

Research Items.

THE HORSE IN BABYLONIA.—In the June issue of the *Philadelphia Museum Journal* Mr. Leon Legrain describes a series of Babylonian seals in the museum collection. In one of the most remarkable the rider, whip in hand, is represented with a bird-like head in profile with no distinct hair or beard, mounted on an animal which may be a horse or a donkey. Mr. Legrain is half disposed to regard this as the first representation of the horse in Babylonia, but this is far from certain. In the only known example of this type the animal has been called a bull, and the rider identified with the thunder god, Ramman Adad. But as the seal probably dates from the time of the Guti invasion, this mode of riding astride may be a new and foreign feature imported from the north-east by the Guti people.

EFFECT OF DRYING UPON THE SKULL.—In an interesting paper in the *Journal of Anatomy* (vol. lvii., pt. iv., July 1923), T. Wingate Todd discusses the effect of maceration and drying upon the linear dimensions of the green human skull. His observations cover the effects of drying upon twenty-four macerated skulls and the differences between eight green skulls and the same within twelve hours of emergence from the macerator. He concludes that great individual variation occurs in percentage shrinkage, which, relatively small for length, increases somewhat for breadth and height, upon transformation from the green to the dry macerated state. The average shrinkage (all dimensions) amounts to about 1.1 per cent. of the final measurement. The duration of measurable shrinkage is about three weeks; but shrinkage demonstrable by shifting of the Euryon may continue for three months. Sex, stock, age, cranial thickness, cranial shape, and the condition of sutures are all eliminated as factors having no influence upon shrinkage. In passing through the stage of maceration, and during the first few hours of drying, the green skull loses a total average of 0.84 mm. in length, breadth, and auricular height. The average total shrinkage in complete transformation from the green to the dry macerated state is given as 5.6 mm., corresponding to a reduction of about 42 c.c. in a cranium of some 1500 c.c. capacity. The writer further gives examples showing that, given the linear dimensions in green and dry macerated states, it is possible to calculate the shrinkage in capacity to within a few cubic centimetres by either the Cleveland formula or those of Lee and Pearson.

BIRD CENSUSES IN THE UNITED STATES.—The United States Department of Agriculture has just published, as Bulletin No. 1165, a "Report on Bird Censuses in the United States: 1916 to 1920," by May Thatcher Cooke, of the Bureau of Biological Survey. The paper deals with an interesting attempt to establish a statistical basis for the study of the problems of bird population—the numbers and distribution of birds of different species, annual and other fluctuations, and the effects of irrigation, of cultivation, of the clearing of woodlands, and of protective legislation. The subject is one both of scientific interest and of economic importance: the study of it is not unknown in Great Britain, but it has not so far been undertaken on an important scale. A census takes the form of an annual count of the number of breeding pairs on a defined tract of land which is taken to be representative of the district as a whole. The conclusions so far reached in America, as mentioned in the paper under notice,

are purely tentative, and only a part of the United States is adequately covered by the records for the period. For the section of the country lying north of Maryland and the Ohio River and east of the Great Plains, a little more than one pair of birds to the acre is found to be the present average for farm land. For the land immediately surrounding the farm buildings, and including lawns and orchard, the average is about 130 pairs per 100 acres, the estimated population of an entire farm of 100 acres being about 112 pairs. The American robin (*Turdus migratorius*) is the most abundant species in those States lying north of North Carolina and east of the Mississippi, and the alien house-sparrow (*Passer domesticus*) takes second place: for farm land in this section there are about 9 pairs of robins and 8 pairs of sparrows per 100 acres. Further and more comprehensive figures should make interesting comparisons possible.

