

## Research Items.

**PREHISTORIC CULTURE OF THE COLUMBIA RIVER, U.S.A.**—In vol 73, art. 11, of the *Proceedings of the U.S. National Museum*, Mr. H. W. Krieger describes the results of an investigation of a prehistoric pit-dwelling village at Wahluke, Grant County, Washington, which was undertaken as part of a general survey of the Columbia River area with the view of determining the character of the culture of its early inhabitants and its relation to neighbouring cultures. The area is of considerable importance ethnologically, as the Saddle Mountains form a barrier dividing Salish from Shahaptian-speaking Indians. Geologically, the formation makes it possible to determine without question that man could not have inhabited the area in pleistocene times, and that the relics of early man attributed to pleistocene deposits or associated with pleistocene faunal remains are intrusive. The culture of the pit-house village is especially interesting, as indicating the exhaustive manner in which the inhabitants exploited the natural resources of the area, more particularly in the development of their stone culture, no less than twenty-five varieties of stone being enumerated, of which they made use in the manufacture of tools and implements. It is to be noted that all forms of the stone axe were lacking in the surface finds and among the grave offerings; the inhabitants of Wahluke depended on the hafted discoidal stone war club, the flaked hammerstone, the grooved maul, and the stone wedge in its stead. The cemetery contained both primary and secondary burials, but practically no other type than that of ceremonial burial. A few skulls were recovered from among the remains. These showed artificial deformation, and the occipital flattening due to the use of an uncovered cradle board. The frontal occipital flattening was produced by a cradle board similar to that used by Columbian Indians in historic times.

**A THEORY OF THE SMILE.**—In *Psyche* (vol. 8, No. 4) Mr. A. M. Hocart develops a theory of the smile. He points out that the origin of the smile does not seem to have been satisfactorily explained by psychologists. Even Prof. Wm. McDougall, who explained the laugh as a protective reaction (*NATURE*, vol. 67, 1903) left the smile on one side. A search among other animals may furnish some clue. When a dog is pleased, especially when it is full of fun, it opens its mouth slightly, draws back the corners of the mouth, and bares its teeth. If one tickles it under the arm pits as it is lying, it is apt to draw back the corners of its mouth slightly without baring its teeth. A puppy welcomes its master with its ears cocked, a distinct gleam in its eyes, wagging its tail and smiling. As its master draws nearer, it rushes toward him and proceeds to chew his hand. The smile then may be the resultant of two opposite tendencies, the impulse to tear with the teeth and the impulse to suck and lick the object of affection. Adult man does not habitually bite the object of his affection, but there is a tendency that way which usually betrays itself only in words; in children there is a distinct tendency to chew affectionately. This tendency is in man early repressed and only breaks out into action under the stress of violent emotion. The parallel between the man's smile and the dog's is so close, that they may be identified, the differences being due to man's more complex development. The author offers these suggestions in the hope that they may stimulate research into the question. Darwin in his "Expression of the Emotions" related the smile to the expression of pleasure in sucking.

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**DEATH AND EVOLUTION.**—In former papers Prof. Raymond Pearl has suggested, from statistical analyses, that the different organ systems of the human body are not all equally capable of withstanding disease, and that the distribution of human mortality is associated with the evolutionary history of the human body. A further study suggests that the incidence of disease in various organ systems has an evolutionary significance throughout the vertebrate series (*Quart. Rev. Biology*, vol. 3, June 1928, p. 271). His animal statistics are drawn from the records of deaths at the Gardens of the Zoological Society of London for the four years 1920-23, 4448 deaths in all. The predominant causes of death amongst vertebrates, including man, are associated with the alimentary, the respiratory, and the circulatory systems in the order named, and of these the first two are by far the most mortal. But whereas there is a decreasing ratio of alimentary fatality from reptiles to birds and from birds to mammals, the order is reversed in the case of the respiratory system. It would seem, therefore, that while the evolution of the respiratory system has made it more and more vulnerable to the attacks of disease, the alimentary system has gradually attained a greater disease-resistance. Again, if the incidence of deaths be tabulated according to the primary germ layers from which the organs arose, it is seen that in all vertebrate groups, including man, the endoderm series is most vulnerable, the ectoderm series least vulnerable. Further, whereas the ratio of deaths associated with ectodermal organs increases from the lowest to the highest vertebrate, the order is exactly reversed in the case of endodermal organs. Although the nervous system does not stand high in the incidence of death, it is interesting to note that in civilised man its vulnerability is enormously greater than in any other vertebrate group, the ratios, from 100 deaths in each group, being, reptiles 0, birds 0.12, mammals 0.64, man 8.91.

