by this omission. The emphasis throughout is laid upon that which is practically useful, and the usefulness is illustrated by actual problems taken chiefly from the modern literature of physical chemistry. In general, the book leaves little to be desired, and can be warmly recommended to the many who are in search of a guide more practical than the usual formal treatise upon pure advanced mathematics. THEODORE W. RICHARDS.

TEXT-BOOK OF ELECTROCHEMISTRY. BY SVANTE ARRHENIUS, Professor at the University of Stockholm. Translated by JOHN MCCRAE, PH.D. New York: Longmans, Green & Co. 1902. xi + 344 pp.

The first chapter deals very briefly with the many fundamental conceptions, definitions, etc., necessary to a study of the subject; but the arrangement of this matter could be improved. Polarization is here the first topic touched, and it would seem more logical to let this follow the definitions of atomic weight, of temperature, electrolysis, and other such matters, some of which in fact need not be defined in a book on electrochemistry.

The second chapter is a brief one on the early history of the subject, in which much more space is devoted to the Grotthus theory than to Faraday's facts.

The third chapter covers in a concise and clear manner the laws of gases and of their application in the case of solutions. It has, however, not been shown that van't Hoff's generalization of the gas laws to solutions applies to "all finely dispersed material." Suspensions, at least, may form an exception.

The subject of properties of solutions is then fully treated. Two pages devoted entirely to valency and entitled "Review of Results Obtained," do not seem of use.

The subject of chemical equilibrium is well treated in Chapter VI.

Following the unfortunate lead of Ostwald and of Nernst, Arrhenius considers that the identical light absorption of the various equally dilute permanganate salt solutions is proof of the dissociation theory, and leaves the reader to assume that the color of the ions is a splendid support of the theory. Any one who looks into this point carefully will find it very complicated. The depth of color of salt solutions of colored ions does not change, as does the electrolytic dissociation, with the dilution. In illustrating the

process for determining the transport number, one unfortunate sentence may bother the student a little. Potassium chloride is being electrolyzed and the author states that by analysis after the electrolysis, the increase of potassium about the cathode and of chlorine about the anode enable one to make the calculation. The disposition of the deposited chlorine and potassium should have been discussed here.

The subject of electrochemistry is treated in its widest significance so that many of the physical properties of solutions are carefully considered; therefore, the work practically covers a course on the physical chemistry of solutions as this is now understood.

Two-thirds of the book are devoted to purely electrochemical topics. The treatment of each topic is concise and the selection of topics so complete that it may safely be asserted that no other English work on this subject contains so much in so small space.

The treatment of potential differences, of surface tension, and the mercury electrometers, is well connected. Six pages are devoted to a very fair treatment of the lead accumulator. The Gretz aluminum rectifying cell is also described. Several pages are devoted to practical electrochemical analysis and to copper refining.

Chapter XVII contains brief descriptions of the Peltier and the Thomson Effects, and contains also a couple of pages on the electric arc. There then follow a dozen pages dealing in a practical way with the various classes of the electric furnace and a final discussion of the effect of silent electrical discharges.

Usually when an important discovery is mentioned in the text, an interpolated number refers the reader to the original article. In this way, about 300 original references are made available. In a book of this kind such a scheme is commendable.

Very considerable credit is due to Dr. Euler and to Dr. McCrae for the improvements on the original Swedish work, which was brought up to date and translated into German by the former, and well translated into English and improved with the literature references by the latter.

The mathematics frequently employed do not extend beyond the elements of the calculus.

Because of the breadth of field treated and the general good quality of the treatment, the book is one of the best on the subject. W. R. WHITNEY.

PHYSICS. TEXT-BOOK FOR SECONDARY SCHOOLS. BY FREDERICK SLATE, Professor of Physics, University of California. New York: The Macmillian Co. 1902. xxi + 1414 pp. Price, $2.00.

The seventeen-page preface convinces the reader that the author is preparing a book from a mind trained for teaching natural science. He has clear views as to the pedagogic functions of such a work, and is consistent even to his unwillingness to confuse the mind by pictures of things which can be actually seen in the laboratory. The preface will be instructive to the many teachers who are to read it.

About 100 pages are devoted to the properties of matter; approximately an equal quantity to heat; and the subjects of sound, light, and electricity are also quite fully treated. Besides the index, there is a list of references for collateral reading, an outline of 180 experiments, and a compilation of over 100 interesting questions. The experiments are also especially carefully selected and worded,—there are no cook-book directions. The book is a readable Physics, and is not replete with definitions for the anxious student to commit to memory. He is forced by the arrangement to think for himself. In fact, there is hardly a direct definition in the book. The author's plan is to give the necessary information upon a subject through the discussion of phenomena or of experimental facts, and he usually concludes with a statement that "such a phenomenon is known as diffusion," for example, or "this is called the latent heat". The matter chosen for discussion is well fitted for use with classes of students who are being encouraged to think independently, and is made interesting by the method of presentation. On the other hand, the depth to which each topic has been sounded will prevent even the most advanced of its students from feeling superiority to the treatment. It has evidently been prepared by one who has given the entire subject most careful attention and it should prove to be a very useful book. W. R. WHITNEY.

ESSAYS IN HISTORICAL CHEMISTRY. BY T. E. THORPE. The Macmillan Co.: London and New York. xii + 582 pp. Price, $4.00.

In this book are gathered sixteen addresses which have been