SCIENTIFIC BOOKS

LATTICE THEORY

Lattice Theory. Vol. XXV. Colloquium Publications. By GARRETT BIRKHOFF. v+155 pp. New York: American Mathematical Society. 1940.

THE past decade has seen a tremendous and continuing growth of interest in modern abstract algebra. Algebraic concepts and technique have been found to be frequently applicable to other branches of mathematics as well as other sciences, and their fundamental value has been emphasized thereby.

A major portion of algebraic study has been concerned with mathematical systems consisting of a set of elements which behave with respect to two operations very much as ordinary numbers do with respect to addition and multiplication. In studying subsystems of the same type as a given system one usually considers the meet and join of any two of them, and finds that these are again subsystems of the same abstract type. Thus one may again abstract and study a new type of mathematical system consisting of two operations and a set of elements whose behavior with respect to the operations is now like those of subsystems with respect to meet and join. The application of algebraic research technique to this most recent phase of abstract algebra is a study which has strongly attracted many American algebraists and one of the most prolific workers in the field is Garrett Birkhoff, who has called the subject *Lattice Theory.*

Birkhoff's book is the first comprehensive treatment of the subject and its applications. It contains all the recent major developments in the subject in a unified form which will make the book an inspiring research reference for the relatively large number of research algebraists interested in the field. The exposition is clear and well written and should prove of great value in satisfying the demand of non-specialists in the subject who have been anxious for several years to obtain a text by the use of which it may be possible to present the subject as a graduate course in modern mathematics.

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FORAMINIFERA

A Catalogue of Foraminifera. By BROOKS F. ELLIS and ANGELINA R. MESSINA. 30,000 pp. The American Museum of Natural History. $100.00.

THE natural sciences have reached a stage in their development where the scientist is almost buried under the knowledge with which he has to deal. No longer can he make this knowledge usable by merely organizing it. He must now summarize it and catalogue it as well.

The summarizing and cataloguing of man's knowledge of even a relatively small branch of one of the natural sciences, such as a single group of animals, is a laborious task. When the group contains more than 18,000 species the task calls not only for much labor, but for great organizing ability on the part of the scientist and large-scale financial backing by some interested institution or government bureau. Few scientists have had the ambition to plan summaries or catalogues of this scope, fewer still have had the courage and energy to undertake their preparation, and very few, indeed, have had the ability to enlist the necessary financial support and carry the work through to completion. This catalogue is proof, however, that, given the man, such projects can be successfully carried out.

Because of their importance as index fossils in the search for petroleum and for other reasons the Foraminifera have received a good deal of attention from biologists and paleontologists in recent years. Much has been published concerning them in many languages. Some 18,000 living and extinct species have been described. The mere cataloguing of these species must have been a huge undertaking. The preparation of an *illustrated* catalogue was a task on which only a brave and optimistic man would have dared to venture. That Professor Ellis *did* undertake it is proof that he was both courageous and an optimist. That he completed it is proof that he was a practical idealist.

Undoubtedly the most practical thing which Professor Ellis did when he planned this project some ten years ago was to enlist the cooperation of Miss Messina, who shares with him the credit for its successful carrying through. With the generous assistance of the Work Projects Administration, the American Museum of Natural History, Columbia University and New York University, these authors have prepared and issued one of the most voluminous single publications relating to the natural sciences that has ever appeared in print. A staff of 125 artists, bibliographers, editors and other assistants was engaged for six years in the preparation of the manuscript and its printing.

The 30,000 pages of the catalogue contain one or more figures of every species of foraminiferan, living or extinct, a reference to the original description of the species, a transcript of the original description, a record of the time range, type locality and geographic range of each species, the depository of the type specimens and a list of bibliographic references. There are also included a discussion and bibliography of each genus, with a type reference, a transcript of the original description and the name of the genotype when a genotype was designated by the original author. The pages of the catalogue are bound in ledger type post binders to permit future rearrangement and the insertion of additional pages containing descriptions of new