

Research Items.

THE GOD SETEKH.—Some interesting deductions bearing upon the development of religious beliefs in ancient Egypt are made by Mr. R. O. Faulkner in the March number of *Ancient Egypt* from references to the god Setekh in the Pyramid Texts. The centre of the worship of this little-known deity appears to have been Ombos in Upper Egypt, and he appears to have been to some extent the embodiment of the destructive powers of Nature. In the Osiris and Horus myths of the later texts stress is laid upon his malevolent activities; but the Pyramid Texts, the oldest beliefs concerning him which have come down to us, present contradictory ideas which probably represent different stages in his history. Originally he ranked as equal with the other gods. Thus his relations with Horus and Osiris vary in three ways: (1) Setekh is without either friendliness or hostility, but stands over against them as representing a different tract of the country; (2) Horus and Setekh co-operate for the benefit of the deceased; (3) Setekh is the mortal foe of Horus. As the Osiris cult gained ground Setekh became hostile to him also. It is not always clear whether Horus is the old tribal Horus or the son of Isis. Probably the tribal myth was transferred bodily into the Osirian legend, the original cause of hostility being the feud for the supremacy of Egypt settled in the lawsuit which was brought before the court of the gods at Heliopolis. The reversal which converted Setekh from one of the principal gods of the Egyptian pantheon to an outcast was no doubt due to political causes, and the frequency with which he appears as the enemy of Osiris is to be attributed to the comparatively late rise of the cult of that deity when the evil character of Setekh had been fully established.

IRISH SEA HERRING.—The report for 1923 on the Lancashire Sea-Fisheries Laboratory contains three papers dealing with investigations into the life-history and fishery of the herring in the Irish Sea. Mr. A. Scott, from the results of his examination of stomach contents, concludes that the movements of both herring and mackerel are influenced to a very considerable extent by the presence or absence of plankton organisms, and believes that it should be possible to predict with a fair amount of accuracy whether these fishes will arrive earlier or later than usual, by making adequate observations on the plankton. The food of the herring during the fishery in June, July and August 1923 consisted of the few months' old stages of fishes such as rockling, sand-eels, clupeoids, gurnard and long rough dab, along with the crustaceans *Meganyciphanes*, zoea and megalopa stages of crabs, larval pagurids, *Pandalus*, and various Copepoda. Mr. W. C. Smith, in a study of the composition of the Manx herring shoals, states that young fish approach the coast in May and remain close to the land for about three months, increasing in abundance during June and July, and moving to the deeper water off the Calf of Man in August. Older fish come in later, appearing on the Irish side of the Channel in July, and gradually working across to the "Calf" waters to meet the other shoals in August. Mr. W. Birtwistle and Miss H. M. Lewis made an extensive examination of Irish Sea herrings in 1923 with regard to age, growth, and maturity, and now put forward two interesting hypotheses: (1) Irish Sea herrings are all autumn spawned; (2) herrings spawned in the very early autumn will show a greater mean length and a more advanced mean stage of maturity than herrings spawned in the late autumn.

SEX DIFFERENTIATION IN THE CHICK.—In a paper published in 1921 (*Jour. Exp. Zool.*, v. 33), Minoura

put forward the claim that he was able to produce in the developing chick embryo intersexual forms due to the action of the sex-hormones secreted by a gonad of the opposite sex grafted on to the chorio-allantoic membrane. His work was of fundamental importance, since it provided the only experimental support of Lillie's theory of the causation of free-martin in cattle. Minoura's experiments were recently repeated by A. W. Greenwood (*Brit. Jour. Exp. Biol.*, 2, No. 2, 1925). The technique has been greatly improved and a sex-linked cross was used, making it possible to identify the sex of the chicks at an early stage in development. Although the author obtained many successful grafts, he has entirely failed to confirm Minoura's results. He shows that Minoura cannot be said to have demonstrated conclusively that the differentiation of the sexual apparatus of the host embryo can be modified towards an intersexual condition through the action of a gonad graft of the opposite sex. Further, he shows that the conditions obtaining in the bovine free-martin are not reproduced in these experiments, in that in the latter the embryo is exposed to the specific action of the grafted gonad alone, whereas in the former the female co-twin is exposed to the action of all the internal secretions from the male.

