

## Research Items.

**THE SPEAR THROWER IN AMERICA.**—Some remarkable spearthrowers of ancient American origin are described by J. Alden Mason in the *Museum Journal* (Philadelphia) for September 1928. At the present day the spearthrower is used in America only by the Eskimo, certain of the tribes of the Amazon, and the Tarascan Indians of Lake Patzcuaro, Mexico; but formerly it was employed much more widely. Specimens are known from the pre-Cliff Dweller remains of Utah belonging to the people known as the Basket-makers, from pre-Columbian Florida, and from pre-Columbian graves of the coasts of Peru and of Ecuador and Colombia, from the Aztecs of the time of Montezuma and from the Toltecs. The Haitians of the time of Columbus used it, as did certain Californian tribes of a century and a half ago. Not more than about thirty examples have been found in any one of these areas. Of the specimens here described, one belongs to the so-called Thule culture of the early Eskimo, and was found by W. B. Van Valin in the region of Point Barrow in 1919 in a series of mounds. It differs from any of the modern types, being of a superior grade alike from the æsthetic, technological, and utilitarian points of view. It is of a coniferous wood and measures  $14\frac{1}{2}$  in. in length by  $2\frac{3}{4}$  in. maximum width. Its peg is of ivory. The second example belongs to the Basket-makers' culture of Utah and was the first to be found in the south-west. It is remarkable for a number of ceremonial objects attached to the handle. These include the tooth of a canine or feline, wrappings of yucca fibre, cotton yarn, and fur; and an X-ray examination has revealed four beads, probably of turquoise and representing the heart of a fetish bird, which lie under the yarn and cannot be otherwise examined owing to the fragility of the material. Two spearthrowers which are unique, and the rarest known in America, come from Marco Key, Florida, where they were discovered in 1896. They are longer and more slender than spearthrowers from other regions, the closest approximations being those in use among certain eastern Colombian tribes. A carved rabbit at the distal end of one is reminiscent of the carved spearthrowers of the Magdalenian period of palæolithic Europe.

**RESCUE AND RECLAMATION OF FISH.**—The Division of Fish and Game of the Californian Department of Natural Resources has developed a strange industry—the rescue and reclamation of lost, or potentially lost, fishes. Black bass and other spiny-rayed fishes take advantage of flood conditions to spawn in areas which at the time seem perfectly suitable, but as soon as the overflows begin to dry through evaporation, both the newly hatched young and the adult fishes become a prey to predatory birds and mammals, and the result is a total loss. The rescue of this threatened population and its transference to a safe environment has assumed very considerable proportions. One worker reports that up to the end of August 1928, he had saved in his district of Hanford, 158,200 fishes, the majority of which were cat-fish, and these were planted in rivers throughout the country. During the month of August as many as 258,000 valuable angling fishes were saved to the State. Although a certain amount of useless and possibly harmful transportation has been carried out by enthusiasts, the aim of the Division of Fish and Game is to save only food-fishes, and to utilise them in stocking barren waters with the species most adaptable to their particular conditions.

**COMBAT REACTIONS IN FROGS AND TOADS.**—Reactions to special stimuli which produce specific phases

of pose and movement suggesting a struggle, have been described amongst reptiles, but, according to Georg Hinsche, have not been suspected to occur amongst amphibians (*Biolog. Centralbl.*, Bd. 48, 1928, pp. 577-617). He finds a well-marked series of such reactions, twisting, staggering, stiffening, and kicking, suggesting attack and defence, to be exhibited by *Bufo vulgaris* and *Pelobates fuscus*, and rather less definitely displayed by other native amphibians such as *Bufo vividis*, *B. calamita*, *Rana esculenta* and *Hyla arborea*. Certain tactile as well as optical stimuli are adequate to set free such reactions, but along with the specific stimulus environment is an important factor. Hinsche considers that these combative reflexes are associated with very elementary reflex complexes related to the creature's food supply, burrowing habits, and sexual acts, and that, from the point of view of biological significance, they constitute a specific reply to a definite type of stimulus, and are not simply a reaction against an individual enemy. Their differences in degree in the different species he has experimented with are put down to differences in morphological and anatomical structure in these species. But in general the author finds that where a tendency towards flying leaps occurs, as in many species, the combat-reaction is reduced in intensity.

