theory of normal operators and specialised to apply to a number of particular cases such as planar surfaces. The authors' special interests are treated in the fourth chapter, which deals with the classification of open Riemann surfaces of different classes and the derivation of inclusion relations between them. The final chapter on differentials contains the classical results, obtained by Hilbert space theory and Weyl's lemma, and culminating in the Riemann-Roch theorem and the theory of Weierstrass points. There is a very comprehensive bibliography and index.

The treatment is almost completely self-contained. Possibly because of the great wealth of material included, study of the book demands considerable concentration; a fair amount of work is also required of the reader since arguments are not always given in complete detail. For this reason the student beginning the study of Riemann surfaces may find it advantageous to read first a less comprehensive and sophisticated account, such as is given, for example, by G. Springer's *Introduction to Riemann Surfaces* (Addison-Wesley, 1957). For the research worker, however, the book by Ahlfors and Sario is indispensable and is likely to remain the standard text for some time.

R. A. RANKIN

N. BOURBAKI, *Éléments de Mathématique XXVI. Groupes et Algèbres de Lie: Chapitre* 1. Algèbres de Lie (Hermann et cie), 148 pp., 21 NF.

Chevalley completed two volumes of his well known work on Lie groups before he embarked on a systematic account of Lie algebras. In this latest volume of Bourbaki, which is the first in a series on Lie groups and algebras, we are first introduced to the theory of Lie algebras. A hundred pages of theory is balanced by over thirty pages of exercises. The theory in the case of a Lie algebra over a ring of prime characteristic is sketched in a number of the exercises. For the moment we confine our attention to those Lie algebras that are finite dimensional vector spaces over a field of characteristic zero.

A number of criteria are obtained for a Lie algebra to be one of the following types: soluble, nilpotent, semi-simple. Varying soluble and nilpotent radicals play an important role. The soluble radical has a complement—a Levi subalgebra—which is semi-simple; two Levi subalgebras are transformed into each other by a special automorphism (Theorem of Levi-Mal'cev). The theory reaches its climax in the Theorem of Ado. Every Lie algebra has a faithful representation of finite dimension such that the image of the nilpotent radical consists entirely of nilpotent elements.

The enveloping algebra of a Lie algebra over a commutative ring with unit element is considered in detail and the general form of the Poincaré-Birkhoff-Witt Theorem on the isomorphism between the symmetric algebra and the graded algebra associated with the filtered enveloping algebra is obtained.

The well known theory of Lazard on the connection between groups and Lie algebras is confined to a sketchy mention in the exercises and the following topics receive no attention: free Lie algebras, the Campbell-Hausdorff formula and basic monomials.

The volume is almost self contained and can be recommended as an introduction to the theory of Lie algebras.

S. MORAN

BORSUK, KAROL, AND SZMIELEV, WANDA, *Foundations of Geometry* (North Holland Publishing Co., Amsterdam, 1960), 400 pp., 90s.

This book is concerned with the foundations of Euclidean, Bolyai-Lobachevskian (hyperbolic) and real projective geometries and carries the development of each to the point at which the system of axioms can be shown to be categorical as well as consistent.