KELLEY, J. L., NAMIOKA, I. AND OTHERS, *Linear Topological Spaces* (University Series in Higher Mathematics, D. van Nostrand Co. Ltd., 1963)

The problems of physics which inspired the originators of functional analysis to remarkable levels of mathematical abstraction found their general setting in the theory of operators in linear spaces. Textbooks on operator theory abound. This is the first comprehensive volume in English dealing with the general linear topological spaces themselves.

Attention is mainly confined to locally convex spaces in which the existence of sufficient continuous linear functionals is guaranteed. Separate chapters are devoted to the basic notions of category, convexity and duality, while the relationship between order and topology is examined in an appendix. The excellent collection of illustrative examples is a feature of the text, but the omission of a comprehensive bibliography is surprising.

The publishers are to be congratulated on their judicious use of variation in typesetting which has made the later volumes in this series such a pleasure to read. This book will form an important addition to any modern analyst's library.

T. T. WEST

CURTIS, CHARLES W. AND REINER, I., *Representation Theory of Finite Groups and Associative Algebras* (John Wiley and Sons) 685 pp., 150s.

This is an important work. In a massive volume the vast topic of representation theory of finite groups and associative algebras has been expounded by algebraists for algebraists. The authors set out to write a book that would be useful both to the expert and to the student. For the latter's benefit they included a generous amount of background material, such as the invariant factor theorem for matrices and an account of classical ideal theory. Yet, the book is hardly intended to make easy reading. The great wealth of material might well daunt any but a fairly experienced reader, although all chapters are preceded by summaries and references to other parts of the book, and some suggestions are made in the Preface to help those readers whose main interest lies in the representations of finite groups. The presentation is lucid and reasonably self-contained; occasionally arguments are based on exercises of earlier sections or even on subsequent results. Some of the exercises are quite difficult and embody substantial parts of theory.

The list of chapter headings indicates the scope of the book: 1. Background from Group Theory; 2. Representations and Modules; 3. Algebraic Number Theory; 4. Semi-simple Rings and Group Algebras; 5. Group Characters; 6. Induced Characters; 7. Induced Representations; 8. Non-semi-simple Rings; 9. Frobenius Algebras; 10. Splitting Fields and Separable Algebras; 11. Integral Representations; 12. Modular Representations.

It need hardly be stressed that the flavour and the general approach is thoroughly modern. Modules and their mappings into one another take precedence over matrices, although the latter are not scorned altogether, and characters, which, of course, give less information than the representation module, are somewhat pushed into the background; they are not defined until page 209.

Even in a volume of this size, it is impossible to give a complete account of all the major results in the field. Some selection had to be made, and it is understandable that the two authors, who have made distinguished original contributions, should have favoured those parts in which they are themselves interested. It was not their intention to concentrate entirely on representation theory and to reduce the preliminaries and accessories to a minimum. For example, as they remark in the Preface, far more material about non-semi-simple rings is included than is needed for modular representations. It would be ungracious to quarrel about personal taste in a work of this magnitude and scholarly excellence. But I was a little disappointed that some of the most interesting recent applications to structure problems of finite groups were merely mentioned without proof at the end of the book, albeit with references to the literature.

There is no doubt that the authors have rendered a great service to all algebraists, who will find in the book an invaluable mine of information. The Bibliography of 17 pages is especially welcomed.

W. LEDERMANN

HILDEBRANDT, T. H., *Introduction to the Theory of Integration* (Pure and Applied Mathematics Series, Vol. XIII, Academic Press, New York, 1963), ix+385 pp., 100s.

This is, to a first approximation, an account of some standard topics in the theory of Stieltjes and Lebesgue integration in their classical forms. The general level is rather above that of a final honours course in a British university (there is also much more material than the possible content of such a course). There is assumed " a basic knowledge of the topological properties of the real line, continuous functions, functions of bounded variation, derivatives, and Riemann integrals ". The chapters are: 1. A General Theory of Limits; 2. Riemannian Type of Integration; 3. Integrals of Riemann Type of Functions of Intervals in Two or Higher Dimension; 4. Sets; 5. Content and Measure; 6. Measurable Functions; 7. Lebesgue-Stieltjes Integration; 8. Classes of Measurable and Integrable Functions; 9. Other Methods of Defining the Class of Lebesgue Integrable Functions, Abstract Integrals; 10. Product Measures, Iterated Integrals, Fubini Theorem; 11. Derivatives and Integrals. The book ends with a list of about a dozen standard references (Lebesgue, Caratheodory, Saks, Halmos, Bourbaki, *et al.*), and an Index. References to original papers are found at the appropriate points in the text (not in footnotes or in a final Bibliography), a practice that has much to commend it. There are about one hundred and thirty exercises spread throughout the book.

The Riemann-Stieltjes integral is approached by way of the general concept of " functions of intervals " and their integrals. Measure and the Lebesgue integral are treated for the most part in the generality of a one-dimensional Lebesgue-Stieltjes theory. On the whole, the author confines himself to the one-dimensional case except in those chapters (3, 10) where a generalisation is necessary.

The presentation is clear and straightforward, and the book is easy to read. There are one or two places where a pedant might prefer a different treatment; for instance, the author's " many-valued functions " could well be replaced by one-valued functions with a different domain of definition. But no analyst with a classical training is likely to take offence. The book seems likely to be a convenient reference for many classical topics, and could with advantage be consulted by anyone giving a course of lectures on the subject.

There is more material here than a student needs to absorb before passing on to more general " abstract " integration theory. Indeed, not everyone may find a detailed discussion of special cases helpful; an abstract approach may be more congenial, in view of the current shift of emphasis in undergraduate mathematics courses. Others, again, may require a usable theory of integration in (at least) locally compact topological spaces, in the minimum time. The choice is like that facing the contemporary traveller: the scenic route through the village, or the by-pass? This is the scenic route.

J. H. WILLIAMSON

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