**THE MOSQUITOES OF NORTH AND SOUTH AMERICA.**—Dr. H. G. Dyar, of the United States National Museum, has recently contributed an important revisional monograph entitled, "The Mosquitoes of the Americas." It is issued as *Publication of the Carnegie Institute of Washington*, No. 387 (1928), and brings up-to-date the many changes in synonymy that have taken place since the publication of Howard, Dyar, and Knab's standard four-volume treatise on the "Mosquitoes of North and Central America and the West Indies" (1912-17). It is, furthermore, to be regarded as being supplementary to the latter work, since it also includes all the known species from South America. The classification of the group has not been materially altered from that adopted in the larger monograph just mentioned, except that five tribes of these insects are recognised instead of two. The Sabethini are here regarded as a separate division, since the American species all exhibit the peculiar larval feature of the median ventral brush on the anal segment being wanting. Dr. Dyar's work will be found invaluable by special students of mosquitoes, since he describes in concise language the male, female, and larva of every species where material is available, and their salient structural characters are fully illustrated on the 123 plates which accompany this monograph.

**PHILIPPINE ECHINOIDS.**—Mr. Hilario A. Roxas, in his paper "Philippine Littoral Echinoida" (*Philippine Journal of Science*, June 1928), reports on the littoral sea-urchins and sand dollars in the collection of the Department of Zoology, University of the Philippines. Echinoderms are not very numerous in the Philippines, but eleven species of sea-urchins and five of sand dollars (Clypeasteridæ, Arachnoididæ, Laganidæ, and Scutellidæ) have been found at Puerto Galera, Mindoro, which is the main collecting ground. The only really common species are *Tripneustes gratilla*, *Echinotrix calamaris*, and *Echinometra oblonga*, none of the others being abundant. Photographs are given of all the species, showing the main characters of the tests in most cases, both with and without the spines, which should make identification easy. *Prionocidaris verticillata* is a very striking form,



bright green when alive and having long heavy spines ornamented with whorls of projecting ridges.

**FLOWER SIZE AND CHROMOSOME SIZE IN PETUNIA.**—A peculiar genetic behaviour in *Petunia* is briefly described by Mr. E. Malinowski (*Jour. Heredity*, vol. 19, No. 11). He shows that in a variegated strain of *P. violacea* Lind. obtained from de Vilmorin, there is great variability in the size and colour of the flowers on some plants, other plants producing only large purple flowers or small lilac ones, and the same variable progeny being produced from seeds of any of the type. But plants cannot be inbred because of self-sterility. It is suggested that this range of variation, although phenotypical, is produced by the presence of one gene. It is further stated (and this needs confirmation) that the large purple flowers show larger chromosomes in their cells than the small lilac flowers, although in any one flower bud the meiotic divisions may show some cells with large and others with small chromosomes. The statement is also made that, following the reduction division, one of the daughter cells may have large and the other small chromosomes. It is suggested that the differences in flower size may be the result of the difference in size of the chromosomes. The whole subject requires fuller investigation, which might yield significant results.

**DICEISM IN THE GARDEN ASPARAGUS.**—A paper on the degree of diceism in the garden asparagus by T. Shoji and T. Nakamura, in the *Japanese Journal of Botany* (4, 125-152; 1928), raises many points of general interest. In male plants the pistil was developed in the flowers to an extent that varied with the individual plant, but was very constant in the flowers upon any one plant. In the male flowers, instead of the typical trilocular ovary, bi- or unilocular ovaries may be found, and in some cases one carpel is modified into an anther. An interesting test is made of Robinsohn's reagent for determining the receptivity of the stigmatic surface for pollen, by the extent to which it stains when immersed in an aqueous solution of sodium potassium tartrate and silver nitrate. According to Robinsohn, the stigma should only stain deeply when it is in a receptive state, and tests of the normal pistils of asparagus were in accordance with this statement. On the other hand, heavy staining of certain regions of the imperfect pistils in the male flowers, which were quite without stigmas, rendered the reagent useless in distinguishing between fertile and infertile carpels. Wounds at the surface of the carpels tended to take up the stain, and the authors raise the question as to whether the degree of staining with this reagent is connected with the extent to which the cuticle is interrupted at the stigmatic surface, itself a question of some general interest. Many details of the cytology of the degenerating mega- and micro-sporangia are given in this paper.

**LAND SHELLS FROM THE WEST INDIES.**—Dr. H. A. Pilsbry and E. G. Vanatta describe three new land shells from Tortuga Island and one from Haiti, whilst Dr. Pilsbry appends a paper on the species of *Lucidella* (subgen. *Paeniella*), including two new, from Haiti and Santo Domingo (*Proc. Acad. Nat. Sci. Philad.*, vol. 80). Figures illustrating both papers are combined on one plate. Fig. 17, which is stated to represent a form of *Cerion tortuga*, n.sp., differs so much from Fig. 15, the type, and Fig. 16, a coloration variety, as to suggest that, variable as these shells are, an illustration of some other species has accidentally been substituted when making up the plate.