THE OPALINID CILIATE INFUSORIANS.—Dr. M. M. Metcalf has recently published (U.S. Nat. Mus., Bull. 120) what he describes as a preliminary review—a memoir of 484 pp., with 258 illustrations—of these ciliates which live in the rudimentary caecal portion of the rectum of Anurid amphibia. Most of the material used in the study of the 150 new species, sub-species, and formæ was obtained from museum specimens of Anura which had lain long—some for more than eighty years—in alcohol. The author gives a general account of the structure and life-history of *Protoopalina intestinalis*—a binucleate opalinid—and deals in some detail with mitosis and other nuclear phenomena in this and other forms. He concludes that each ordinary nucleus of an opalinid contains both trophic and reproductive chromatin in full activity. Dr. Metcalf discusses the relationships (a) of the four genera—*Protoopalina*, *Zelleriella*, *Cepedea*, and *Opalina*, and (b) of the family. He suggests that the Opalinidæ and *Trichonympha* may have arisen from similar ancestors, and that still more probably the *Euciliata* arose from ancestors which had become disturbed in their relations of mitosis and fission, and that they had passed through a pseudobinucleate condition to one of true binucleation, finally reaching their present structure, having two nuclei—one hypertrophied for metabolism, the other inactive except during the sexual period. An important section of the memoir deals with the geographical distribution of the species of Opalinidæ and the families and sub-families of the Anura.

SKIN SPOT OF POTATOES.—Skin spot has frequently been regarded as a relatively unimportant blemish upon the potato tuber, so that considerable interest was aroused by the recent announcement by Shapovalov (*Journ. of Agricultural Research*, vol. 23, pp. 285-294) that the pustules of this disease represent a primary stage of corky scab, a much more serious trouble produced by *Spongospora subterranea*. Until this paper, it had been generally assumed on the basis of a paper by Miss M. N. Owen (*Kew Bulletin*, 1919, pp. 289-301) that skin spot was due to quite a different organism, a new species of *Oospora*, named by the discoverer *O. pustulans* Owen and Wakef. As skin spot frequently occurs upon seed tubers of many of the best-known varieties of potatoes, it was obviously of great importance to know whether the organism causing skin spot could also give rise to corky scab, and potato-growers will read with relief the communication by W. A. Millard and Sydney Burr in *Kew Bulletin*, No. 8 for 1923. This work

records the results of inoculation experiments with both *Oospora pustulans* and *Spongospora subterranea*, which confirm Owen's original conclusions completely, and leave no doubt that the first organism is responsible for skin spot and the second for corky scab. Anatomical investigations of the pustules also show clear differences between those of skin spot and of corky scab, and there is no likelihood of a skin spot pustule later masquerading as a typical corky scab. Shapovalov's contrary results were obtained in the United States, and Millard and Burr are therefore led to make the suggestion, inevitably suggested by their own work, that except when the American author examined diseased tubers sent from Europe, he never had typical skin spot under observation.

VARIATIONS IN LEVEL OF LAKE VICTORIA NYANZA.—Attention was directed in 1904 to the remarkable variations in the level of the Victoria Nyanza by Col. Lyons, who attributed some of them to differential movements in the adjacent land. The general oscillation of the level in that lake and in the Albert Nyanza is described by Mr. C. E. P. Brooks in a Geophysical Memoir, No. 20, issued by the Meteorological Office (1923; 8 pp., 1 pl.; price, 1s. 6d.). Mr. Brooks describes the variations in the lake levels as recorded by tide gauges on the Victoria Nyanza from 1896 to 1922 and on the Albert Nyanza from 1904 to 1922, and compares the rise and fall of the lakes with the variations in sunspots and rainfall. The discharge from the Victoria Nyanza over the Ripon Falls is estimated at only 6 per cent. of the rainfall on the basin of the lake. Most of the rain is removed from the basin by evaporation, which Mr. Brooks regards as highest during periods of sunspot minima, so that the lake level is then normally lowest. He claims that the lake levels accord more closely with variations of sunspots than with those of rainfall. He points out in illustration of this view that the great rise in the level of the two lakes in 1917 was "entirely unconnected with any increase in the rainfall." The curves on the plate illustrating the memoir show a general agreement of the sunspot minima with the lake levels: but the agreement is not complete, for the sudden rise in 1901 followed an increase in rainfall but without any equivalent movement in the sunspot curve. There was a similar disagreement in 1913, and moreover, the high level of the Victoria Nyanza in 1906 preceded instead of followed the sunspot maximum of 1907.

