

country has done everything for science that can be done in the way of organization. If one adds to this what one knows of Hungarian talent, there can be little doubt that these efforts must be followed by a rich harvest.

This handsome volume, in impeccable English, is not for sale through the trade, but scientists interested in Hungary may be able to obtain it through the Scientific Officer of the Hungarian Embassy, London.

D. GABOR

## EARLIEST CIVILIZATIONS OF THE NEAR EAST

### Earliest Civilizations of the Near East

By James Mellaart. (The Library of Early Civilizations.) Pp. 143. (London: Thames and Hudson, 1965.) 30s.

THE making of metal tools is a complicated process, more especially when the copper is derived from its sulphide ore. It would seem reasonable, then, to assume that the discoveries which led to the preparation and use of metals for tool-making purposes eventuated in only one or two places, and thence gradually spread around the world. The practice of agriculture and the domestication of animals, on the other hand, can result from climate changes and could have evolved independently in many different regions. Agriculture, especially, gave rise to the village and later to the articulated town where different groups of people performed different functions for the good of the community. Early Neolithic cultures as a rule are, therefore, more diverse in development than are the early metal cultures, and it is to the Near East that we must, perhaps, look for these earliest appearances. They succeed the so-called Mesolithic cultures which grew up following the changes of climate which took place at the end of Palaeolithic times. These in turn gave rise to a Protoneolithic period when tentative attempts at a simple agriculture and the domestication of animals can be observed. Then come the fully developed Neolithic cultures with, somewhat later, the manufacture of pottery. As has been indicated not a few slightly different developments of this true Neolithic civilization can be observed in the Near East. In *Earliest Civilizations of the Middle East* the author has described many of these for us, and the frequent illustrations, often in colour, help the reader to visualize how these early folk lived and the sort of objects they made.

In Anatolia a few naturalistic paintings and engravings have been observed which have been classed as late Palaeolithic, and, following these, there is a spread of Mesolithic cultures with typical industries including pygmy tools. One of the more evolved of these is the Natufian culture of Palestine. An illustration gives a good idea of the characteristic objects made. The protoneolithic is next considered and the succeeding chapter deals with Syria and Palestine in the seventh millennium. Here it may be mentioned that in the Near East the chronology is considerably 'longer' than has, until recently, been considered to be the case in the West. Almost certainly we in this part of the world will have to lengthen out our own Neolithic era. Succeeding chapters deal with the ceramic Neolithic period in Syria, Lebanon and Palestine, as well as in Mesopotamia and Northern Iran. Once again the illustrations are especially useful in enabling the reader to visualize the differences between the various culture groups. There follows a chapter on Anatolia where the author is very much on his own ground. Here he points out that it is a mistake to think of Anatolia as a barbarian fringe to the "fertile crescent". On the contrary, the region was a great cradle of fine Neolithic cultures. The most splendid site is Çatal Hüyük, covering some 32 acres. There are 12 successive building-levels

dating from 6500 to 5650 B.C. There are wall paintings, a rich industry including necklaces and many pottery statuettes of goddesses, etc. There is also a shrine elaborately furnished with bulls' heads. It would seem, too, that woven material was made. Çatal Hüyük was the high spot of the Near East Neolithic and after it the succeeding early metal age (Tell Halaf) seems almost to be a comedown. Nevertheless, the future, of course, lay with the spread of metal industries and the final chapter describes some of these in the area.

Admittedly the title of this little book confines us to the Near East, but it is perhaps sad to have to consider these regions, however important, without any chronological tie-up with the Neolithic cultures of Europe and elsewhere. None the less, this volume makes an admirable introduction to the subject and the author is to be congratulated.

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## ALGEBRA OF THE LATTICE

### Introduction to Lattice Theory

By Prof. D. E. Rutherford. (University Mathematical Monographs.) Pp. x+117. (Edinburgh and London: Oliver and Boyd, Ltd., 1965.) 35s.

A SET of elements  $x, y, \dots$  is partially ordered if there is a binary relation  $x \geq y$  which is reflexive, anti-symmetric and transitive. This is a wide classification. In *Introduction to Lattice Theory*, Prof. Rutherford gives, as an example, the set of all human beings, when  $x \geq y$  means that either  $x$  and  $y$  are the same individual or  $y$  is a descendant of  $x$ . The idea goes back, at least implicitly, to Boole, whose algebra remained for a long time the only system in which the elements need have no numerical significance. C. S. Peirce remarked that, if an order relation exists, union and intersection can be defined as the least thing which contains  $x$  and  $y$ , and the greatest thing contained in both  $x$  and  $y$ , that is, as a least upper bound and a greatest lower bound, respectively. Schroeder cleared up some of Peirce's detail, and Dedekind directed attention to the importance of ordered sets, and lattices. A lattice is a partially ordered set such that any two elements possess both a least upper bound and a greatest lower bound: for example, the set of all positive integers when  $x \geq y$  means that  $y$  is a factor of  $x$  and the bounds are then the lowest common multiple and the highest common factor.

Boolean algebra now appears as the first and still one of the most fascinating of investigated lattices. Lattices may be classified into main groups according to the various further restrictions laid on their relations, and Prof. Rutherford gives a very clear and comprehensive picture of these types, and their applications to logic, topology, geometry, and switching circuit theory. His book is meant for the undergraduate just beginning to make a serious study of abstract algebra, and is better suited for this purpose than its only competitor in English, the brilliant but somewhat highbrow volume by Garrett Birkhoff in the American Mathematical Society *Colloquium Series*. Rutherford knows that the omission of steps which would be obvious to the trained and sophisticated mathematician may cause endless trouble to the beginner; he therefore gives his proofs in full and adds a good deal of informal expository comment, providing also some sensible examples for the reader. His text has been remarkably well organized to allow him to do all this in little more than 100 pages, but, of course, it still demands, as by their nature do all texts on abstract algebra, a remarkably high degree of sustained concentration on the part of the reader. Granted this, the rewards to be obtained from a study of this live and growing field are considerable, as a pleasure in itself and as a stimulus to constructive work. T. A. A. BROADBENT