Tensile tests were carried out on test-pieces cut from strips containing large crystals, so that the parallel portion in each case was occupied by a single crystal. Values of from 6 to 10 tons per square inch ultimate stress and 30-50 per cent. elongation on 2 inches were obtained, and may be compared with about 19 tons per square inch and 53 per cent. elongation obtained for the same material in the fine-grained condition. A single crystal cut from the coarsely crystalline strip can be rolled out to 100 times its original length and reduced from 0.125 to 0.001 in. without annealing and without showing any signs of cracking at the edges. The properties in this respect were very similar to those of the aluminium crystals made and tested by Carpenter and Elam. It was found, however, that in certain circumstances these large iron crystals were exceedingly brittle, a property not hitherto observed with aluminium. If a crystal were placed in a vice in a certain way and given a sharp blow with a hammer, fracture frequently occurred along what appeared to be a cleavage plane. A large number of crystals were broken in this way. Only in a few cases did bending occur, such as would happen in finely crystalline iron. In the large majority of crystals tested it was found possible to obtain fractures in two planes exactly at right angles. The authors consider it probable that the large crystals grown in strained iron possess a similar orientation.

Messrs. Edwards and Pfeil have established two important facts which bear on the production of large iron crystals: (1) The critical strain required to produce very large crystal-growth on subsequent annealing varies with the initial grain size of the material used, the larger the grain size the greater being the strain required. With very large crystals, sufficient strain to cause growth cannot be applied, since recrystallisation occurs at the crystal boundaries. (2) Surface crystals of the original finely crystalline aggregate behave differently from those in the interior and require a greater tensile strain before they will disappear.

The authors explain these facts in the following way. In the case of a single crystal it is considered that deformation occurs by a process of slip causing little change in the crystal lattice. Some change must

occur, for single crystals of tungsten, aluminium, and iron are hardened by cold work, but in the case of single iron crystals, whatever change up to 25 per cent. elongation occurs is removed on annealing without producing recrystallisation. If, however, two crystals in contact are deformed, there will be interference with slip, owing to the change in the direction of the slip planes in passing from one crystal to the other. In these circumstances some other kind of movement must occur during deformation. X-ray analysis does not indicate any difference between the lattice constants of cold worked and annealed metals, but shows a relation in the former between the direction of the crystallographic axes and that of straining.

The second type of deformation is interpreted therefore as a rotation of the crystallographic axes accompanied by elastic strain. The depth to which this change penetrates from the boundaries depends upon the degree of deformation. With small crystals but little deformation will cause the depth to correspond with the radius of the crystals. The larger the crystals the greater the deformation necessary to cause the change to reach the centres. When this second type of deformation has penetrated to the centres (and the strain at the crystal boundaries has not exceeded a certain value) the authors consider that the degree of axial alignment due to rotation has proceeded to such an extent that, on annealing, it is easier for the atoms to form a single crystal than to revert to their original orientations. With very large crystals, however, before the second type of deformation has penetrated to the centres, the strain set up at and near the crystal boundaries has become so great that, on annealing, the atoms in these highly strained regions preferably form new crystals, *i.e.* recrystallise.

With regard to the small surface crystals, the authors consider that a greater degree of deformation produced by tensile stress is required before the change is sufficiently complete to permit of growth or absorption during annealing. When, however, the critical degree of strain is caused by rolling and the freedom of the surface crystals is thus at least partly removed, their growth or absorption can occur.

H. C. H. C.

Immigrant Cultures in Egypt.

By Sir FLINDERS PETRIE, F.R.S.

A GENERATION ago our view of Egypt was limited to three brilliant periods, without beginnings or connexions. The discovery of the pre-dynastic ages in 1895 showed two successive civilisations, waxing and waning, which were disentangled by the classification of sequence-dating, and appear to have come in first from the west and then from the east. The further discovery of the royal tombs of the earliest dynasties at Abydos provided a monumental basis for what had, so far, only been recorded history. There the position has rested for twenty years, but recently much more has come to light, consolidating the long view of the past.

On a jasper cylinder seal of Asiatic work, the figure of a king named Khandy was identified with the same name recorded in the VIIIth dynasty of Egypt. As that king is shown receiving homage from a Syrian,

and secondarily from an Egyptian, it appears that he was ruling in Syria and holding Egypt. Other foreign names in that dynasty indicate that the VIIth and VIIIth dynasties, who succeeded the first pyramid age, were Syrian rulers. This accords with the frequent use then of button badges, always of foreign work, and bearing designs known in Babylonia and Cilicia. Excavation of the cemetery of the IXth and Xth dynasties capital, Herakleopolis, showed an entire absence of the Syrian buttons, and a throw-back on to Egyptian lines, apparently due to a Libyan immigration.

