back farther than the beginning of the XIII century, and that they never did exist in Arabic; the MSS. said to be found in the Paris Bibliotheque Nationale and which have been translated into Latin and modern languages are fictitious.

In a larger part of the volume the subject is treated in a series of biographies; this, however, is natural where the discoveries of certain individuals exerted radical changes in the philosophy of the science.

In Parts IV and V the development of modern chemistry is well set forth, and every student of the science would do well to read and absorb these chapters early in his curriculum.

Professor Venable names a chemical periodical established as early as 1697 by Stahl.

An excellent feature of the work is its fair-mindedness, giving credit where credit is due. This remark is, perhaps, superfluous, as the book is American; but after Jagnaux' great volumes, written to prove that chemistry is a French science and the polemical writings of certain German authors, one can not but recognize the impartiality characteristic of American writers.

A few illustrations, portraits, and representations of original apparatus would have enlivened the volume; perhaps these can be introduced in a second edition. The proof-reading is excellent. There is an index. H. C. BOLTON.

QUANTITATIVE CHEMICAL ANALYSIS BY ELECTROLYSIS. BY DR. ALEXANDER CLASSEN. AUTHORIZED TRANSLATION, SECOND ENGLISH, FROM THE THIRD GERMAN EDITION, REVISED AND GREATLY ENLARGED. BY W. H. HERRICK, A. M. New York: John Wiley & Sons. 1894. Price $3.00.

It is now twelve years since Professor Classen published the first edition of this book. The little volume of about fifty pages contained a systematic description of the methods then practiced in the laboratory at Aachen, little or no attempt being made to include the results that had been obtained elsewhere. An entirely rewritten and much enlarged second edition was issued in 18 6. In this, electrolytic analysis is treated as an independent branch of quantitative analysis, but while the methods proposed and worked out by the author and his associates are fully presented, only occasional reference is made to the researches of

other experimenters: "Nach eignen Methoden," still remained the device of the book.

A third edition, of which the subject of this review is a translation, appeared in 1893. The author now evidently attempts to present a complete treatise on electrolytic analysis. The numerous controversies with other chemists, and the adverse criticism of some of his methods, have induced him to revise and modify considerable portions of the text, and to introduce many methods developed and described by others. Nevertheless the book is not entirely free from the defects of its earlier editions. Especially is it to be regretted that Prof. Classen has not thought it worth his while to give references to the original papers.

The most satisfactory part of the work comprises the introductory chapters; the descriptions of the apparatus used for generating, reducing, and measuring the current are very complete, and leave little to be desired. The Gilcher thermopile might, perhaps, have replaced the older constructions, and some of the obsolete forms of galvanic cells might have been omitted. The translator has made some very judicious additions, describing devices used in American laboratories.

Under "Determination of the Metals" much new matter has been introduced. Great stress is laid upon the proper control of the current, and, whenever possible, the normal density is given. Most of the space is allotted to the precipitation of metals from solutions of their double oxalates, and it is tacitly assumed, that this is in most cases the best method. Prominence is also given to the electrolysis of the sulphosalts of antimony and tin—a method improved by Classen—and the deposition of metals from solutions of their pyrophosphates (Brand). The names of Smith and Rüdorff appear very frequently, but we do not find that the directions for carrying out their processes are always adequate, and not a few of the American chemists' methods are entirely omitted.

This criticism applies even more strongly to the section on the separation of the metals. While excellent results are doubtless to be obtained by the use of many of the methods described here, it can not be denied that some are not separations at all (iron from cobalt, nickel, and zinc, etc.), and others are not

electrolytic separations. It seems to us that in many cases the author could have substituted, with advantage, the electrolytic processes, which have been proposed by others in recent years.

Professor Herrick's translation is excellent in every respect; while it closely follows the original text, it contains numerous very valuable additions. H. F. KELLER.

LABORATORY MANUAL AND PRINCIPLES OF CHEMISTRY FOR BEGINNERS. BY GEORGE M. RICHARDSON, ASSOCIATE PROFESSOR OF CHEMISTRY IN THE LELAND STANFORD JUNIOR UNIVERSITY. pp. 233. New York: Macmillan & Co. 1894. Price $1.10.

This book is, as the author states in his preface, "principally intended as a *laboratory manual*," and the course of experiments "arranged for the elementary students of chemistry in this university." It is in two parts, Part I (pp. 84) consisting of a course of laboratory experiments, and Part II being devoted to theoretical chemistry.

While many of the laboratory experiments contained in Part I are instructive and well adapted for their purpose, and well suited for beginners, there are also many with which fault may be found.

In some instances these experiments involve the use of rather complicated pieces of apparatus requiring an expenditure of the student's time to get together and set up which is out of proportion to the importance of the fact to be taught by the experiment itself; in other instances the time and work required to perform the experiment are in like manner excessive when taken in comparison with the importance of its object.

But a far more serious fault than this lies in the difficulty of most of the quantitative experiments, of which there is a very considerable number, "greater," as the author states, "than is commonly found in such laboratory manuals."

Most of these quantitative experiments are decidedly beyond the ability of the average beginner in chemistry to perform with any degree of accuracy, and some of them can yield accurate results only in skilled hands.

It is far worse than useless to require a student to perform quantitative experiments without also requiring of him accurate results; hence, if quantitative work is to be given to the beginner