A MULTIPLE TEMPERATURE INCUBATOR.—C. B. Williams and T. W. Kirkpatrick describe (Ministry of Agric., Egypt, Technical and Sci. Service, Bull. No. 38, 1924) useful forms of this apparatus designed to enable them to study the behaviour of cotton pests at a number of different temperatures in order to find their death-point, the points of greatest and least activity, and their rates of development at temperatures close together and approximately constant. A copper or aluminium bar, tube, or trough is inserted at one end into a hot tank and at the other end into an ice-box—all suitably insulated so as to minimise changes of temperature. In the first apparatus a copper bar was employed, and in this 71 holes were bored at intervals; each provided a place where a tube could be maintained at a different temperature the daily variation of which was found in any one case to be less than half a degree. The authors suggest that bacteriologists and mycologists may find the apparatus useful.

A NEOTENOUS SALAMANDER FROM JAPAN.—M. Sasaki (*Jour. Coll. Agric., Hokkaido Imp. Univ.*, Japan, vol. 15, pt. i, 1924) gives an account of the bionomics of a salamander, *Hynobius lichenatus*, which, in Lake Kuttarush, occurs as a typical neotenus form, regularly breeding in that phase. While the phenomenon of neoteny is not rare, particularly among the Urodela, reproduction in the neotenus condition has hitherto only been known in the Axolotl. The larvae of neotenus parents underwent normal metamorphosis under laboratory conditions. From experiments the author concludes that the main factor which brings about neoteny is low temperature, to which, however, must be coupled a rich food supply. The temperature must not be so low as to impair the vitality of the animals and inhibit feeding, since starvation, even under otherwise good conditions, stops both growth and metamorphosis. Conditions suitable to neoteny, a permanent temperature of from 4°-10° C. and a rich food supply, were found to exist in the Nitella zone of Lake Kuttarush, where neotenus forms of *Hynobius lichenatus* were found by the author in abundance and regularly reproducing.

EMULSIFIED OIL-SPRAYS FOR LEMON CULTURE.—A large number of the lemon groves of Florida are

located in artesian well districts, and the water from these wells is utilised in spraying the trees for white flies and scale insects. Unfortunately this water is particularly hard, and great difficulty is met with in mixing unstabilised oil-emulsions with it. Accordingly the water was treated with caustic potash fish-oil soap prior to adding the emulsion, but the method involved trial and error; caustic soda and fish-oil soap, used separately, were found more economical. Where the rust mite prevails, as in the United States and the West Indies, other measures have to be taken. Messrs. W. W. Yothers and J. R. Winston give details of the use of combination sprays both for rust mite and for other insects, in Bulletin 1217 of the United States Department of Agriculture (1924). These sprays concern the use of soda-sulphur or potash-sulphur solutions mixed with unstabilised oil-emulsions, but they are not always so effective as they might be, and a lime-sulphur solution has been employed to greater advantage as an insecticide. Unfortunately there is again a difficulty in getting the lime-sulphur solution to mix with unstabilised oil-emulsion. Experiments in the direction of stabilising oil-emulsions have shown that the use of colloidal substances such as glue, skimmed-milk powder, casein, wheat flour, corn-starch and laundry starch produces the desired effect. The combination spray is made by filling a spray tank full of water, to which is added the requisite amount of lime-sulphur solution; then the stabilised oil-emulsion is added, consisting, for example, of paraffin or lubricating oil, water, caustic soda, fish-oil soap, and glue. After agitation the spray is ready for use, and it can be applied to foliage, branches, or fruit without injury, providing that the whole process of mixing has been carefully carried out and the correct proportions of each ingredient employed.

UPPER AIR CIRCULATION OF THE ATLANTIC.—The upper air circulation of the Atlantic Ocean is dealt with by Mr. E. W. Barlow of the Meteorological Office, Air Ministry, in Professional Notes, vol. 3, No 39. An historical account is given of upper wind currents and temperatures over the Atlantic obtained chiefly from kites and pilot balloons, and our present knowledge of air circulation in relation to trades and counter trades is indicated. The meteorological aspects of Atlantic flying are dealt with; these include sea-fog and conditions which create "bumpiness," and advice is given as to the most favourable heights for flights to North and South America. The work is of considerable interest, and the author has brought together a good deal of useful information. Some early discussions by the Meteorological Office, and especially those carried out under the supervision of Capt. Toynbee on the Atlantic equatorial regions, scarcely receive the attention they deserve. These earlier discussions show that in the region of the Doldrums, with north-east winds at the surface, the direction of upper clouds is generally from south-east, and with surface winds from south-east the upper clouds are about equally from south-east and north-east. To the north of the Doldrums and to 20° N., with wind north-east there is a high percentage of the upper clouds from south-west. To the south of the Doldrums and to 10° S., with wind south-east, there is a high percentage of upper clouds from south-west and a fairly high percentage from north-east. These results are obtainable for each month. Table IV., by the author, gives the times in hours required for flight between Newfoundland and Ireland under best, ordinary, and worst conditions. The Meteorological Office "Synchronous Weather Charts of the North Atlantic Ocean, 1882-3," have been used for these calculations. These charts represent the

weather conditions for a single year, and the weather in any other year would in all probability be very different, a fact which should be emphasised.

