Research Items

CAPSIANS AND BADARIANS.—In *Ancient Egypt* (pt. 1, 1928), Prof. V. Gordon Childe criticises some of the arguments adduced by Dr. Scharff, the German orientalist, as proof of the western origin for Early Predynastic culture in Egypt. Dr. Scharff notes the appearance in Mauretania of tanged and concave-based arrow heads, but while these in Egypt go back to Badarian times, the native Capsian form of the Mediterranean coast-lands was the chisel-ended variety, tipped with flint trapezes or lunates. These are foreign to the Badarian and Fayum cultures; they seem to have been used by the Libyan element in Egypt, but only after the development of the barbed and tanged varieties. The first tanged arrow-head cited from Mauretania by Scharff comes from 'dolmenic' tombs, the general affinities of which are with the Nubian *C*-group. Its arrival in Africa Minor is actually a good deal older. It is found in early neolithic deposits at Abd el-Adhim and at Redeye in Tunisia as an intruder in a Final Capsian microlithic context, while in the oasis of Négrine, south of Tebessa, in a late Tardenoisian context, only the lunate and trapeze are found—types also predominant at Abd el-Adhim. None of these tanged forms is so old as Badarian, and in Spain they belong to the relatively late Los Millares. Hence the neolithic begins on the Nile with a form secondary farther west, and the true North African begins at a later date with the white cross-lined pottery. This suggests that in addition to the current from the west affecting Egypt in the First Predynastic age was a counter current reaching Mauretania after Egypt. Other western parallels may be similarly explained, the conclusion being that there are elements in Badarian that are not African in the same sense as Early Predynastic is where these elements are blended with others that are truly western; but even so a western crossed an eastern drift.

YAKṢAS.—Dr. Ananda K. Coomaraswamy has made a study of the origin and status of the Yakṣa (*Smithsonian Miscell. Collect.*, vol. 80, No. 6), which is a valuable contribution to the study of survivals in modern Hinduism and carries a step further the analysis of the diverse elements which have contributed to the composition of Hindu culture. In the centuries preceding the Christian era the religion of India passed through its greatest crises, and though Vedic ritual has in part survived to the present day, the outlook of medieval and modern India is profoundly different from that of the Vedic period. The philosophy of the Upanishads and Buddhism was for the individual who had left behind him the social order; but there grew up in Indian religion a tolerance for beliefs in which life was not abnegation but the fulfilment of function. Of this tolerance belief in the Yakṣas is one manifestation. In popular folklore the Yakṣas are classed with the demoniac Raksaṣas, but they were once tutelary deities, indigenous and non-Aryan and usually beneficent powers of wealth and fertility. This is shown by the iconography, especially in the association of a female voluptuous figure with a tree. The foot sometimes touches the trunk suggesting fertilisation, in accordance with the Hindu conceit that the touch of a beautiful woman's foot is needed for the blossoming of the asoka tree. Yakṣa worship was a Bakti cult with images, altars, temples, and offerings. Thus it came about that the Yakṣas were practically Devas, and that all the greater deities could be regarded as Yakṣas, thus effecting a syncretism of the dieties of the Aryan conquerors and the personifications of the animistic beliefs of the non-Aryan peoples they conquered.

AMERICAN BATS.—Two genera of American bats which afford striking contrasts in many particulars, *Myotis* and *Pizonyx*, have been monographed by Gerrit S. Miller and Glover M. Allen (*Smiths. Inst., U.S. Nat. Mus., Bull.* 144; 1928). The former genus is represented in America by forty-six recognisable races, so similar in habit that the authors are "forced to regard the process of specific differentiation in the group as a whole as primarily dependent on some other factor than any influence which might be exercised directly by the environment." Yet they find that climatic conditions have a marked influence on colour: the coastal area from Alaska to California has darkened local forms, in the semi-arid regions to the east the colour is less intense, while in the desert conditions of the south-west and parts of the interior the same species become extremely pale. The distribution of the species suggests that the American *Myotis* stock was derived originally from the northern part of the Old World. In contrast to the wide range of *Myotis*, *Pizonyx*, with a single species, is confined to the coast and islands of the Gulf of California, Mexico, and its many peculiarities suggest that it has evolved in response to some peculiar habit. The enlarged foot and claws, relative freedom of the leg from the wing membrane, and lengthened tooth cusps, perhaps indicate a diet consisting partly of fish, but so far no food has been found in the stomachs of specimens examined.

