by identifying the surface with the functional obtained by integrating k-forms over the surface.

One of the most important features of the space of varifolds is a certain compactness property which makes it possible to obtain a varifold as a "weak" solution to Plateau's problem. While the local structure of such solutions is not yet completely known, the author states some theorems valid for two-dimensional varifolds in Euclidean three space, R^3, that improve upon the results of T. Rado and J. Douglas concerning least area problems. Perhaps the most interesting is the one that combines the results of W. H. Fleming and E. R. Reifenberg and which states that if a boundary C is prescribed which is the union of a finite number of disjoint simple closed smooth curves in R^3, then there is a two-dimensional varifold V which is a solution to this problem and has the property that the support of V minus the points of C is a two-dimensional real analytic manifold. The beauty of this solution comes from the fact that varifolds include all smooth surfaces and thus the solution V represents a surface of least area among all competing surfaces and not merely one of least area among those of prescribed topological type.

This book consists of four chapters, the last two of which describe varifolds and variational problems involving varifolds. In order to set the stage for this discussion, the first chapter gives an interesting expository account of least area phenomena and the second deals with the subject of rectifiable subsets of Euclidean space. A k-dimensional rectifiable set is one which can be approximated (in the sense of k-dimensional Hausdorff measure) by smooth k-manifolds. Rectifiable sets have become objects of fundamental importance to measure theoretic geometry since they are essential in describing the structure of sets of finite k-dimensional Hausdorff measure.

The material in this book is designed to be accessible to students who had a solid course in advanced calculus and it would serve nicely as a supplement to a course in the calculus of variations. The numerous revealing examples, which are accompanied by illustrations, will enable the reader to obtain a strong intuitive grasp of the many intricacies that are associated with Plateau's problem.

WILLIAM P. ZIEMER

Lie theory and special functions by Willard Miller, Jr. Mathematics in Science and Engineering, vol. 43, Academic Press, New York, 1968. xv+338 pp. \$16.50.

The principal aim of this book is to provide a group-theoretic interpretation of certain properties of the special functions of mathematical physics. Its spirit is quite different from that of the usual textbook treatment of the special functions. Since the methods employed are not widely known, a brief explanation of the central ideas is in order.

Let G be an r-parameter Lie group on n variables $x_1, \cdots, x_n$. Suppose we can find a set of functions $v_k(x_1, \cdots, x_n)$, usually infinite in number, such that the vector space over the field of complex numbers having the v's as a basis is invariant under G. Thus

$$gv_k = \sum_{l=1}^{\infty} T_{lk}(g)v_k(x_1, \cdots, x_n), \quad g \in G, \ k = 1, 2, \cdots,$$

where T_{lk} is a function of the parameters. The left member is known explicitly and is a generating function for the T_{lk}. It is readily shown that the group property provides an addition theorem

$$T_{lk}(g_1g_2) = \sum_{j=1}^{\infty} T_{lj}(g_1)T_{jk}(g_2), \quad l, k = 1, 2, \cdots,$$

for the functions T_{lk}, while the Lie derivatives yield differential recurrence relations. These ideas have been utilized by theoretical physicists in the analysis of the representation theory of the 3-dimensional rotation group. There are other groups which can be exploited similarly.

For the groups considered in the text the functions T_{lk} turn out to be special functions. Thus an impressive number of properties of special functions is derived, many of them previously obtained by manipulation of infinite series, but now shown to be subject to a unified treatment. No attempt is made to derive a complete list of formulas—the author's emphasis is on group-theoretic methods.

The first chapter consists of a résumé of the classical Lie theory. Lie's principal theorems are explained without proof and are adapted to the author's purposes. The reader is assured that he is not expected to be acquainted with the modern global theory of Lie groups.

The second chapter begins with a general discussion of the representation of an abstract Lie group by linear operators on a vector space, and the conditions under which a representation may be realized by a local Lie group. These considerations are then applied to certain 4-parameter Lie algebras and their realizations in one and in two complex variables.

The results of the second chapter form the basis of the next three chapters which embrace more than half of the book. They deal with Bessel functions, confluent hypergeometric functions and hypergeometric 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