line, rather than to a course covering a somewhat less concentrated list of topics in real function theory. The first, unarguably positive, change is the addition by the editor of appendices to several chapters; these show how results stated in the original text only for bounded measurable sets can be extended or adapted for unbounded sets. The second, or negative, change is the omission of the last eight chapters of the original work. This brings the scope of the text down to approximately the material needed for a one semester course of measure and integration on the real line, if it is assumed that the student already knows his $\epsilon$ from his $\delta$, lim sup and lim inf, and uniform convergence; all these matters are used freely through the text. The present book ends with the chapter on absolutely continuous functions of one variable and their relation to differentiation and integration. It is easy to agree with the editor that, in an introductory course in measure theory given in a limited time, such topics as singular integrals, transfinite induction, set functions, Baire classification of functions, a little functional analysis, and a chapter of the contributions of Russian mathematicians to the theory of real functions, can be omitted without unfairly distorting the subject. Unfortunately Fubini's theorem has also been lost in this cut; as this is the last of the basic theorems of the Lebesgue theory, it would have been good for the student if it could have been kept available. The author and editor have both displayed considerable knowledge of the subject under discussion. All the kindly reviews of the other versions of this book, as far as they refer to the early chapters, apply as well to this edition. The style of the present work is very smooth; the clarity of the author's discussion is carried into English with none of the stiffness of expression which plagues translators.

M. M. Day

*The construction and study of certain important algebras.* By C. Chevalley. (Publications of the Mathematical Society of Japan, no. 1.) The Mathematical Society of Japan, 1955. 6+64 pp.

This booklet reproduces lectures given by the author in Japan in 1954 on the main topics in multilinear algebra. But the subject is approached from an unusual point of view, the importance of which has only been realized during the last few years, mainly in the recent work on homology and Lie theory; and it is chiefly for the introduction it presents to these new methods that the book is especially valuable, being probably the first of its kind to appear in print.

The main themes of the book are the notion of "*universal*" algebra with respect to a given property, and the notion of *graded* algebra.

The first example of universal algebra is given by the free associative algebra, which forms the topic of the first chapter; of course, it provides at the same time an excellent illustration of the concept of graded algebra (with gradation either in the group of integers or in the group of integers mod 2); the author also develops here the general notion of derivation in a graded algebra, and shows how a derivation is determined in the free algebra by its values at the generators.

Chapter II takes up the theory of tensor algebras and tensor product of modules or algebras. The tensor algebra $T$ of a module $E$ is defined by its universality property (extension of a linear mapping of $E$ into an algebra $A$, to an homomorphism of $T$ into $A$) and its existence is proved by considering it as a quotient algebra of the free algebra generated by the set $E$. The tensor product of two modules is then defined a little artificially by embedding it in the tensor algebra of their direct sum, and its characteristic "universal" property with respect to bilinear mappings is only mentioned later on. It is shown also how derivations can be defined in a tensor algebra, and finally the "skew" tensor product of two "semi-graded" algebras (i.e. with gradations mod 2) is defined in view of applications in chapter III.

The next chapter treats at the same time Clifford and exterior algebras of a module: the first is introduced by its universality property (extension to an algebra homomorphism of a linear mapping $u$ of $E$ into an algebra $A$, such that $(u(x))^2=Q(x)\cdot 1$, where $Q$ is a quadratic form on $E$), and the exterior algebra of $E$ is just the special case corresponding to $Q=0$. The (usually cumbersome) determination of a basis of the Clifford algebra is here achieved very neatly via a general theorem which proves that the Clifford algebra of a direct sum of two orthogonal submodules is the skew tensor product of the Clifford algebras of the submodules. Another novelty is the definition of the trace of an endomorphism by means of a derivation of the exterior algebra extending the given endomorphism. The relations between Clifford algebras, orthogonal groups, and spinors are briefly touched upon (without proofs).

The last chapter is entitled *Some applications of exterior algebras.* After a few words on Plücker coordinates, the main developments are devoted to the definition of the author's "exponential mapping" from the algebra $F$ of even elements of the exterior algebra into itself (introduced already in the author's book *The algebraic theory of spinors*, and which is a nice way of presenting the Papy "reduced powers" with a minimum of computations); this is achieved by means of some clever lemmas on derivations. As an application, the pfaffian of a 2-vector is defined, and an interesting proof is given of the equality of the determinants of an endomorphism and of its transposed endomorphism, both endomorphisms being considered (following another idea of Papy) as restrictions of a single endomorphism of the direct sum of the module $E$ and its dual.

Due to the usual time lag between research and teaching, multilinear algebra, although fundamental in modern mathematics, is still hardly taught (if taught at all) in most universities. It is to be hoped that many professors will avail themselves of the opportunity created by the publication of this little book, and let their students share the experience of the young Japanese mathematicians who first listened to these challenging lectures.

J. DIEUDONNÉ

*Konstruktive Funktionentheorie.* By I. P. Natanson. Trans. by K. Bögel. Berlin, Akademie-Verlag, 1955. 14+515 pp. 36 DM.

The phrase "constructive theory of functions" was coined by S. Bernstein to describe the part of analysis that deals with the approximate representation of functions of a real variable by means of combinations of other functions. Thus it includes the theory of approximation, in various metrics, by polynomials and trigonometric polynomials; the theory of interpolation and approximate integration (formerly known inappropriately as "mechanical quadratures"); large portions of Fourier analysis and the theory of orthogonal functions; and related subjects like moment problems. All this may fairly accurately be thought of as the classical part of the subject. Although its fine structure (to borrow a term from atomic physics) is still undergoing investigation, the main results are at least 25 years old, often much older. There are also a number of topics that clearly belong to the subject but are of more recent development: approximation by translations of a function (and hence Wiener's Tauberian theorems); approximation by entire functions (developed by Kober and Bernstein within the last ten years); weighted polynomial approximation on infinite intervals (here the fundamental problem was finally solved by Pollard, and independently by Ahiezer and Bernstein, in 1953); closure and completeness theorems; extremal problems for polynomials, trigonometric polynomials, and more general classes of functions (currently enjoying a renaissance at the hands of Rogosinski and others); and the theory of special classes of functions that admit simple representations, such as absolutely mono-