

Mac Lane, Saunders

Homology. Reprint of the 3rd corr. print. 1975. (English) Zbl 0818.18001
Classics in Mathematics. Berlin: Springer-Verlag. x, 422 p. (1995).

Homological algebra has evolved over the last half-century into a fundamental tool in algebra, algebraic topology, algebraic geometry, complex-analytic geometry, and algebraic number theory. The methods of homological algebra, which have their origin in the homology and cohomology theories for topological spaces, provide a powerful machinery for proving nonconstructive existence theorems in these areas of mathematics, on the one hand, and they allow, in many cases, to establish algebraic obstructions to carrying out certain constructions, on the other hand.

The first stormy phase of development of homological algebra, touching almost every topic in algebra and related areas, reached its culmination in 1956 with the publication of the systematic monograph of *H. Cartan* and *S. Eilenberg* [Homological algebra. Princeton, New Jersey: Princeton University Press (1956; [Zbl 0075.24305](#))]. The second research monograph and textbook on this more and more popular subject was *S. MacLane*'s work "Homology", which appeared in 1963 [Berlin etc.: Springer-Verlag, [Zbl 0133.26502](#)]. At that time, homological algebra had reached a higher stage of maturity and ubiquity, also due to the contributions that *S. MacLane* himself had made in the meantime, and his (henceforth classical) book reflected the state of homological algebra at the time of writing in a masterly, brilliant manner. This and the outstanding didactic features have made *S. MacLane*'s "Homology" into one of the great classics on homological algebra.

The third edition of this book appeared in 1975, and here the author had corrected several errors and inaccuracies. The most important corrections concern the proof of the Homotopy Classification Theorem (Theorem III, 4.3. on p. 78), and a suitable modification of the axioms for allowable short exact sequences in abelian categories (p. 260), so that they can be applied in a direct way to further constructions.

The present edition, appearing in the series "Classics in Mathematics", is a reprint of that third, corrected printing from 1975 [[Zbl 0328.18009](#)]. Undoubtedly, *S. MacLane*'s classic will maintain its long-standing central rôle in the literature on (categorical) homological algebra, also to the benefit for the coming generations of mathematicians.

Reviewer: [Werner Kleinert \(Berlin\)](#)

MSC:

- [18-02](#) Research exposition (monographs, survey articles) pertaining to category theory
- [18Gxx](#) Homological algebra in category theory, derived categories and functors
- [18-01](#) Introductory exposition (textbooks, tutorial papers, etc.) pertaining to category theory
- [18Exx](#) Categorical algebra

Cited in **2** Reviews
Cited in **329** Documents

Keywords:

categories; functors; rings; modules; algebras; complexes; homology theories; Ext and Tor; cohomology of groups; homological dimension; spectral sequences; derived functors; homological algebra