equations, including trigonometry, plane and solid analytic geometry, empirical equations, differential and integral calculus, calculus of finite differences, and the harmonic analysis of periodic functions. The extensive use of graphs and illustrations is indicated by the fact that the book contains 409 figures. In addition to many worked examples there are almost 800 exercises. A few of the examples and exercises are taken from the examination papers of Cambridge, the University of London, and the Board of Education, but a very large number are related directly to technical applications.

One might expect almost anything in a book with the title "Mathematics," but when the subtitle "A textbook for technical students" is added, the contents are accurately described. This volume contains practically everything that goes to make up the mathematical equipment of a graduate of one of the best American technical schools. There are, of course, variations. Some topics are treated less extensively and some receive more attention than in our usual curricula, but the reviewer knows of no other single volume which covers so nearly the ground that is commonly regarded as desirable in our technical schools.

W. R. LONGLEY

Science and First Principles. By F. S. C. Northrop. New York, Macmillan, 1931. xiv+299 pp.

In the preface it is stated that the first principles "involved in a given verified theory are those which it takes as primary" and that the author's "task is the purely impersonal and objective one of dissecting the given scientific theories which our technical scientists have verified, to determine what concepts and principles are taken as primary or undefined." The analysis is centered mainly on relativity, quantum theory, and biology. Since the treatment is not convincing to the reviewer, some main conclusions will be presented in the author's own words; usually the conclusions are reached by the author in connection with an elaborate argument. The following quotations are from pages 120, 202, 270, 280, 288, respectively. "We have but to bring these different requirements together to discover that this universe must be constituted not only of the moving microscopic atoms of the traditional atomic theory but also of one large physical macroscopic atom, spherical in shape and hollow in its interior except for its inner field, which surrounds and congests them." [The foregoing conclusion is reached by means of an analysis of relativity.] "Thus we find biological evidence giving us an entirely independent argument for the existence of the macroscopic atomic theory." "In the first place, the macroscopic atom is a primary substance, with a determinate conscious experience. Secondly, were it not present neither nature nor man would exist; all would be flux." "The spherical shell of the macroscopic atom is a tremendous object off at the edge of the whole physical universe." "Once the traditional theory of first principles is supplemented with the addition of this atom, the problem of knowledge is resolved."

R. D. CARMICHAEL

The Emergence of Life. By John Butler Burke. Oxford University Press, 1931. ix+396 pp.

In the subtitle this book is described as "a treatise on mathematical philoso-