been confirmed by later workers for *Grantia* and *Sycon*, and for *Cliona* and *Reniera*.

Transpiration and Stomata in Desert Plants

THE first paper to be published by the Faculty of Science of the Egyptian University (*Bull. Fac. Science*, 1, Egyptian University, Cairo, 1934) deals with the vexed question of stomatal control of transpiration in desert plants. Earlier work of this nature is reviewed, and comment and criticism made of the lines of attack, methods of investigation and conclusions of the observers. In these present experiments, the investigators, A. H. Nontasir and A. M. Nigaleid, seem to have taken steps to eliminate some of the errors, often included unwittingly in this type of work, and their experiments have been repeated under varying conditions. An interesting modification is made in the relation of relative humidity to water loss—in this case it is the relative humidity deficit of the air which is considered in *direct* proportion to evaporation, which seems a much more rational correlation than that of actual humidity to water loss. The general results indicate once again that stomatal control is almost negligible unless the stomatal aperture is almost closed, that under conditions encouraging maximum evaporation the stomata are wide open, and that when such conditions are removed there is still a time lag in stomatal closure. Actually, in most cases, the water content itself is the most effective limiting factor, resistance to water loss increasing rapidly with falling water content, whilst at the same time spine formation and foliage reduction have a protective effect. Very detailed results of the experiments are given, and the paper is accompanied by a good representative list of references.

Hybrids of Tropical Orchids

A VERY interesting review by M. J. Costantin ("Les Hybrides des Orchidées tropicales", *La Nature*, Paris, November 15, 1935) describes the history of orchid culture since Neumann first succeeded in germinating the seed in 1844. Dominy, an assistant to James Veitch, was the first to hybridise two orchids (1856), and from that time, new hybrid plants have appeared in steady succession, until, at the present time, more than four hundred new kinds are described in most years. These hybrids are all fertile, and in some cases, seed can be produced parthenogenetically, following the mere stimulus of pollen upon the stigma. The account centres round the work of Noël Bernard, who introduced the symbiotic method of culture. Seeds were sown upon a sterilised

medium which was then inoculated with a pure culture of a fungus, usually a species of *Rhizoctonia*. M. Costantin discountenances the asymbiotic method of culture, where seeds are grown on sterilised medium, containing glucose, with no added fungus. This is, perhaps, a little anomalous, for modern asymbiotic culture gives 100 per cent germination, and is used by all large orchid growers.

Horizontal Distortion of the Earth's Crust near Tokyo

IN the enclosure of the Tokyo Astronomical Observatory at Mitaka, five geodetic base-lines, each about 100 metres in length, are arranged so as to form a rhombus and its north-south diagonal. Once a year, on an average, since 1916, the lines have been measured, and the results show a relative increase or decrease in the area of the rhombus of the order 10^{-5} . The yearly variations have been discussed by Mr. C. Tsuboi (*Bull. Earthq. Res. Inst.*, 13, 558-561; 1935), and they are compared with those of the mean annual height of the sea-level at Aburatubo, a mareograph station about thirty-seven miles south of Mitaka. Though the latter variations are partly due to meteorological conditions over the adjoining sea, it is remarkable how similar are the curves representing the two variations, an increase in the area of the rhombus corresponding with an upheaval of the sea-coast. It thus seems probable, as Mr. Tsuboi concludes, that the changes in the area of the Mitaka rhombus are not of local origin, but correspond with larger crust-deformations prevailing over at least the southern half of the Kwanto district.

Flood Regimen of the River Garonne

IN a studiously analytical monograph on the regimen of the Garonne, reprinted from *La Revue Géographique des Pyrénées et du Sud-Ouest* (April-July 1935), M. Maurice Pardé, professor in the School of Hydraulic Engineering of the University of Grenoble, has made an important contribution to the literature on river characteristics and discharges. The Garonne floods, says Prof. Parde, illustrate most vividly the complex character of the river. In no other fluvial basin in France, otherwise than exceptionally, do floods rise to so great heights. There exist, with several variations, three distinct types of inundation: Oceanic-Pyrenean, Oceanic-Classic and Mediterranean, as compared with a single type for the Seine and the Po, two types for the Loire, three for the Rhine and four for the Rhone. In reality, the flood system is more complex on the Garonne than on the Rhine, since the characteristics of the three types persist in intensity as far as the lower course of the river, while the 'Mediterranean' floods of the Rhine are absorbed in Lake Constance and the summer Alpine floods lose their violence below the Neckar. Alone in Europe, the Rhone and the Danube exhibit a variety of inundations comparable with those of the Garonne basin. The Oceanic-Pyrenean floods rank first in intensity, and occur at all seasons, though rarely in advanced summer or at the commencement of autumn (September, 1772). It is in May and June that they attain their greatest frequency and gravity. The main cause is heavy rainfall on the northern slopes of the Pyrenees and of the Montagne Noir, produced by winds from a north-west or northerly direction. The Oceanic-Classic type of flood, mostly deleterious

in the lower Garonne, occurs chiefly in winter; simultaneously with the Garonne, this type frequently afflicts several other important water-courses in western Europe, primarily the Dordogne, the Vienne and the lower Loire, then the Seine, the upper Rhone, the Meuse, the Rhine, etc. Such floods originate regularly in the passage of an atmospheric perturbation over France, while an anticyclone, essentially convex towards the north-east, is stationed on the south-west of the Iberian peninsula. The 'Mediterranean' type of flood is produced by torrential precipitation induced by the south-east wind in the eastern part of the basin. The severity of the Garonne inundations is remarkable.