Last winter the study of the rock tombs of the Uah-ka princes of Qau—south of Assyt—of the IXth and Xth dynasties, has opened a fresh view. It had already been noted that certain black granite sphinxes from Upper Egypt, which resembled the kings of the XIIth dynasty, were markedly of the Galla type. At

Qau, the temple-tombs cut in the rock are of exactly the plan of the Nubian temples, a form unknown elsewhere; and, further, the family name—Senusert—of the XIIth dynasty appears. These facts link together and agree with the Egyptian “prophecy” of the XIIth dynasty, that a king Ameny (=Amenemhat) should arise from the south, the son of a Nubian woman. It appears, then, that when the Syrians broke in on the north, the Gallas pushed down from the south, controlled the artists in black granite, and founded a rule of the south which centred at Qau; this was in alliance with the Herakleopolite dynasties, and eventually founded the XIIth dynasty at Thebes.

Last year there came to light some work of a prehistoric culture, differing in all respects from the recognised prehistoric Egyptian. This year the clearance of a stratified deposit showed that this unknown culture was as old, or older, than the early prehistoric age already recognised. As the known prehistoric culture is quite continuous on all sites, and bears nothing like the new material, the presumption is that we are handling remains of a still earlier period. This new culture is identical in the

types of flint chipping with the flints so widely spread from the Fayum up to the Palestine desert. We have now certainly the general products of this people, who have as yet only been known by their flint work. Further, this work is closely like that of the lowest stages of Susa, and the Solutrean of Europe. All of these seem to be due to various waves of one Asiatic culture, and thus accord with the recent views in the “Cambridge Ancient History.” The peculiarities of this earliest known culture in Egypt are: in flint, the swallow-tail arrowhead, delicate *vesica* tools pointed at both ends; in pottery, the thinnest and hardest ware known, polished black, with the surface streaked by comb-dressing all over; in beads, glazed steatite, garnet, and carnelian; in painting, the use of long rectangular palettes, concave at the ends, with green malachite, and red hæmatite face-paint. All of these may be seen in the exhibition of the British School in Egypt at University College, Gower Street, open on July 5-26. There will also be shown more remains of the earliest human period known in Egypt, from the gravels of the eastern desert; after further study, it is hoped to give some account of these.

Obituary.

CHARLES OBERTHÜR.

BY the death, at the age of seventy-eight, at Rennes of the veteran naturalist, Charles Oberthür, workers in the study of insect life have suffered the loss of one whom personal tastes, the circumstances of life, and a persevering and enthusiastic character combined to make a conspicuous and leading figure among the fraternity of entomologists. As the printer and producer of his own works, Oberthür was able to give full scope to his conception of the requirements of entomological description and illustration. Similar ideals have presented themselves to others, but to few indeed has the opportunity been given to carry them out on so extensive and magnificent a scale. The splendid series of “*Etudes d'Entomologie*” and of “*Lépidoptérologie Comparée*” which emanated from his press at Rennes bear witness to his indefatigable labours in the advancement of his favourite pursuit, and to the liberal, one might even say the lavish, expenditure which he devoted to the worthy presentation of the results of his entomological studies. The beauty and accuracy of the hand-painted illustrations in these volumes have never been surpassed.

Though the order of Lepidoptera engaged most of his attention, Oberthür did much to further the subject of economic entomology, which he rightly recognised as being of high importance to an agricultural community such as that of the greater part of France. The material accumulated by him is of the greatest service to students of bionomics; but to Oberthür himself the various topics offered by evolutionary problems, such as those of protective resemblance, mimicry, phylogeny and distribution, made little or no appeal; nor did he concern himself with experimental investigation of the phenomena of heredity. But in his own line, and in the working out of his own methods, he was exceptionally efficient. Many have had occasion to be grateful for his kindly and helpful generosity.

PROF. FILIP POČTA.

WITHIN the past few months death has taken heavy toll among the professors of the Charles' (Bohemian) University of Prague. On January 7 died Prof. Počta, professor of palæontology and geology. He was born in Prague in 1859 and studied first in our University, then in Bonn, in the Musée d'Histoire naturelle in Paris, in the Laval Museum in France, and from there in Stockholm with Prof. Lindström. His first big work was a modern investigation of the sponges from the Bohemian calcareous formation, of which he studied not only the external form but also the interior skeleton, and this study he extended to sponges from Hungary, Dresden, France, and from the collection of the Bonn University. After this he studied the rudists and worked in the Sorbonne, the École de Mines in Paris, as well as in the British Museum. After the death of Prof. Novák he investigated the material which was left by Barrande, who intended to describe it in the eighth volume of his classical work, “*Système silurien du centre de la Bohême*.” For this purpose Počta made a great collection of illustrations of corals and Coelenterata, a collection which was, as regards execution, without a rival. He also deciphered for the first time the inner structure of the end chamber of Orthoceras. The first part of the eighth volume was published in 1894 and the second in 1902. Being originally a palæontologist, he became later on a geologist. He published much in both sciences in Bohemian, German, French, and Magyar. Počta was a member of the Royal Society of Bohemia, of the Bohemian Academy of Sciences, of the Geological Societies of Paris, Berlin, and of other learned societies. BOHUSLAV BRAUNER.

WE regret to announce the following deaths:

Dr. George Little, state geologist of Mississippi, 1868-72, and of Georgia, 1874-81, on May 15, aged eighty-six.

Prof. Charles Hunter Stewart, professor of public health, University of Edinburgh, on June 30, aged sixty-nine.