SHORTER NOTICES

Exercises d'Analyse. Vol. 4. By Gaston Julia. Paris, Gauthier-Villars, 1935. iv+230 pp.

This is a fourth and worthy companion volume to the other three volumes of *Exercises d'Analyse* by the same author. It is given over wholly to the solutions of fifty-five problems in partial differential equations of the first order. Again, as in the earlier volumes, it is a set of exercises which figure in the program of certification of the differential and integral calculus at such institutions as the École Normale Supérieure and the Sorbonne, and which constitute further material supplementary to Goursat's classic *Cours d'Analyse.* Students preparing for the examinations of the licence and the agrégation will, of course, work through these volumes.

Some few of the problems are of such character that they might be treated in an elementary first problem course in differential equations,—exercises, for example in solving: (1) systems of the form

$$\frac{dx}{dt} = f_1(x, y, z), \quad \frac{dy}{dt} = f_2(x, y, z), \quad \frac{dz}{dt} = f_3(x, y, z);$$

(2) total equations $Pdx+Qdy+Rdz=0$; (3) linear partial differential equations $Pp+Qq=R$; (4) the more general equation $f(x, y, z, p, q)=0$, where the methods of Lagrange and Charpit may be used. For the most part, however, the problems are of a theoretical nature and suitable only to give to more mature students. Many of the exercises are solved in more than one way, and thus the established spirit of the series is maintained. Most of them are taken from past examinations, Paris predominating, some even dating back to the 1870's. More new material might have been included.

Problems with boundary conditions are treated only slightly and singular solutions not at all. Numerous applications are made to the field of geometry but none to physical problems. Free use is made of methods employing geometry, with and without coordinates, and also of the complex variable.

The printing is well done, on paper of improved quality.

C. O. Oakley

Cours de Cinématique. By Gaston Julia. Edited by Jean Dieudonné. Second Edition. Paris, Gauthier-Villars, 1936. 161 pp.

The writings of French scientists in general are undoubtedly outstanding for their grace and elegance of style. There is a smoothness and ease of development, with nevertheless a completeness and rigor, which makes them fascinating for reading and study. This little volume continues that tradition.

The author begins with the kinematics of a point and develops the elementary theory by a combination of vectorial and analytic methods.

In the second chapter the motion of a rigid body is considered, the broad general principles being given. The helicoidal motion of a set of moving axes is discussed and then it is shown that the most general motion of a rigid body can be described as a helicoidal motion. The helicoidal movement gives the velocities but not the accelerations. This is pointed out, but it might have been useful to account for this difference by pointing out the distinction between vectors and vector quantities.

Chapter III deals with the relative motions of different systems of axes and the composition of relative motions, and after developing the general principles makes various applications, including treatments of the methods of Poinsot and Roberval. The discussions here are principally for the two dimensional case, but in Chapter IV the application to sets of moving coordinate axes in space is made.

The remaining chapters deal with more detailed study of the motions of rigid bodies. Chapter V is devoted to plane motion. The theory of the instantaneous centre is developed, and also the method of describing continuous plane motion by the rolling of one curve on another. The formulas of Euler and of Euler-Savory are obtained, and the graphical construction of Savory for relating instantaneous centres is given. Several applications are made, including a discussion of various types of epicycloids.

In Chapter VI the motion of a rigid body with one point fixed is considered. This is done by studying the motion of a sphere, with centre at the fixed point and radius arbitrary, relative to a fixed sphere having the same centre and radius. This permits of the description of the motion by means of curves on these spheres rolling on each other, just as in the case of plane motion.

The final chapter deals with the general motion of a rigid body. Use is made of the line complexes formed by the normals to the trajectory of a point and by the tangents to a trajectory, and motion is described by the rolling of one surface on another.

All told, the author has given a very thorough and well organized development of his subject. The notation used is simple and consistent. Vector and coordinate modes of expression are intermingled, and the free and natural choices that have been made render the discussion easy to follow.

There are slight inconsistencies in two or three of the Figures but these are not serious, and the number of typographical errors noted was small.

J. W. CAMPBELL

Statistical Mechanics. By R. H. Fowler. Cambridge, University Press; New York, The Macmillan Company, 1936. Second Edition. 864 pp.

The publication of a new enlarged edition of Fowler's treatise on statistical mechanics brings forcibly to the reader's attention the rapidity with which work in this field has progressed since 1929. There is a wealth of new material presented both from the theoretical and experimental side and the order of presentation has been changed by introducing the quantum mechanical point of view from the outset and omitting all reference to the older Bohr theory.

The mathematical methods utilized in the first edition remain essentially unchanged, and as these have been reviewed so ably in this journal by M. H. Stone (vol. 39 (1933), p. 850) it is hardly necessary to comment further on