Infra-Red Absorption of Crystals

R. B. BARNES, R. R. Brattain and F. Seitz (*Phys. Rev.*, Oct. 1) have elaborated a theory of the infra-red absorption of cubic crystals, and have tried to correlate it with new experimental work on MgO. On the classical theory, a cubic crystal has only one characteristic absorption frequency, corresponding to a vibration in which like ions move together and unlike ions 180° out of phase. The new theory handles the crystal as a system of interacting particles arranged on a lattice, and a general potential function of interaction is set up. The existence of anharmonic terms in the potential function is supposed to modify the selection rules in such a way that a complicated secondary structure is superposed on the single absorption frequency. The experiments were made on crystals of MgO prepared in the electric furnace on evaporated films and on powder. They show the existence of a secondary structure, but the low resolving power and the fact that the crystals were at room temperature, this causing broadening of the lines, make a detailed comparison with theory impossible. Further experiments are being carried out.

Quantum Theory, Geometry and Relativity

THE quantum theory, with its principle of uncertainty, seems to show that ordinary geometry is not applicable to microscopic space. In a series of interesting papers by T. Hosokawa, K. Morinaga, T. Sibata, Y. Mimura and T. Iwatsuki (*J. Sci. Hiroshima Univ.*, A, 5, 141, 151, 189 and 205; 1935), a new 'wave geometry' is discussed, which is chosen so as to conform with quantum theory. Its definitions are rather startling at first sight, as they are expressed in terms of matrices and a wave function which is a solution of a generalised Dirac wave equation. From these definitions an extensive theory is developed, more or less on the lines of the ordinary tensor calculus, giving results which are taken as the starting point of a new theory of relativity. It is claimed that this gives Einstein's law of gravitation in a natural manner. Another consequence of the new theory is the existence of gravitational waves, and equations are obtained which, it is hoped, will prove as useful in gravitational theory as are Maxwell's in ordinary electromagnetic theory. In short, the authors are attempting to go beyond the ordinary unified field theories, which leave out quantum theory, and to set up a universal scheme to embrace all physical theories. There are several points that have not yet been fully worked out, and it is too soon to say whether the attempt has been successful; but it certainly opens up what appears to be a very promising line of inquiry.

Diesel Fuel Research

RESEARCHES on Diesel fuels are being carried out by Prof. P. H. Schweitzer and T. B. Hetzel in the Pennsylvania State College laboratories on oils for Diesel engines (Science Service, Washington, D.C.). The sources of petrol are continually diminishing, and unless it becomes possible to produce petrol cheaply from coal, we must anticipate to look forward to the day when motor-cars will be run with cheap Diesel fuels. Petrol 'knock' is due to the petrol starting to burn evenly in the cylinder, and then suddenly exploding, causing a 'knock'. For smooth running, it is necessary to retard the burning of the petrol, and this can be done by lead tetraethyl. In Diesel engines combustion is not started by sparking plugs but by spontaneous ignition due to the compression of the fuel, its temperature rising above that needed for explosion. If too much fuel explodes at once, there is a knock, and the way to stop it is to make the fuel burn as soon as possible after entering the cylinder, the remedy being to speed up combustion. Schweitzer and Hetzel have developed an ignition lag indicator which will be useful for testing the relative values of Diesel fuels. They employ the principle of a phonograph pick-up device in conjunction with a radio loud-speaker. The fuels are compared for performance over a wide range of compression values and the results found can be usefully applied in practice in special cases.

Preservation of Mine Timber

THE third of the series of Forest Products Research Records is entitled "Experiments on the Preservation of Mine Timber" by Messrs. J. Bryan and N. A. Richardson (H.M. Stationery Office, 1935). The timber used annually in the mines of Great Britain is valued at £6,000,000; it is estimated, however, that less than two per cent receives any preservative treatment. Losses are due to wood-destroying fungi. To some extent the reason why the non-expert is not so readily converted to the idea of preservative treatment is due to the fact that the incidence of attack is variable, some mines being quite free from infestation of this type. When conditions are favourable, such as in humid shallow pits, decay is very rapid, and the timber is short-lived if not treated with a preservative. The cost of timber is consequently high in such situations, and here preservative treatment would probably reduce running expenses of the pit. As is pointed out, the failure of mine timbers may often be due to incipient decay due to fungal attack, rather than to lack of individual strength. Thus preservative treatment may lead to greater safety in the mine. The note explains that experiments were inaugurated at two pits, the Langton Pit, Pinxton, near Nottingham, and the Woolmet Pit at Portobello near Edinburgh. The experiments were carried out with imported and home-grown Scots pine pit props which were treated at the pit-heads with solutions of sodium chloride (common salt), zinc chloride, sodium fluoride, Wolman salts, and placed in workings at about 800 ft. below the surface. In the Pinxton Collieries creosoted props were also used. The results attained so far after $4\frac{1}{2}$ -5 years inspection are considered satisfactory—the more expensive preservatives, namely, creosote, Wolman's salts and sodium fluoride, being the best.