CLIMATE OF THE NETHERLAND INDIES.—The Royal Magnetic and Meteorological Observatory of Batavia, in Verh. No. 8, vol. 1, part 7, gives a discussion of the weather by Dr. C. Braak. In addition to the Dutch text English summaries are given. Favourable conditions for lightning and thunder appear to be calm air and an unstable vertical temperature distribution, extending to a great height. The bulk of tropical thunderstorms are heat thunderstorms, short-lived, and of relatively small extension. Fewer persons seem to be struck by lightning in the East Indies than in Europe, and fires caused by lightning are very rare. Special kinds of trees are struck fairly frequently, in particular the coco-nut palms. Hail is said to be a rare phenomenon in the tropics, but instances are given of the occurrence of hailstorms; they are most frequent in the monsoon changes, as is the case with thunderstorms. No marked connexion is shown between pressure and sunshine or pressure and temperature, but there appears to be a pronounced relationship between sunshine and temperature. A comparison is made between the climate of the Netherland Indies and that of other regions. With regard to temperatures of the wet bulb thermometer, it is noted that whilst at Batavia the maximum heat, although disagreeable, can be endured without too much discomfort, the same cannot be said of many other places in neighbouring countries. Destructive cyclones are rare. A comparison is made of the climates of those regions in the Archipelago and outside of it where the best results are obtained with different crops.

THE JAPANESE EARTHQUAKE OF SEPTEMBER 1, 1923.—Several papers have recently been published on the great Japanese earthquake of 1923, one of unusual interest being that by Mr. K. Shiratori (*Japanese Journ. of Astr. and Geoph.*, vol. 2, 1925, pp. 173-192). From the seismographic records at Sendai, he locates the epicentre in Sagami Bay off the southern end of the Miura peninsula, and the focus at a depth of 44 km. From September 1 until the end of the year, 652 after-shocks were recorded at Sendai, of which 80 were comparatively strong. The epicentres of the latter are distributed in three zones, together in the form of the letter N. The first zone is parallel to the Fuji volcanic zone and traverses the Izu islands. The second, branching from the first near Tanzawa Mountain, runs along the Miura peninsula, crosses the Uraga channel, and meets the third zone, which follows the line of the Yamiso Mountains, off the east coast of the Boso peninsula. These zones are so intimately connected that, when one is active the others also come into action. Mr. Shiratori remarks that observations of the earth-potential at Sendai show abnormally large variations during near earthquakes, those at the time of the great earthquake being very marked.

VOLCANIC ACTIVITY IN KILAUEA.—In his interesting account of the recent eruption of Kilauea, Dr. T. A. Jaggar remarks on the periodicity of the great eruptions of that volcano (*Hawaiian Volcano Obs.*, Mon. Bull. for April and May 1924). These have occurred in the years 1790, 1823, 1855, 1887, and 1920 (the culminating year of the present cycle), the mean interval between successive eruptions being thus 32.5 years. For Vesuvius, about 33 years is a common interval, the last two eruptions having occurred in 1872 and 1906. "It would appear, and this agrees

with Omori's work in Japan, that 130, 65, and 32·5 years are intervals significant in volcanism." In the *Volcano Letter* for February 19, Dr. Jaggar uses the percentage of dead cones in a district as an index of comparative volcanic activity in different Pacific regions (Sumatra, South Japan, the Fuji cross-zone in Japan, the Kurile Islands, the Tonga Islands, and the Hawaii Islands). He concludes that the extinction becomes less and the activity greater as we advance from the continental to the oceanic districts.

OIL AND GAS POSSIBILITIES IN MONTANA.—In a recent publication of the Department of the Interior, United States of America, we have a striking example of the value to a nation of highly organised geological survey, one that exists not only to amass and co-ordinate data of regional geology, but also to disseminate results and conclusions of contemporary economic import. In an area lying to the south of the Bearpaw Mountains, Montana, some little oilfield development had already been in progress, but had met with indifferent success; the United States Geological Survey accordingly sent Mr. Frank Reeves to investigate the geology and petroleum possibilities here, and the results of his survey are now available to the public in an excellent bulletin (751-C), one of high technical and literary merit. The author concludes that an area is favourable from a commercial point of view because the strata (*i.e.* Cretaceous) contain abundant organic material "of the proper kind to yield oil"; further, that there has been sufficient, but not too much, regional alteration of the sediments to influence oil formation from this organic material; that there are suitable reservoirs of porous strata; that structures favourable to oil accumulation are present; that there has been no escape of oil by faults or as a result of flushing by circulating ground-water; that the character of the water found in one oil well sunk is favourable to the existence of oil, and that gas in commercial quantity has been located within the area. If geological advice can be of positive value in minimising risk of failure, here is a clear case where the chance is worth taking, though, as the author conscientiously remarks, "no one should invest money in the drilling of wells here unless he can afford to lose it." For the rest, the survey of this area shows it to be geologically typical of much of the north-central Montana country, characterised especially by its full Cretaceous development, its complexities of folding and faulting—the last factor of a somewhat unique kind in this area—and its abundant evidence (though not always on a commercial scale) of bitumen in one form or another.