**FOREIGN BIRDS ESTABLISHED IN NORTH AMERICA.**—A summary of all the facts that can be learned about the introduction or transplantation of birds in North America has been compiled by John C. Phillips (*U.S. Dept. Agr. Tech. Bull. No. 61*, April 1928). The list contains the names of a wonderful variety of birds, from tinamous to sparrows, but relatively few of the many have succeeded in forming permanent colonies. Some were mere escapes from captivity, which had little chance of survival, but even amongst the birds deliberately planted in the new land, for their beauty, their value as songsters, or their sporting qualities, there were many failures. Some, such as the capercaillie, black game, and many European songbirds, vanished almost as soon as they were liberated; others nested for a season and then declined, although all the conditions seemed favourable for survival; still others, for example, the European skylark and goldfinch, survived and bred for a term of years and then disappeared; only a small minority of forms found conditions so favourable that they settled down and multiplied. The English house-sparrow, the starling, the pheasant in Massachusetts, and the partridge in the north-west have been extraordinarily successful colonisers; but as a rule the first outburst of success is soon checked by natural causes, and a fresh balance is established. It has even happened that an alien, at one period so prolific as to be regarded as a pest, has entirely disappeared when Nature has had time to bring her opposition forces into line.

**BIOLOGY OF THE OYSTER AND OTHER LAMELLI-BRANCHS.**—In the April number of the *M.B.A. Journal* (N.S., 15, 2), J. H. Orton finds that shell-growth, fattening and breeding of *Ostrea* are mainly governed by temperature. He is thus able to describe three types of environment by reference to which most oyster beds may be defined. Many other aspects of the oyster's internal and external economy are discussed. C. Amirthalingham investigates the state of sexual maturity of *Pecten*, which undergoes changes having a well-defined lunar periodicity. C. M. Yonge combats the view that *Ostrea* can absorb soluble substances directly through the superficial epithelium. He shows that the appearance of this phenomenon in the experiments of other workers is almost certainly to be attributed to the action of leucocytes liberated on the epithelia in 'bleeding,' which is liable to occur in unfavourable conditions. A. C. Stephen gives a general account of the biology of *Tellinatenuis* in Cumbrae bays.

**PARASITISM AS A SEX-DETERMINING FACTOR.**—In the *Official Record U.S. Department of Agriculture* (vol. 6, No. 43; 1927) is an interesting account by N. A. Cobb, G. Steiner, and J. R. Christie of observations on the nematode *Mermis subnigrescens*, a common parasite of grasshoppers. These became parasitised by swallowing the eggs of *Mermis* which had been deposited on the food-plant of the grasshoppers. The infective egg contains a well-developed worm. In thousands of observations the average number of worms per infested grasshopper in Nature was from one to three, and always females. Females, in the absence of males, can produce viable eggs which give rise to infective larvæ. Experiments were made to determine the dose of eggs of *Mermis* that would be fatal to the host, and for young grasshoppers in the second instar this was found to be well under fifty eggs. When a slightly sublethal dose of eggs was given all the resulting worms were males; e.g. 20 *Mermis* eggs were fed to a grasshopper previously free from this parasite, and the resulting 19 worms were all males, whereas feeding with a very few eggs resulted in female worms. Corresponding observations on a *Pseudomermis* in the larvæ of a midge (*Chironomus*), on an *Agamermis* in the tea bug (*Helopeltis*), and on an *Alloermis* in the common ant (*Lasius niger*), showed that when the parasitism was high the worms were males, and when low were females. Between these extremes were gradations, the proportion of males varying with the severity of the parasitism. The authors consider that here is a case where environment is a sex-determining factor which becomes potent not during the early embryology of the worm but after a well-developed, highly differentiated larva has been formed.

**TRICHOMONAS HOMINIS.**—Robert Hegner (*Jour. Amer. Med. Assoc.*, 90; 1928) records experiments on *Trichomonas hominis* from the intestine of man, on *T. buccalis* from the mouth of man, and on six other species from monkey, cat, rat, chicken, and frog. Twenty-one tubes of serum-saline-citrate medium were inoculated with each of the eight species of *Trichomonas* and immediately fresh blood was added, three drops to each of three tubes, from man, dog, cat, rabbit, rat, guinea-pig, and mouse, and the material was incubated for twenty-four hours except in the case of the trichomonads from the frog, which were examined at the end of five hours. Every species of trichomonad ingested red cells from each of the seven species of mammals; the number ingested by any one trichomonad varied from one to seven. *T. hominis* from the mouth of man ingested the largest number of red cells; of those offered rat's blood, 96 per cent had ingested one or more

red cells. The data suggest that the larger the size of the red cell the more difficult is it for the trichomonads to ingest it. The author concludes that the species of *Trichomonas* accept red cells as food just as they do other food particles (e.g. bacteria and organic debris) and is not to be regarded as evidence of pathogenicity. In another paper (*Amer. Jour. Hyg.*, 8, No. 1; 1928) Prof. Hegner examines the viability and transmission of *T. hominis*, which has no cyst stage in its life cycle and hence must pass from host to host in its trophozoite phase. The results indicate it is highly improbable that the cockroach ever serves as a transmitting agent, but that flies fed on infected material, from twenty minutes to four hours afterwards, deposit faeces or vomit drops containing living *Trichomonas*.