SPACE FORMULÆ OF BENZENE, NAPHTHALENE, AND ANTHRACENE.—The carbon atoms of the benzene molecule are shown by B. Orelkin (Jour. Russ. Phys.-Chem. Soc., 1923, 54, pp. 493-532) to be situated at the corners of a regular octahedron. This conclusion is arrived at from geometrical considerations, which show that the above arrangement of the carbon atoms is the only one in which the thirty valency electrons of the benzene molecule can form a stable system. In support of this formula it is claimed that it explains why more or less than six carbon atoms cannot form an aromatic nucleus. The properties of the aromatic nucleus are explained as due to the peculiar arrangement of valency electrons around the carbon atoms, whereby each of the latter possesses two electrons in common with its neighbours. Sachs found that the relative distances of the *o*-, *m*-, and *p*- positions were as $1 : \sqrt{2} : \sqrt{3}$, and the same proportion is shown to hold for the formula now deduced. The space formulæ of naphthalene, anthracene, and chrysene are obtained by the condensation of two, three, and four benzene nuclei, and the angles of the space lattices of crystals of these

substances are calculated from their molecular structure. These calculated values agree very closely with experimental values obtained by other workers.

LOW-TEMPERATURE CARBONISATION OF COAL.—The Fuel Research Board of the Department of Scientific and Industrial Research has just issued a Technical Paper No. 7 on "Preliminary Experiments in the Low-temperature Carbonisation of Coal in Vertical Retorts" (H.M. Stationery Office, 10d. post free). The paper may usefully be read in continuation of the report of the same body for the years 1920 and 1921, analysing the technical and economic problems to be faced in establishing a British industry of low-temperature carbonisation. The necessity for low operating costs, therein emphasised, implies a minimum of manual labour, and the use of the continuous vertical retort is one way of attaining this. An installation of such retorts on the Glover-West system now exists at the Fuel Research Station, Greenwich. Though designed for working under the high temperature conditions now current in towns' gas works, they have been employed in carbonisation trials, now reported, in which low working temperatures were maintained. The setting is ill adapted for securing the best results under such conditions, but the tests—admittedly of an exploratory character—have been carried out to obtain information likely to assist in the design of more suitable retorts. Such retorts have been constructed and trials are to be carried out in them. In the present tests flue temperatures ranged from 700° to 850° C., and it was found advantageous to inject steam into the retort, both to cool the coke and to assist in distributing heat through the charge. A coke was obtained containing about 7 per cent. of volatile matter and said to be suitable for use in domestic grates. The high proportion of breeze in the coke suggests trouble and loss in transportation. Per ton of coal, there was obtained a yield of 12-16 gallons of tar having a "low temperature" character and 18-28 lb. of ammonium sulphate. The yield of gas was only 45-50 therms per ton—very low from the gas-maker's point of view and fatal to commercial success unless the coke realised a very high price. As no finality is claimed for these results, the results from the new retorts will be awaited with interest.

HEAT LOSSES THROUGH HOUSE WALLS.—The Building Research Board of the Research Department has issued, as Special Report No. 7, accounts of the tests carried out at the National Physical Laboratory of the heat transmitted through walls of various types when one surface is hotter than the other, of those made in Norway on the heat insulating properties of the walls of experimental huts constructed in more than 20 different ways in use in that country, and of similar tests carried out in Sweden and in Germany. So far as the British tests have been conducted, they show that a solid gravel concrete wall and a wall of sand-lime bricks transmit about the same amount of heat under the same conditions, but that a wall of stock bricks only transmits about $\frac{2}{3}$ as much heat. A cavity wall of ordinary type transmits about $\frac{1}{2}$ to $\frac{3}{8}$ that of a solid wall according to the size of the cavity. The Norwegian results include the cost of construction and show in a remarkable way the low heat transmission through the less costly wooden walls of various types common in that country. Where cavity walls are used the best arrangement is to place the thicker portion in the interior. The Swedish results, so far as they go, confirm the above conclusions. The German results have led to a subdivision of the air cavity between thin concrete walls into six or more layers by means of paste-boards.