

BOOK REVIEWS

Homology. By Saunders MacLane. (Die Grundlehren der Mathematischen Wissenschaften, Bd. 114.) Springer, Berlin, 1963; Academic Press, New York, 1963. 422 pp. illus. \$15.50.

Approximately seven years have elapsed between the appearance of the first book on homological algebra by Cartan and Eilenberg, and the publication of this book on homology by MacLane. Since both books deal with essentially the same material, it is perhaps inevitable that in reviewing the latter we begin by making some comments contrasting it with the former.

The first book was concerned with the presentation of a new subject—Homological Algebra. At the time of its preparation (over ten years ago) it was not clear just what directions this new subject would move in, and its major triumph and delight was the discovery that by replacing free modules by projectives one could define derived functors of Hom and Tensor product to obtain Ext and Tor, and thereby subsume the existing homology theories of algebraic structures under one unifying notion. Therefore the authors devoted themselves to a painstaking exposition of projective and injective resolutions, derived functors, satellites, homological dimension, products, and spectral sequences, and joyfully indicated the connections between these new phenomena and old ones such as the homology of groups, algebras and Lie algebras, the Hilbert theorem on syzygies, and the Künneth formula.

Since that time, the methods of homological algebra have been applied extensively in many areas, and homological techniques have been refined, elaborated, and generalized. Moreover, the value of homological tools and of the functorial approach has been conceded by more than a dozen mathematicians. Thus MacLane approaches his subject not as a magician with a set of tricks, but as an expositor who intends to demonstrate how a viable coherent theory illuminates meaningful questions. His general pattern, then, is to go from the particular to the general, throwing as much light as possible along the way.

It must of course be borne in mind that the lapse of time and development of the subject are not solely responsible for the clarity of presentation of much of the material in this volume. The author evidently believes in concrete examples and concrete applications of general machinery and within the limited scope of the book, does a fine job in providing them. Thus, when he discusses differential