**LIMITING VITAL FACTORS IN FRESH AND SEA WATER.**—In an article entitled "Die biologische Bedeutung der Salzkonzentration der Gewässer (*Die Naturwissenschaften*, Heft 14, 229; 1928), C. Schlieper gives an interesting account of some of the physical causes of the poverty of the fresh-water fauna compared with that of the sea. The importance of osmotic pressure is considered first, especially the well-known dependence of the osmotic pressure of the body fluids of marine invertebrates on the external osmotic pressure. But as Beudant showed so long ago as 1816, many typically marine organisms can withstand gradual change to completely fresh-water conditions, and, therefore, osmotic pressure alone does not seem to be the most serious factor in preventing migration from the sea to the fresh water. By comparing the morphological differences between fresh-water and marine organisms, the author makes the suggestion that organs of respiration are more highly developed under fresh-water conditions. He concludes that respiration itself is more difficult in this case, and that this is the true limiting factor which determines existence in fresh water and the sea. This factor might be due to difficulty of oxygen absorption or of carbon dioxide excretion. The quantities of oxygen dissolved in equivalent volumes of salt and fresh waters are not seriously different, and oxygen cannot, therefore, be a limiting factor. It is considered that the chief factor is the ease with which carbon dioxide can be excreted and that this is related to the greater bicarbonate content of sea as opposed to fresh water. This is an interesting suggestion, but physically the fresh water and marine environments differ so fundamentally that it seems impossible to ascribe their faunistic differences solely to a single factor such as this. The immense variability of temperature, pH, etc., and the geological inconstancy of fresh water as opposed to the sea, must also be factors of prime importance.

**CULTIVATION OF PERENNIAL COTTON IN EGYPT.**—In the most important cotton-growing countries, the plant has for years been cultivated almost exclusively as an annual. It must not be forgotten, however, that it is a true perennial in habit, and in almost all countries where it was cultivated it was originally treated as such. The voluminous literature on the subject deals almost entirely with the behaviour of the plant in its first year, but quite recently a controversy sprang up in connexion with perennial cultivation. The majority of the authorities is against the practice for a variety of reasons, chief of which are that the quality of the fibre is held to deteriorate after the first year, and that plants left in the ground more than one year will carry insect pests over the winter, and so result in increased attack. In a recent paper, Dr. J. Templeton has brought together a mass of evidence relating to perennial cultivation of cotton in



various parts of the world, and also describes experimental work carried out in Egypt (*Bulletin*, No. 75, Technical and Scientific Service, Ministry of Agriculture of Egypt). The evidence of the experiments as regards staple quality of first pickings is on the whole definitely against the theory that deterioration takes place after the first year. In addition, the 'ratoon' is of a higher class than the first year cotton. Second-year plants cannot carry the insect pests of cotton in Egypt over the winter, and suffer less damage from insect pests in general than first-year plants. The flowering curve of the second-year plants rises more rapidly and reaches a maximum much earlier than that of the first year, thus shortening the useful flowering period, which has an important bearing on the possible damage to the crop from pink boll-worms. The cost of cultivation is also less, no seed being required in the second year and no sewing, resowing, or thinning. Lastly, given pure seed to start with, the crop will remain pure longer.

**MINERALS OF SOUTH AUSTRALIA.**—The *Half-Yearly Mining Review*, issued by the Department of Mines of South Australia for the half-year ending Dec. 31, 1927, states among the general notes that a new geological map of the State has been printed and is now available. Owing to the fact that it is many years since a previous edition was published, the present map contains much new information, the plotting of the pre-Cambrian rocks being especially important, because the great majority of the mineral deposits of the State occur in this formation. There is also a short notice of the new method of geophysical prospecting, which is to be tried out in Australia under an arrangement between the Empire Marketing Board and the Commonwealth Council for Scientific and Industrial Research. The general indications given by a geophysical survey and their limitations are clearly explained. It is shown that this method gives indications which can be usefully followed up by drilling or other methods of definite exploration, and the point is stressed that a geophysical survey cannot by itself record the presence of any particular kind of ore, and above all cannot indicate the existence of rich ore until the presence of such ore has been actually proved by drilling. The most interesting feature in the statistical returns is the steady increase in the production of iron ore, which has now reached nearly three-quarters of a million tons, and the value of which is rather more than half of that of the total mineral production of the State.

