a normal subgroup of $\mathscr{G}$ of index 2. For the remaining coset of $\mathscr{G}_0$ in $\mathscr{G}$ and for the two remaining cosets of $\mathscr{G}_+$ in $\mathscr{G}$ we have $g_{44} \leqq -1$, corresponding to temporal reflections or a reversal of time. The present work has as its main object the description of all completely irreducible representations of $\mathscr{G}_+$ and $\mathscr{G}_0$ and the derivation and interpretation of the corresponding invariant equations. In so far as the representations by matrices of finite dimensions are concerned, the results are well known and, in the reviewer's opinion, more lucidly presented in works such as H. Boerner's *Representation of Groups*, but the large sections of the present work devoted to representations by bounded linear operators in a Banach space have not hitherto been easily accessible in writings in the English language. For this reason Professor Naimark's book is a welcome addition to the literature. The study of these infinite-dimensional representations may, the author suggests, prove as useful for the further development of quantum theory as have the finite dimensional representations in the elucidation of the concept of spin. Furthermore, they afford an admirable introduction to the general theory of infinite-dimensional representations of semi-simple Lie groups.

With physicists in mind the author has endeavoured to make the exposition as self-contained as possible. This approach, however, has its drawbacks from the point of view of the mathematician because the mathematical details are not presented in their wider context but only in their relation to the Lorentz group. For instance, page 1 is devoted to defining a group and on page 2 a footnote points out that only those facts concerning groups will be mentioned which are later required. Eventually after 88 pages, which include a full treatment of the representations of the rotation group, the concept of a subgroup is introduced by way of another footnote. The pure mathematician is likely to find this method of presentation tedious. It may commend itself, however, to the physicist provided he has the necessary stamina to absorb all the technical details exhibited. Basically, the difficulty is that it is doubtful whether any author can write a really satisfactory book for a reader assumed to be ignorant of groups, linear spaces, eigenvalues, Banach spaces, bounded operators, Hilbert spaces, residue classes and the like, which at the same time embodies a substantial amount of the author's own researches on unitary and other linear representations of the orthogonal and Lorentz groups. To fulfil such conditions is a very formidable task and the author has made a commendable attempt to accomplish it.

D. E. RUTHERFORD

FUCHS, B. A., AND SHABAT, B. V., *Functions of a Complex Variable and Some of their Applications*, Vol. I, original translation by J. Berry, revised and expanded by J. W. Reed (Pergamon Press, 1964), 431 pp., 70s.

This book has been written primarily for students of engineering and technology but, containing as it does a wealth of worked examples and an adequate number of exercises with solutions and hints, it could be valuable as a supplementary textbook for honours students in pure mathematics, who would find it easy to read and most illuminating. The subjects considered in the book are mainly those of any first course on complex variable theory but, as would be expected in a book written for applied scientists, considerable emphasis is placed on topics such as conformal mapping and harmonic functions. The treatment is clear, although not modern; complex numbers are treated as vectors, the proof given of Cauchy's theorem is the one using Green's theorem, and several theorems such as that of Morera and the open mapping theorem are quoted without proof. The book is a mine of useful information and can be read with profit by students of complex variable theory at all levels of sophistication.

D. MARTIN

WHYBURN, G. T., *Topological Analysis*, revised edition (Princeton Mathematical Series, no. 23, Princeton University Press; London: Oxford University Press, 1964), xii + 125 pp., 40s.

The first edition of this book, devoted to the proof of theorems of analysis from a topological base, was published in 1958. In this new edition the first five chapters, covering definitions and elementary results in topology and complex variable, and the introduction of the topological index, are unchanged except for the addition of a section on Cartesian product spaces to Chapter 1. The second half of the book has been revised to incorporate new developments in the subject.

One of the major developments has been the discovery in 1960 by E. Connell and A. H. Read, working independently, of topological proofs (i.e. proofs not depending on integration) of the existence of the second derivative of a function analytic in a region. More recently the author, who was aware of the results of Connell and P. Porcelli, has given a simpler method of obtaining them, and this method has been followed in the new edition of the book. It makes no direct use of the openness or lightness of a mapping generated by a differentiable function, but instead appeals to a form of the maximum modulus theorem which was already available and indeed was used previously in proving lightness and openness. As a by-product, new proofs of these topological properties are obtained, and in fact the new proofs are shorter and simpler than those given in the first edition.

For the applications to differentiable functions, the treatment of the topological index may be confined to the simple case of a rectangle, and Professor Whyburn has added a six-page appendix giving such a minimal treatment. Stoïlow's theorem in the large as well as in the small has been included, and also the Vitali and Ascoli theorems.

The revisions have added greatly to the interest and value of the book. There are a number of misprints, some of which have survived from the first edition; those noticed by the reviewer were of a trivial nature. The printing and layout of the book are of the high standard familiar to readers of the first edition. PHILIP HEYWOOD

BACHMAN, GEORGE, *Introduction to p-Adic Numbers and Valuation Theory* (Academic Press, New York, 1964), 173 pp., 24s. 6d.

The first two chapters of this book would form an excellent text for a short course on valuations and p-adic numbers for Honours students. The remaining three chapters, go much deeper and demand more maturity. Valuation rings, places, ordered groups, mappings into ordered groups (with a zero element added) and non-archimedean valuations of general rank are defined and extensions of valuations are studied. A certain number of applications to algebraic number fields are given. There is a useful appendix which serves as a glossary for the algebraic concepts used, but is not intended to make the book absolutely self-contained; for example, Definition 3.2 (p. 77) of the rank of an ordered group demands a knowledge of the concept of order type, which does not appear to be explained anywhere in the text. In the example on p-adic division on p. 40 the digit 3 should be replaced by 2 in each of the four places where it occurs; in the working the digit 4 should, in two places, be replaced by a 3. R. A. RANKIN

F. VALENTINE, *Convex Sets* (McGraw-Hill, 1964), 238 pp., 96s.

This is a clear and rigorous account of the theory of convex sets for both finite and infinite-dimensional linear spaces. Among the subjects treated are the Minkowski metric, the support function, the dual cone, and the theorems of Helly, Krasnosel'skiĭ and Motzkin. The final part contains an interesting collection of exercises, propositions and unsolved problems, and an appendix gives a useful summary of the main