Theoretical Mechanics. A Vectorial Treatment. By C. J. Coe. New York, Macmillan, 1938. 13+555 pp.

This treatise on classical mechanics contains in fourteen chapters 534 pages of text. In the first chapter the author discusses briefly the divisions, postulates, and validity of mechanics. The second of these is more extensively considered in Chapter XII on the General Principles of Mechanics, such as: Lagrange's Equations, Hamilton's Principle, Least Action, and Gauss' Least Constraint.

The second chapter deals with Rectilinear Motion of a Particle making use of the customary scalar calculus method. This is followed by a long chapter on the theory of vectors through the double cross-product and simple differentiation and integration of vectors. More of the calculus of vectors is presented in Chapter XIII as a foundation for the proof of Stokes' and Green's Theorems and a final chapter on Potential Theory.

From the second chapter onward the vector approach is used consistently and beautifully effectively in presenting the theory by classifying vectors as free, sliding, or attached. However, in applications, the solution is frequently effected principally by scalar calculus. Many of the more advanced theorems of classical mechanics are stated and proved by vector analysis. The particular order of presentation postpones a treatment of statics until Chapter VII, where it is considered to be a special case of zero acceleration and velocity.

Chapters VII to XI discuss: Statics of a Particle and of a Rigid Body, Statics of a Flexible Cord, Principle of Virtual Work, Kinetics of a Particle and Kinetics of a Rigid Body. Some topics of considerable technical importance, such as the elastic catenary, impact, and cases of chains involving variable momentum are not included.

In the introduction the author states that "this book presents sufficient material for an introductory and advanced course each running through the year." It is an excellent procedure for a serious student of mechanics to take a two-year course such as this book provides. He will thus obtain a knowledge of vector analysis and at the same time acquire considerable facility in its use in the field of mechanics. Unfortunately, in most undergraduate curricula there is not sufficient time allowed for a student of mechanics to follow this procedure.

Apparently the trend in technical schools is rather away from heavy courses in mechanics than towards them. The teacher finds himself forced to do the best he can with the usual preparation in calculus, no matter how desirable a knowledge of vector analysis may be in a study of analytic mechanics. For this reason, the reviewer doubts that Professor Coe's treatise will find broad use in undergraduate courses. However, for advanced students wishing to combine a study of vector analysis with mechanics, or for students specializing in mechanics, it appears to be a very fine presentation.

J. B. REYNOLDS

Introduction to Bessel Functions. By F. Bowman. London, Longmans, Green, 1938. 135 pp.

Chapter I (19 pages) gives elementary properties of Bessel functions of order 0, and comments (without proofs) on expansions of "ordinary functions of mathematical physics" in terms of orthogonal Bessel functions of order 0. Chapter II (21 pages) derives some partial differential equations and sets up and solves some boundary-value problems. These problems are well chosen to exhibit standard methods of solution. The problems are not carefully phrased in that nothing is said as to whether the differential equation is to be satisfied at points on the boundary, or indeed whether there is to be any condition whatever (such as continuity, etc.) connecting values in the interior with values on the boundary. The solutions are formal; for example, on page 39 we find the assertion that a function v defined by an infinite series $v=\sum A_n v_n$ (the A's being undetermined arbitrary constants and the v's being functions of r and t) satisfies a differential equation and the condition $\lim_{t\to\infty} v(r, t)=0$ "since this is true of every term."

Chapter III (16 pages) discusses briefly Bessel functions of order 0 when the argument is pure imaginary, and gives applications to problems in alternating currents. Chapters IV and V (30 pages) give definite integrals and asymptotic expansions involving Bessel functions of order 0. Chapter VI (35 pages) gives fundamental properties of Bessel functions of real orders, and finally Chapter VII (13 pages) gives applications of them.

The book contains about 150 exercises and problems, many of which consist of several parts and most of which require proofs of identities involving series or integrals. The emphasis in the book is on formulas and identities rather than on rigorous methods of obtaining them. The reviewer feels that the book would be made more useful if numbers of displayed formulas were placed before rather than after the formulas, and the space after the formulas were used to specify the ranges of the parameters for which the formulas hold. The choice of notations and printing is good except for an annoying similarity of two microscopically different Y's which denote different Bessel functions. Finally, the reviewer must report (for the attention of authors and publishers) that the binding of his copy of the book cracked badly in spite of a careful attempt to open the book without tearing it apart.

R. P. Agnew

Advanced Analytic Geometry. By A. D. Campbell. New York, Wiley; London, Chapman and Hall, 1938. 10+310 pp.

Professor Campbell envisages a student who had a rudimentary course in plane analytic geometry in which oblique axes have not been mentioned. The algebraic equipment of the student may exceed somewhat the usual course in College Algebra of our American schools, say, in the matter of determinants, but he cannot be relied upon to be familiar with Sylvester's method of elimination (p. 93). His knowledge of derivatives hardly goes beyond the definition of the term.

This student Professor Campbell undertakes to "introduce to the analytic side of projective geometry." The author realizes that he will have to confront his student with a vast number of new ideas, both analytical and geometrical, and that the student may have difficulties in assimilating new concepts coming in such rapid succession. To meet the situation the author deliberately sets out to remove from the path of the learner every obstacle that can possibly be removed. He begins by picking out a considerable number of topics which are usually dealt with, or made use of, in analytic projective geometry, but which can be treated independently of that subject. He puts this material in the front part of the book, to form preliminaries, or an introduction, to the subject proper. Thus he discusses affine geometry, linear transformations, groups, anharmonic ratio, families of conics, etc. Then he develops each topic gradually, with plenty of examples, without sudden jumps, and with constant regard to the mathematical equipment of the learner. By the time this part of the task is done, the author has not only completed about half of his book, but has produced something that constitutes a rounded whole in itself, and well worth the while of anyone who would drop the subject right there.