**CARBONIFEROUS BRACHIOPODS.**—The first part of a monograph on British Carboniferous brachiopods,

by the late Dr. Ivor Thomas, was published in 1914. The second part (*Mem. Geol. Surv. Gt. Britain, Palæont.*, vol. 3, pt. 1, pp. 1-217, plates i-xii, 1928) is the work of Miss H. M. Muir-Wood and deals with the *semireticulatus* and *longispinus* groups of *Productus* (*sensu stricto*), of which 41 species or varieties are described. The *Producti* can be divided into at least eight genera, namely, *Productus* (restricted), *Avonia*, *Buxtonia*, *Pustula*, *Overtonia*, *Sinuatella* (gen. nov.), *Proboscidella*, and *Etheridgina*; they include the largest brachiopod known, *Productus giganteus*, with a breadth of 300 mm. The shell of *Productus* was apparently anchored by means of spines, sometimes five or six inches long, which are developed on the larger valve. The *Producti* are very abundant in the Carboniferous, but afterwards diminished in numbers and became extinct at the close of the Permian period. The group is said to have been derived from a Strophomenid ancestor in the Ordovician or Silurian. The earliest British representatives are found in the Pilton Beds of North Devon (Upper Devonian or basal Carboniferous). Shells of the *semireticulatus* group make their appearance in the Zaphrentis zone and evolved rapidly, but during *Seminula* times conditions were unfavourable to the development of this group. A multitude of new forms appeared in *Dibunophyllum* times and includes some over-specialised species with a very limited range in time and space. The sudden disappearance and extinction of the *Producti* is thought to be due in part to the excessive secretion of carbonate of lime.

**THE SHAP GRANITE.**—An important contribution to the petrology of the well-known Shap Granite has been made by Dr. D. R. Grantham, with the collaboration of Dr. H. F. Harwood, who has made seven excellent analyses. The results appear in the *Proc. Geol. Assoc.*, pp. 299-331; 1928. The 'granite' is a composite intrusion made up of a suite of porphyritic biotite-granites allied to adamellite. The oldest solid product of the original magma appears to be a chilled peripheral facies of basic type and probably hybrid origin. This 'early basic granite' was disrupted by the ascent of the main intrusions, distinguished as Stages I. and II., within which it occurs as the inclusions hitherto regarded as 'basic segregations.' The main mass of the granite shows successive increase in porphyritic feldspars and decrease in accessories. A fourth phase is represented by Stage III., dyke-like masses of granite still richer in phenocrysts. The inclusions in Stage II. comprise not only 'early basic' and Stage I. types, but also numerous blocks of hornfelsed andesites and (rarely) Coniston limestone. Evidence is brought forward to show that contamination of the original magma by reaction with, and assimilation of, the andesites of the country rock is beyond reasonable doubt. Dr. Harwood's analyses give practically a straight-line diagram from 'andesitic inclusions' to Stage II., and this alone is weighty evidence in favour of assimilation. Further joint work on the andesites themselves is in progress.

**SOUNDING AT SEA.**—The December issue of the *Journal of the Franklin Institute* contains an account of the methods used by the United States Coast and Geodetic Survey for the measurement of the depth of sea water, by Lieutenant J. H. Service, of the Survey Department. For soundings in water too deep for the hand line the sound-wave method in the form known as the 'fathometer' is most used. An electrically driven oscillator strikes a diaphragm under water outside the ship and the sound reflected from the bottom of the sea affects a microphone in a water tank inside the ship's plating below water level. In



series with the microphone is a neon tube which lights up when the reflected sound arrives at the microphone. The tube is placed behind a radial slit in a revolving disc in front of which is a circular dial marked in fathoms. The oscillator acts as the neon tube passes the zero of this scale, so that the depth is read at the end of the revolving slit when it flashes out red owing to the lighting up of the neon tube behind it. The speed of sound in sea water of salinity 35 parts per 1000 at the surface and at 0° C. is taken as 1450 metres per second. It increases 4 metres per second per degree rise of temperature, 3 per 100 fathoms depth, and 1 per part per 1000 increase of salinity.

**STRONG ELECTROLYTES.**—The revival of interest in the properties of strong electrolytes which followed the publication of the Debye-Hückel theory in 1923 shows no signs of falling off, and a further group of papers on this subject has appeared in the issue of the *Physikalische Zeitschrift* for Nov. 1. One of these, by M. Wien, on departures from Ohm's law, is of particular importance. An electrolyte has been shown to undergo a decrease in resistance when it is subjected to high electric stress. In relatively weak fields the increase in conductivity is approximately proportional to the square of the field strength; for larger fields, the rate of increase is linear; and finally, when an intensity of the order of a hundred kilovolts per centimetre has been attained, a new value of the conductivity is reached, which is several per cent above that for weak fields, and is practically unchanged by any further increase in the applied potential. These effects depend in a characteristic way upon the valencies of the ions in the solution, and the ultimate value of the conductivity corresponds, within the limits of experimental error, with the conductivity of the same electrolyte in a weak field at infinite dilution. These observations, together with some others made by M. Wien on the effects of alternating fields on electrolytes, have been discussed by G. Joos, and have been shown to be at least in qualitative accord with the newer versions of the Debye-Hückel theory.

