

## THE BIRTH OF HOMOLOGICAL ALGEBRA

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**1. Introduction.** There appeared, in the same issue of *Expositiones Mathematicae* in 1985, two papers, one by Jean Dieudonné, the other by Urs Stammbach [2], [13]. They were excellent papers; the first described the early history of algebraic topology, with special reference to the work of Poincaré, Brouwer and Alexander; the second showed how the integral homology groups of a group carried important information about that group. The papers had, of course, been written quite independently; moreover, as each author had written in his mother tongue (French, German, respectively), it was unlikely that many would be able to derive benefit from reading both. It occurred to me then to write a short note linking these two papers, and this I did [7]. I also gave a reference to the definitive paper by Saunders MacLane [12] tracing the history of homological algebra from its inception; but I felt then, and have continued to feel even more strongly since, that there were very remarkable features of the inception itself which deserved notice. Thus, when invited to speak at the Second Honolulu Conference on Abelian Groups and Modules, I decided that here was a splendid opportunity to study and review that remarkable period in the development of mathematics and the emergence of a new mathematical discipline. Obviously, I am very grateful to the conference organizers for providing me with this stimulating opportunity.

**2. The contribution of Hurewicz.** In a series of four notes which appeared in the *Proceedings of the Royal Dutch Academy of Sciences* in 1935/36 [11], Witold Hurewicz made a key contribution to the development of homotopy theory by showing that the higher homotopy groups played a vital role in the use of obstruction-theoretic methods to study problems of the extension of maps and the existence of homotopy relations between maps (see [4]). Many, indeed, credit Hurewicz with actually inventing the higher homotopy groups, but

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