**CATHODE PHENOMENA.**—Prof. Güntherschulze points out in the issue of the *Zeitschrift für Physik* for July 4 that the usual assumption that the least potential at which a Geissler discharge can be maintained on a cold cathode is independent of the pressure of the gas, is based upon very scanty evidence, and some new measurements made by him with a massive iron cathode shew that it is by no means always true. Helium, neon, argon, oxygen, and air do certainly exhibit a remarkable constancy of the minimum cathode fall in potential, although there is a small systematic rise for the first three gases with decrease in pressure, but with nitrogen and hydrogen, changes of the order of a hundred volts occur between pressures of one-tenth of a millimetre of mercury and five millimetres of mercury, and it is obviously difficult to attempt to correlate the discharge constants with the thermionic and photoelectric properties of the cathode in such cases. Prof. Güntherschulze's measurements were not made by the accurate but laborious method of exploring electrodes, but there can be little doubt that his results are substantially correct.

**SOUND-PROOF ROOMS.**—In developing transmitters and apparatus for sound reproduction it is necessary to

work in a room which is practically sound-proof. Formerly the walls of rooms were deadened with hair, felt, and other absorbing materials, but the result was not good. Recent theories of sound absorption have shown where the old methods were unsatisfactory. In addition, celotex, a new building material made of matted vegetable fibre and commonly used for heat insulation, has been found to be an excellent absorber of sound. The sound-proof rooms of the Bell Telephone Laboratories of New York are described in their *Record* for June. The rooms are first made with brick walls four inches thick, covered on both sides with hard cement plaster. This structure has a minimum tendency to resonate and a maximum tendency to reflect sound. The doors are built of two thicknesses of  $\frac{1}{4}$ -in. steel plate, separated by an air space, and are fastened by clamps similar to those used on water-tight bulk-head doors. Inside the masonry wall, and separated from it by an air space, is an inner room built of wood and covered with celotex, separated from the wood by a sheet of metal  $\frac{1}{16}$  in. thick, inside which are four successive layers of celotex. The room is supported on as few wooden blocks as possible. In practice it is found that the smallest opening permits the passage of sound. Outer and inner doors, therefore, are arranged so that they are clamped against cushions of rubber foam. To provide the necessary ventilation a labyrinthine duct runs to each of the rooms. Thirteen rooms have been constructed in this way. So far as sounds of fairly high frequency are concerned, they are sound absorbent, but sounds of low frequency are transmitted through the entire structure. The more nearly sound-proof the room is the more sensitive do listeners become to slight sounds. In the present state of our knowledge, an absolutely sound-proof room seems to be impracticable.

**CRYSTAL STRUCTURE OF IODINE.**—Comparatively few of the non-metallic elements have had their crystal structures elucidated by X-ray analysis, although in the case of non-polar substances such information is especially interesting in connexion with the existence of molecules in the crystals. An investigation of the atomic arrangement in the iodine crystal by the Laue, oscillating crystal and powder methods has been carried out by P. M. Harris, E. Mack, and F. C. Blake, and is described in the *Journal of the American Chemical Society* for June. The unit cell of the ordinary form of iodine has orthorhombic bipyramidal symmetry and was found to contain eight atoms. Its dimensions are  $a_0 = 4.795$  A.,  $b_0 = 7.255$  A.,  $c_0 = 9.780$  A. The atoms are grouped in molecules of  $I_2$ , the distance between the centres of the two atoms in one molecule being 2.70 A.

**BORIC ACID ANHYDRIDE AS A DRYING AGENT.**—The use of boric acid anhydride for the removal of water has occasionally been advocated, and in the *Journal of the American Chemical Society* for June, J. H. Walton and C. K. Rosenbaum describe an investigation of its efficiency as a drying agent. The temperature of dehydration of the boric acid was found to be an important factor, and if heated above 800° the product showed an induction period before the absorption of moisture began, indicating the probable formation of molecular complexes as suggested by Myers. Boric oxide appears to be a more powerful drying agent than sulphuric acid and calcium chloride, but is inferior to phosphorus pentoxide and magnesium perchlorate. It remains efficient until the water content rises to about 25 per cent of its own weight, this amount of water corresponding approximately to that required for the formation of metaboric acid. The glassy boric acid anhydride is more easily ground if it is obtained granular by pouring in the fused state into carbon tetrachloride at 0°.