

between the dissociation of strong electrolytes and the requirements of the law of mass action are considered at the end of the chapter on equilibria among several electrolytes and the various attempts to account for this are given. The idea, that the methods of determining the amount of dissociation are at fault, does not harmonize with the previous attempts to show that the various methods of determining the dissociation give concordant results. The last chapters touch on some of the difficulties encountered by the theory in non-aqueous solutions, many cases of instantaneous reactions are known although the solutions show no measurable conductivities. It is pointed out that the ions have a very great capacity for reaction so only small dissociation is needed and in view of the great influence of water on the rate of a chemical reaction, it is necessary to show in these cases that this substance is really absent. To the opponents of the theory it is suggested that "we are not accustomed to tearing down a habitable house and putting ourselves out on the street because a few rooms are illy lighted, unless it be we can move into a better one."

As collateral reading for a course of lectures or for students in analytical chemistry this little book should find a place. The equations are developed very simply and the beginner will find here explanations of many things which would otherwise be "rule of thumb." If the beginner lacks a sufficient knowledge of electrochemistry to comprehend some of the points, it is probable that too much detail would cause him to lose interest or miss the main relations. If it appears to some that undue prominence is given to the favorable side of the theory at first, it is to be remembered that this is more or less customary. The beginner learns for example that the volume of a gas is inversely proportional to the pressure to find later that this holds only for restricted domains of a comparatively few gases. The translation seems to have been well done. It is more usual to use the term "cell" than a literal translation of the german "kette."

GEORGE A. HULETT.

ELECTROCHEMISTRY. H. DANNEEL. Translated by Dr. E. S. Merriam. 181 pages. Price \$1.25. Wiley & Sons, New York.

The author considers that theoretical chemistry and electrochemistry are so intimately related that a knowledge of one presupposes a knowledge of the other. In treating the subject from this standpoint the author has emphasized the fact that the development of electrochemistry has materially affected our chemical theories and that it is an important aid in the investigation of chemical problems.

Work, current and energy are the first subjects treated. Seventy pages are devoted to a consideration of chemical equilibrium, the theory of electrolytic dissociation and conductivity. The treatment of these subjects is necessarily brief. The beginner must take much for granted, particularly in the development of equations, but there is here a good review for the

more advanced. With this foundation the author has given the essential features of electromotive force, galvanic current, polarization and electrolysis, in a compact and connected form. This makes a readable little book which should find a place among our electrochemical textbooks.

The derivation of the gas equation from the laws of Boyle's and Gay Lussac (p. 17-18) should be either more complete or only the final result given. The equation  $p_v = p_0 v_0 (1 + at)$  is not the product of the two equations given. The combination of the two laws depends on a proposition in variations and it might not be out of place to state this proposition in chemical text books for then the derivation is direct and simple and avoids the usual cumbersome, and generally to the beginner, misleading derivation. On page 79 and 81 the term "specific conductivity" is used, where no doubt specific conductance was intended. GEO. A. HULETT.

THE PRINCIPLES OF QUALITATIVE ANALYSIS, FROM THE STANDPOINT OF THE THEORY OF ELECTROLYTIC DISSOCIATION AND THE LAW OF MASS ACTION. BY WILHELM BÖTTGER, Privat-docent in the University of Leipzig. Translated with the author's sanction and revised with his co-operation by William Smeaton, Instructor in General Chemistry in the University of Michigan. Price \$2.00. Pp. 300 and XVI. P. Blakiston's Son & Co., Philadelphia, 1906.

The treatment of Qualitative Analysis from the point of view of the application of the equilibrium law to its reactions, as first demanded by Ostwald, appears now indispensable for a thorough comprehension of its methods and consequently for an intelligent completion of an analysis. On the other hand Qualitative Analysis affords splendid material, from a purely pedagogical point of view, for making a student thoroughly familiar with the application of these fundamental laws of chemistry to the most varied chemical changes; there is quite a difference between learning such laws and knowing how and where to apply them in the complex phenomena of most chemical changes. The study of analysis from the point of view mentioned has therefore the twofold advantage of developing keener, more intelligent analysts, and of developing better chemists through analysis. In Böttger's Qualitative Analysis, we have a very laudable effort to present the subject thoroughly and consistently from this point of view and without detriment to the purely analytical value of the book. For the trained, mature chemist and analyst, it is full of sound, interesting material and discussions. But it seems to the writer that pedagogically the treatment has been carried out in an extremely weak and confusing way and that this book in the hands of beginners in analysis would rather confuse than help them. There is no need at all for such an effect, for the treatment from the physico-chemical standpoint can be made pedagogically, simple, logical, direct and convincing. We note for instance that the treatment of complex ions (p. 16) precedes the presentation and application of the mass-action law (p. 33) and thus has become practically un-