geometric functions respectively. To treat these topics thoroughly the author is obliged to examine at length some purely group-theoretic problems, such as unitary representations and the decomposition of tensor products into irreducible components. These results are of interest in themselves, apart from their applications to special function theory.

Chapter 6 is concerned with the 6-parameter, 3-dimensional Euclidean group. The irreducible representations of the associate Lie algebra are obtained but, because of computational difficulties, detailed applications are omitted. We expect this gap to be filled in the future.

Chapter 7 describes the Infeld-Hull factorization method. The author shows that the representation theory of the four Lie groups examined in the preceding four chapters is equivalent to the Infeld-Hull factorization method. This equivalence does not diminish the importance of Miller's contributions, but serves to show that the results of the preceding chapters form a complete unit in a certain sense.

In Chapter 8 the author considers the problem of classifying the realizations of a given Lie algebra, with a view to ascertaining the extent to which the preceding chapters are complete and the prospects for further research. It is the most difficult part of the book, requiring some knowledge of the cohomology theory of Lie algebras.

The last chapter introduces the reader to two new Lie algebras. A 5-parameter Lie algebra is defined and its irreducible representations obtained. Some interesting identities involving Hermite and Weber functions result. A 3-parameter Lie algebra is defined and treated similarly. The applications are generalizations of identities involving Bessel functions. We infer that the techniques developed in the book are not limited to special functions.

It is a pleasure to recommend Miller's book to all who have more than a casual interest in the special functions and to adventurers seeking new pastures.

LOUIS WEISNER

Rapport sur la cohomologie des groupes by Serge Lang. Benjamin, New York, 1967. viii+260 pp. $8.00; paper: $3.95.

This is a report written in 1959 for the use of Bourbaki. Despite its belated public appearance, it still provides a fairly complete survey of the general features of the cohomology theory of groups. A large part of this theory developed in connection with its application to class field theory. In particular, the account given here contains everything from cohomology theory that is used in the well-known Artin-Tate treatment of class field theory, an unpublished portion of which is one of the sources of the present book.

The material is organized into nine chapters, as follows. Chapter 1 establishes the existence and uniqueness of the cohomology functor. The basic facts for this are derived from an abstract theory of effaceable connected sequences of functors on general abelian categories. This chapter also contains the complete determination of the cohomology of a finite cyclic group and the main facts (important in class field theory) concerning the cohomological Herbrand quotient.

Chapter 2 treats the relations between the cohomology of a group and that of its subgroups and its factor groups, developing the properties of the maps of restriction, inflation, transfer, and translation. Some special attention is given to Sylow subgroups, in this connection. Chapter 3 gives the main facts concerning cohomologically trivial modules. It also contains Tate's important 3-level criterion for a module homomorphism to induce an isomorphism of cohomology.

Chapter 4 begins with a categorical treatment of cup products. The cup product for group cohomology is then defined from an explicit multiplicatlon of cochains, and its properties with respect to restriction, transfer, and inflation are established. This is followed by an application of cup products to duality and periodicity of the cohomology of a finite group, and to the Tate-Nakayama theorems concerning class modules.

Chapter 5 briefly describes a more elaborate notion of 'augmented products,' which was introduced by J. Tate, and which has been used in connection with abelian varieties. Chapter 6 sketches the mechanism of spectral sequences.

Chapter 7 is essentially an account of unpublished work of Tate on the cohomology of groups of Galois type, i.e., compact groups whose topology is given by the normal open subgroups as a fundamental system of neighborhoods of 1. One considers the category of Galois modules for such a group, which are the modules that are continuous modules when endowed with the discrete topology. The corresponding cohomology is the limit of the cohomology of the finite factor groups mod. the open normal subgroups as approximants. The main results concern the cohomological dimension of torsion Galois modules. These results are of particular interest in the case of infinite Galois extensions of fields.

Chapter 8 is devoted to the cohomology of group extensions, where one has the most interesting interpretations of the low-dimensional cohomology groups and of the cohomology maps involving subgroups and factor groups. The final Chapter 9 deals with class formations and the associated Weil groups. This is the abstract scheme that embodies the main cohomological features of class field theory.

As is natural for this type of report, it assumes that the reader is familiar with the basic notions and techniques of general homological algebra, and it leaves a fair amount of detail for the reader to fill in. For the specialist, this book is an extremely valuable complement to the existing literature on the subject.

G. HOCHSCHILD

Cohomology operations and applications in homotopy theory by Robert E. Mosher and Martin C. Tangora. Harper's Series in Modern Mathematics, Harper and Row, New York, 1968. $x+214$ pp. $12.95.

This book is based on a revised version of notes taken by the second author during a course given by the first. According to the author's preface the book is intended for advanced graduate students having considerable knowledge about cohomology and some familiarity with homotopy groups. The book concentrates on the mod 2 theory and only gives references for the mod p results.

The authors begin with a definition of the Steenrod squares which is one of the several different definitions originally due to Steenrod. All the fundamental properties of the squares except uniqueness are proved. This is followed immediately by an application to vector fields on spheres and the Hopf invariant. Spectral sequences are introduced in order to state Serre's theorem. No proof is given. This material is applied to calculate $H^*(K(\pi, n))$ where $\pi = Z$ or Z_2. Serre's theory of classes of Abelian groups is introduced and used to facilitate the calculation of some homotopy groups of S^n. These calculations are used to illustrate some of the theory. The book finishes with short treatments of Postnikov towers, higher cohomology operations and the Adams spectral sequence.

The book is well written and interesting to read. The main criticism of the book is in its emphasis. It seems to me that any treatment of this sort should give more play to the Adams spectral sequence both for the calculations of homotopy groups and as a statement about higher cohomology operations. The book does collect and make easily available to beginners in this subject a lot of material which was not easily obtained before. As such it is a useful addition to the literature. On the other hand it is not complete enough to be a valuable reference work and this fact may also be its biggest drawback as a text.

M. MAHOWALD