theorems including some in projective geometry.

Chapter II (pp. 71–110) is similar in character to Chapter I except that it is concerned with three-space. Chapter III (pp. 111–155), together with Chapters I, II, and VI, gives a reasonably complete account of projective geometry. Chapter V, Differentiation and Motion (pp. 177–196) is somewhat similar to the development by classical vector analysis. It treats among other things velocity, acceleration, curvature, central motion, and displacements in space. In Chapter VII, The General Theory (pp. 217–249), the central ideas are linear dependence and the various products of extensives. Determinants enter the picture by way of the fact that if $b_1, \cdots, b_r$ are each linearly related to $a_1, \cdots, a_r$, then $[b_1 \cdots b_r]=D[a_1 \cdots a_r]$, D being the determinant of the coefficients in the linear relationship. Chapter VIII (pp. 250–264) gives the application to linear equations and determinants. With regard to linear equations the modus operandi is to multiply each equation of the set $a^r_c x^c = b^r$ by an extensive e_r and add, thus $e_r a^r_c x^c = e_r b^r$. This reduces N equations in N unknowns to a single equation in extensives. The familiar theorems on the solvability of equations follow with marked simplicity. The treatment of determinants like the book as a whole is characterized by the wide scope of the material which is intelligibly presented in a relatively small space. Chapter IX (pp. 265–294) treats transformations, square matrices, and central quadrics—mostly well known material in slightly different dress. The remaining chapters are devoted to: the screw and linear complex, the general theory of inner products, circles (two chapters), the general theory of matrices, quadric spreads, and algebraic products.

HOMER V. CRAIG

Introduction to the theory of relativity. By Peter Gabriel Bergmann with a foreword by Albert Einstein. New York, Prentice-Hall, 1942. 287 pp. $4.50.

Many excellent books have been written on the Theory of Relativity. Although some of them appeared more than twenty years ago they are still read and studied, far from being regarded as antiquated. The books of Weyl, Pauli, Eddington are justly looked upon as classics in this subject. To say that Bergmann's book is in the same class as the books just mentioned means great, but deserved, praise.

Bergmann's book has its own character, and differs from the other books on Relativity Theory which have appeared up to now. First, it is more modern. The application of Relativity Theory to the Theory of Cosmic Rays, to Sommerfeld's relativitistic theory of the hydrogen atom, de Broglie's waves, Ives' experiments, Compton's effect, all these topics have found their proper places in Bergmann's book. But the advantage of having all these subjects included in a book on Relativity Theory does not, in itself, mean very much. Relativity Theory had changed but little in the last twenty-five years and all these additions are not very important from the point of view of Relativity Theory. Much more important for the evaluation of this book is the originality of the author's approach.

Someone may look for a book on Relativity Theory which states clearly and axiomatically the assumptions of this theory and develops deductively the conclusions from these assumptions. This is not what Bergmann's book tries to do. What it tries to do, and does excellently, is to show how we were compelled to adopt these assumptions, how the structure of Relativity grew from logical contradictions in the classical theory, how their removal leads naturally and simply to the Theory of Relativity. The author presents not the painful historical process, not how Relativity was discovered, but how it should have been discovered if we had known the simple and straight road of logic leading to its formulation. Even in Relativity Theory, created almost by the genius of one man, this difference between the historically and logically reconstructed process is remarkable; it is the difference between the broad highway and the pioneer's narrow pathway.

The author succeeds well in presenting the development of Relativity as a logical necessity. The book is always free from the dogmatic dull textbook tone and often achieves dramatic qualities. The style is clear and simple.

The book is divided into three parts. The first part (pp. 3–147) contains the Special Relativity Theory. Tensor algebra is included in this part. Tensor analysis is partially in this part, partially in the second part. Though from the structure of the book it is clear why the author did it, I have my doubts whether this was the best possible solution. Compared with the material of other books, one finds in this part modern examples from Quantum Theory, but misses the Minkowski representation.

The second part (pp. 151–242) contains the General Relativity Theory. The transition from the Special to General Relativity Theory is remarkably good. The whole chapter shows the natural development of the essential ideas in General Relativity Theory; difficult concepts are introduced in a very interesting and simple, though never superficial manner. When comparing it with other treatments, we note the omission of cosmological applications (treated so well in Tolman's book) and of time-space measurements in connection with the experimental verifications of General Relativity Theory. On the other hand much space is devoted to the equations of motion as deduced from the field equations.

The third part (pp. 245–279) is of much more special character and deals with the unification of the gravitational and electromagnetic field. Here we find an exposition of Weyl's and Kaluza's theories and of their generalizations on which the author collaborated with Einstein. This part will rather interest specialists than students.

The book is well designed. The title of the book is too modest. It is not an introduction; it is an excellent book on the principles of Relativity Theory.

L. INFELD

Degree of approximation by polynomials in the complex domain. By W. E. Sewell. (Annals of Mathematics Studies, no. 9.) Princeton University Press, 1942. 9+236 pp. $3.00.

The main subject of this book is the relation of the analytic and continuity properties of a function inside and on the boundary of a region, and the degree of approximation by polynomials. It is related to the analogous questions for functions of a real variable and approximation by trigonometric sums, as presented in treatises of C. de la Vallée Poussin, S. Bernstein, D. Jackson and G. Szegö. The problems of the present work originate with the fundamental theorem that a function analytic in a Jordan region and continuous in the closed region can be uniformly approximated by polynomials. This was proved by J. Walsh in 1926. His treatise *Interpolation and approximation by rational functions in the complex domain* (Amer. Math. Soc. Colloquium Publications, vol. 20, 1935) is an important forerunner to the present book.

This book is divided into two parts. Part 1 (Chapters II, III, and IV) is devoted to a study of the relation between the degree of convergence of certain sequences of polynomials $p_n(z)$ to a function $f(z)$ on a point set E in the z-plane on the one hand and the continuity properties of $f(z)$ on the boundary C of E on the other hand (Prolem α). Recent contributions to Problem α are due primarily to J. Curtiss, Sewell, and Walsh.

In Part II (Chapters V–VIII) a more delicate problem is considered. Let E with boundary C be a closed limited set, whose complement K is connected and regular; thus a function $w=g(z)$ maps K conformally on the exterior of the unit circle $|w|=1$ in the w-plane so