PHYSIOLOGICAL PROBLEMS AT HIGH ALTITUDES.—During the Mount Everest expeditions of 1922 and 1924 it was proved that man can live, for some days at least, at altitudes above 23,000 ft. (oxygen pressure = 9·5 per cent atmosphere), and can climb, though with difficulty, at 28,000 ft. It has yet to be proved whether man can climb at 29,000 ft., where the oxygen pressure is only 7½ per cent of an atmosphere. Dr. Argyll Campbell has proved that some mammals—rabbit, rat, mouse—after gradual acclimatisation, will live for a week at this low oxygen pressure and afterwards recover, but they were at rest in a moderate temperature, and not active and exposed to climatic rigours as climbers would be. A monkey, however, under similar conditions, became collapsed and recovered with difficulty. In animals which die from the effect of these low atmospheric pressures, fatty degeneration of the heart and liver is found. It is prolonged periods of exposure that are harmful, and the longer climbers are exposed to very low oxygen pressures the smaller will be their chance of reaching the summit, however expert they may be. Dr. Campbell suggests that possibly the daily inhalation of oxygen at normal pressure for a few hours when above 15,000 ft. may inhibit to some extent these evil effects (*Lancet*, July 14, p. 84).

THE MARINE ENVIRONMENT.—H. H. Poole and W. R. G. Atkins contribute further work on light-penetration into sea-water to the *M.B.A. Journal* (N.S. **15**, 2). They describe refinements of their photo-electric measuring apparatus and give additional determinations of the vertical absorption coefficient with comparisons of readings of Secchi's disc. J. R. Bruce in the same number studies the physical conditions of the Sandy Beach at Port Erin and the carbon dioxide and sulphide relations, especially in connexion with the well-known 'black layer.'

DANISH HYDROMEDUSÆ.—Dr. P. L. Kramp gives a detailed account of the biology and distribution of all

the Danish Hydromedusæ in his memoir, "The Hydromedusæ of the Danish Waters" (*Mémoires de l'Académie des Sciences et des Lettres de Danemark*, Copenhagen, Section de Sciences, 8me série, t. 12, No. I.). The work covers much ground and is interesting, both from the point of view of the systematist and of the plankton worker, being divided into two parts, the first dealing with the regional and seasonal occurrence of each species, the second with the results as applied to the general principles of plankton research. All the Danish species are studied in detail with their life-histories, special attention being given to the appearance of the hydroids at different seasons. Much that is new results from the winter researches, as previous work was almost exclusively undertaken in spring and summer. Thus, the fully developed colonies of *Coryne Sarsii*, the hydroid of *Sarsia tubulosa*, are apparently only found in the winter and early spring, when they liberate the medusæ and die down, which accounts for their rarity in summer. Three forms of the medusa are distinguished, a 'Blue Sarsia,' a 'Brown Sarsia,' and a 'Red Sarsia,' all attributed to the same species *S. tubulosa*, but with different distribution. Details of its many other forms have been described in the author's previous work on the Anthomedusæ of the Danish *Ingolf* Expedition (1926). The hydroid of the little gemmiferous *Rathkea octopunctata* is still unknown, although the medusa is so common. Gemmation apparently depends very much on the temperature of the water, and the medusæ keep to the lower water layers. Dr. Kramp throughout his work emphasises the fact that medusæ are of practical importance as an aid to hydrography in their capacity of indicators of currents, and are perhaps the most valuable of all pelagic organisms for this purpose.

TREE HABIT IN ANGIOSPERMS.—In a recent paper Dr. Agnes Arber discusses the arguments that have been adduced in favour of the arboreal ancestry of the Angiosperms, and concludes that they are inadequate to substantiate the theory (*New Phytologist*, vol. 27, No. 2). It is considered that the probabilities are in favour of an herbaceous habit in the primeval Angiospermic stock, which is held to have originated long ages before the earliest appearance of the group in the fossil record; the flowering plants, as they first come into our ken in the Mesozoic, would thus be already an old group. The fact that the floral characters of many woody plants are more primitive than those of their herbaceous relations is attributed, not to their being "more ancient" than the herbs in question, but to the *evolutionary lag* which has occurred in trees on account of the lengthening of the generations which is the result of the arboreal habit. Herbs with their shorter generations must have been able to evolve more rapidly, and thus tend to show more advanced floral specialisation. The frequency of the tree habit in the Angiosperms is held to point to the extreme antiquity of the flowering plant stock, which has allowed time for many lineages to reach a phase of senility; for trees show two characters which are indicative of old age in animal races—growth to a relatively large size, and the accumulation of non-living material in the body. The tree habit is probably the outcome of a certain fundamental tendency—the liability to the accumulation of waste products. It is hazarded that the earliest historical symptom of this tendency was the deposition of a wall round the plant cell, which has perhaps been the most important single factor in hampering the evolution of the plant as compared with that of the animal. The same tendency is regarded as having reached an ultimate expression in the massive framework of the forest tree.