MINERALOGY OF FOSSIL BONE.—The common belief that fossil bones are generally silicified is completely disproved by A. F. Rogers, who has thoroughly investigated a collection of 300 different examples ranging from the Ordovician to recent times, and gathered from widely separated countries in every continent. The evidence, which is convincingly set forth with numerous excellent photomicrographs in the *Bull. Geol. Soc. America*, vol. 35, pp. 535-56, 1924, shows that fossil bone consists almost entirely of the amorphous mineral collophane, which is also the principal constituent of phosphate rock. Collophane is not a definite chemical compound, but seems to be a hydrous solid solution of calcium carbonate (with smaller amounts of the fluoride and sulphate) in calcium phosphate. Corresponding to this the refractive index of fossil bone ranges from 1·573 to 1·621, though the smaller range, 1·595 to 1·615, includes the great majority of the specimens. The values show no regular relation to geological age. Bones seem to

become fossilised in a comparatively short time, and after that no further changes of importance take place. The collophane of fossil bone exhibits a feeble double refraction due to strain, and a thin section of the spine of a Permian reptile even displayed a distinct pleochroism from pale to deep yellow. This is probably the first record of pleochroism in an amorphous substance. Of all the specimens examined only three were found to be silicified. Various forms of silica, together with calcite, are commonly associated with collophane, but whereas the latter fills up the pores left by the removal of organic matter, and so preserves the structure of the bone, the associated minerals are usually merely the infillings of cavities. Thus it is found that the well-known opalised bones from White Cliffs in New South Wales are internal casts showing no organic structure.

DEFINING IRON AND STEEL.—The definitions of steel and cast iron as given by various authorities may be divided into two classes: (1) those based on the principal properties and methods of production of these materials; and (2) those based on the constituents present, *i.e.* on the carbon content. For example, steel is defined as an iron alloy which can be hardened by quenching or results from melting and is very tough, or is an iron alloy containing a certain quantity of carbon which when quenched is hard and elastic, etc. A definition based on the method of production is not really appropriate, for when a new method has been discovered, the definition has to be altered. The definition based upon properties is also inadequate, for the words "hard," "tough," and "elastic" are all relative. In a recent issue, Vol. 13, No. 2, of the *Science Reports of the Tohoku Imperial University*, Prof. Honda discusses this question and concludes that the only satisfactory definition is on the basis of composition. He defines steel as an iron carbon alloy with a content of carbon lying between 0·035 and 1·7 per cent. Cast iron is defined as an iron carbon alloy the carbon percentage of which lies between 1·7 and 6·7. The lower limit of 0·035 in the case of steel is chosen because, up to this amount, the carbon is retained in solid solution in the iron. These definitions take no account of the other constituents ordinarily present in steel and cast iron. While these may be regarded as immaterial in the case of steel, such is not the case for cast iron. However, Prof. Honda's contribution to the question is a step in the right direction.

UNITED STATES ORDNANCE.—The issue of the *Journal of the Franklin Institute* for March contains the address on modern ordnance delivered in September 1924 at the centenary celebrations of the Institute by Major-General C. C. Williams, of the United States War Department. It is devoted chiefly to the improvements which have been effected in the six years since the War, and shows that in almost every type of gun the range has been increased by about 50 per cent. at the expense of a small increase in weight. For sea-coast protection the guns are sixteen-inch and throw a projectile weighing more than a ton a distance of 27 miles. It has been decided that the long-range guns of the "Big Bertha" type are of doubtful value, as their work can be much more cheaply done by bombing aeroplanes. The demolition type of bomb has been considerably developed, and although a 4000 lb. bomb is under trial, it is believed that a 2000 lb. bomb will be the largest size needed. These bombs are timed so as to penetrate to the lowest story of a building or 40 to 60 ft. below the surface of the water before exploding. In this way the maximum effect is produced, and in the case of a ship greater damage is done by a near hit than by a direct one.