**LUMINESCENCE.**—A report upon a cathodo-luminescence and the luminescence of incandescent solids by E. L. Nichols, H. L. Howes, and D. T. Wilber, that has been issued as a *Publication of the Carnegie Institution of Washington* (No. 384), furnishes a valuable summary of the experimental work that has been carried out by the authors and others in this little-known branch of optics. Their object has been to bring together investigations on the relations between the emission of light from hot bodies, other than purely thermal radiation, and such phenomena as fluorescence and phosphorescence at lower temperatures. Some of their results are very surprising, for example, the frequent excess of the radiation over that from a black body at the same temperature, and in general they find that selective emission, when excited thermally, shows the effects characteristic of ordinary fluorescence. The position of the bands in the spectra is often, moreover, the same under the different modes of excitation, of which exposure to a hydrogen flame and to the light of an iron arc are two typical examples, and from the evidence that they have presented they conclude finally "that the luminescence superposed upon the incandescence of the various solids is simply a *fluorescence* in all essentials identical with that commonly excited by light, cathode rays, and other familiar agencies."

**A MULTIPLE-DOME ARCH DAM.**—A reinforced concrete dam of unusual design has recently been completed in a canyon of the Gila River, Arizona, U.S.A. The dam is for a reservoir for the storage of

water for flood control and power supply and for the irrigation of some 100,000 acres of land held as a reservation for the settlement of certain Indian tribes. The dam is the subject of a well-illustrated article in the *Engineer* for Jan. 18, from which it will be seen that not only is it of unique design but it is also a handsome structure. Many single-arch and multiple-arch dams have been constructed, and in these inclined arches spring from the piers, each arch sustaining the vertical weight of water as well as its horizontal pressure. In the new Coolidge Dam, as it is called, these arches are replaced by dome-shaped structures something of the form of the half of a very thick eggshell cut along its major axis. In the Coolidge Dam there are four piers, 180 feet centre to centre, and from these spring three ferro-concrete domes which are 21 feet thick at the base and 4 feet thick at the crown. The height of the dam is 250 feet. The first of its kind, the dam was designed by Major C. R. Olberg, of the United States Indian Bureau, and in his description of it he states that the maximum compression stresses for the dome were fixed at 600 lb. per sq. in., and in the buttresses at 400 lb. per sq. in. At first sight the shuttering for the construction of such domes would appear to be a matter of great difficulty, and not the least interesting feature of the work was the method used by the contractors for this shuttering.

**NITRALLOY STEELS.**—The issue of the *Chemical Age* for Jan. 5 contains some interesting information concerning the case-hardening of steels by nitrogen. When iron and steel are heated in an atmosphere of ammonia, nitrogen is absorbed, and with special steels (nitralloy) a very hard surface is produced. The 'nitration' is carried out after machine finishing, since no deformation occurs, providing that all strains have been relieved by suitable heat treatment, but only a small regular swelling, for which due allowance can be made. The resulting hardness is 900-1100 on the Brinell scale (chromium vanadium steel, case hardened, being 742) and permits glass and quartz to be cut. The nitrated steels are capable of taking a mirror finish, and it is claimed that they show exceptional resistance to wear. They retain their hardness up to 500° C.

**OXIDATION OF PYRITES IN COAL SEAMS.**—The Safety in Mines Research Board has issued a report of an investigation by H. Macpherson, N. Simpkin, and H. Wild (S.M.R.B. Paper No. 47. London: H.M. Stationery Office; 1s. 6d.) recording an examination of the occurrence of pyrites and its oxidation by air, particularly in the Ravine seam of Lancashire. Their work supports the view that pyrites acts not so much by initiating combustion as by promoting disintegration of the massive coal. This disintegration is brought about by the volume change on oxidation and assists access of air to the coal substance itself, which can then take up oxygen and so become heated.

**FIRING COAL DUST.**—A paper, by T. N. Mason and R. V. Wheeler, issued by the Safety in Mines Research Board (S.M.R.B. Paper No. 48. H.M. Stationery Office. 3d.), records experiments on firing coal dusts in a steel gallery, 7½ feet in diameter. The results confirm the view that the inflammability of the dust increases with the content of volatile matter of the coal, inflammability being measured by the mean speed of the flame. Explosability—measured by the maximum pressure developed—is of the same order and in close agreement with the proportion of incombustible matter which must be mixed with the coal dust to suppress its inflammability.