PYRAMIDELLIDÆ FROM THE GULF OF CALIFORNIA.—Dr. F. Baker, Dr. G. D. Hanna, and A. M. Strong describe 53 forms of Pyramidellidæ from the Gulf of California (*Proc. Calif. Acad. Sci.*, Ser. IV, vol. 17). The greater part of the specimens were obtained by Dr. Baker in the spring and summer of 1921 when on an expedition sent out by the California Academy of Sciences. Twenty-two new species and one new subspecies are included in the number, and illustrated from photographs taken, we are told, by special optical equipment necessitated by the small size of the objects. For identification purposes, however, it would have been better had the photographs been retouched before being reproduced.

THE SILVER IODIDE PHOTO-CELL.—In No. 139 of volume 8 of *Scientific Papers* of the Institute of Physical and Chemical Research of Japan, Messrs. S. Iúmori and T. Takebe summarise their researches on the properties of the above cell. The electrodes of thin sheet silver are immersed in a solution of potassium iodide in a glass trough coated with tinfoil to exclude light except from an area of one of the electrodes. Either the potential difference between the illuminated and non-illuminated plate may be measured by a potentiometer, or the current the cell produces may be measured. For illuminations between 100 and 1000 foot candles the potential difference produced $= a$ (illumination) $- b$ where a and b are constants depending on the temperature, and concentration of the solution, the area of electrode illuminated, and the wave-length of the light used. The authors give a theory of the cell and show how the cell may be applied in photometry. They state that it shows neither inertia nor fatigue in use, but that it is difficult to construct two cells which have the same constants.

DUST IN MINES.—The *Journal of the South African Institution of Engineers*, volume 36, No. 7, 1928, contains an interesting article by James Boyd on the estimation of dust in mine air on the Witwatersrand. The author gives a complete history of the problem, showing how and when siliceous dust was recognised as the principal cause of the disease known as miners' phthisis. He describes the various methods used for determining the proportion of such dust in the mine air both by gravimetric and volumetric methods, and naturally pays especial attention to the use of the 'konimeter.' He describes briefly the methods employed in other countries, and compares them with the methods used in the Transvaal, discussing in detail the errors to which each method is liable. Finally, he shows the results obtained in the Transvaal by systematic dust sampling, on the basis of which the preventative measures now in use were adopted. From 1916 to the present day there has been a great and steady improvement, the general average of dust in the air being less to-day than one-third of what it was at the former date. A complete bibliography, which will be found specially valuable to students of the subject, is attached to the paper.

THE THERMAL AGITATION OF ELECTRICITY.—The possibility that thermal motion of electricity in a conductor might produce a detectable fluctuation of the potential difference between its terminals, which was recognised by W. Schottky in 1918, and again considered by Dr. J. B. Johnson last year (see NATURE, Jan. 8, p. 50, 1927), is dealt with in some detail by the latter author and Dr. H. Nyquist in the July issue of the *Physical Review*. The average square of the difference of potential through a conductor due to this cause should be proportional to its resistance and to its absolute temperature, but should be otherwise quite independent of its shape or material, since such

quantities as charge, mass, and number of the carriers of electricity do not appear explicitly in the theoretical expression for the electromotive force. An experimental test, made by amplification through six stages of audion tubes on to a vacuum thermocouple, has now verified all the essential points of the theory. The resistances used varied between a few thousand ohms and a few megohms, and were made of such widely differing materials as carbon, in the form of filaments, metals, in wire or films, and salts and acids in aqueous and alcoholic solution. The temperature range was between that of liquid air and that of boiling water. A mean value of Boltzmann's constant, obtained from twenty-three such measurements, was 7 per cent less than the accepted number, a result within the probable error of the determination. The phenomenon is of importance technically, and attention was in fact directed to it by the dependence of amplifier 'noise' upon the input resistance. Dr. Johnson points out that the effect may be minimised by working with as low an input resistance as is feasible and controlling its temperature, and by making the frequency range of the system no greater than is essential for the proper transmission of the applied voltage, but that for voice frequencies an alternating potential of about a microvolt is the smallest that can be satisfactorily amplified with usual circuits.

CELLULOSE ACETATE.—Parts 2-6 of vol. 3 of the *Report of the Aeronautical Research Institute*, Tokyo Imperial University, are concerned with researches on cellulose acetate and its solution, carried out by K. Atsuki, R. Shinoda, and Y. Tanaka. The quality of aeroplane dope prepared from cellulose acetate depends to a large extent upon the solvent used. It was found that a mixed solvent, consisting of acetone, ethyl alcohol, benzene, benzyl alcohol, and triphenyl phosphate, and possessing the greatest solvent power and lowest viscosity, produced a film of maximum tensile strength. Cellulose acetate frequently contains a residue of sulphuric acid, which may cause spontaneous decomposition and cannot readily be removed without impairing the quality of the dope. The addition of 1-2 per cent of calcium naphthenate appears to be an efficient method of stabilisation, the sulphuric acid being converted into calcium sulphate. The acetylation of cellulose and the relation of temperature and time of ripening to the viscosity of cellulose acetate have also been investigated.

EXPERIMENTS ON INTENSIVE DRYING.—Some interesting results obtained by R. H. Purcell on the effect of drying on the reduction of copper, bismuth, mercury, and silver oxides by carbon monoxide, and of copper oxide by hydrogen, are described in the *Journal of the Chemical Society* for May. In the case of pure copper and bismuth oxides, prolonged drying of both the oxide and the carbon monoxide decreased the rate of reaction. The temperature required for reduction depended on the time of drying, but rose to a maximum of about 425°. At this temperature it is possible that the reduction was effected by carbon formed by decomposition of the carbon monoxide. In the case of hydrogen and copper oxide, however, no difference was observed even when the materials had been dried for two years. Similarly, drying had no effect on the reaction between mercuric and silver oxides and carbon monoxide, or on the union of mercury and oxygen. Other experiments indicated that organic vapours may catalyse the reduction of copper oxide by carbon monoxide, though not so efficiently as water.

ELECTRICAL HEATING OF SOILS.—The heating of the soil in greenhouses and hotbeds by means of hot-water pipes or manure has been universal until quite recently. In 1923 G. Jacobson, the electrical engineer at Aker (near Oslo) in Norway, noticed that the grass over a buried electric cable near the power station was far more luxuriant and vigorous in appearance than the grass elsewhere. This led him to make experiments in his own garden. He heated the soil electrically by means of buried lead-covered cables enclosing high resistance wire circuits. The success attained has made the system a commercial one. In Norway alone there are about 200 nurseries which make use of this method. In Great Britain there are two installations, one at the Cheshunt Horticultural Research Station and the other on the farm of Mr. Borlase Matthews at East Grinstead. Mr. Matthews has communicated a paper on the method to the *Electrical Review* for Aug. 10. He gives data from which the cost of the method can be readily computed. It is not necessary to maintain a constant supply of energy as at 75° F., the standard temperature, the soil retains its heat for a long period. Arrangements can therefore be made with the electric supply authorities, who can supply energy cheaply at certain hours of the day. This can be done by automatic switches which turn on the supply during the periods when the station is lightly loaded. Much less labour is required when the soil is heated electrically, and the plants are as healthy and strong as when the best manure hotbed is employed. In Sweden the method has been tested on a large scale. The standard electric beds are 92 feet long and the cables are enclosed in earthenware ducts to prevent them being damaged by the gardener's spade. Strawberries have been raised to maturity in two months by this means. Potatoes planted in April were ready for digging at the end of June, two months before the ordinary crop. The commercial results obtained have proved satisfactory.

LIGHTHOUSE ILLUMINATION.—In an article in *Engineering* of July 6, Dr. Du Riche Preller gives an account of some recent developments in the systems of lighting used in lighthouses in France. In 1922 high-power incandescent lamps began to replace the electric arc for use in lighthouse illumination. The four important channel lighthouses of Dunkirk, Calais, La Canche (south of Boulogne), and Cape de la Hève (Havre) have all adopted the incandescent lamp system. The lighthouse of Les Baleines, in the Bay of Biscay, is also being converted to incandescent lighting. In British lighthouses four-kilowatt lamps are used, but in France, Philips lamps up to ten kilowatts are in use. The lights at St. Catherine's Point and the Isle of Man on the British coast, and those of Grisnez and Ushant on the French side, give a striking illustration of the difference between French and British practice. The long-duration flashes of five seconds and the slow rotation of the St. Catharine's apparatus give one extreme and the lightning flashes of one-tenth of a second and the rapid rotation of the Grisnez apparatus give the other extreme. The difference between the two practices is probably due to the prevailing greater density of the atmosphere on the British coasts. For this reason a longer time is required before the light becomes perceptible. For this reason also the British atmosphere necessitates intensive illumination of the nearer sea within a moderate range rather than overhead long-distance flashes to the horizon. The prevalence of violet rays is found to militate against the penetration of the luminous beam into a dense atmosphere. The French system, modified so that the flashes are not less than two-tenths of a second, has been adopted in a number of British lighthouses.