"All known to me are later than the discovery, and none have been found in ancient burials." He is fully sustained by facts in his historic doubt 'that wampum belts were made by the prehistoric Indians.' When the New York bulletins on archæology reach the use of shell articles, I hope, should I prepare that paper, to show this in detail. The material is in hand, but not yet arranged. Meanwhile it is certain that the early interior inhabitants of New York knew little of shell beads at all.

W. M. BEAUCHAMP.

SCIENTIFIC LITERATURE.

Practical Plant Physiology; an Introduction to Original Research for Students and Teachers of Natural Science, Medicine, Agriculture and Forestry. By DR. W. DETMER, Professor of Botany in the University of Jena. Translated from the second German edition by S. A. MOOR, M. A. (Camb.), F. L. S., Principal of the Girasia College, Gondal, Kathiawad, India. With one hundred and eighty-four illustrations. New York, The Macmillan Co.; London, Swan, Sonnenschein & Co. 1898. 8vo. Pp. xix + 555. Price, $3.00.

The laboratory method of study finds variable application in the several departments of botany, but in none is it so typically and profitably serviceable as in the domain of physiology. The strong chemical and physical bias which pervades the subject permits almost every vital operation of the plant to be brought under control by chemical or physical methods. As changes and movements in plants are usually slow, the greatest delicacy of method and apparatus is often required to secure intelligible results. In consequence of these facts the laboratory part of instruction in vegetable physiology is destined to become varied and extensive, and to take form slowly.

It is to the credit of Dr. Detmer, of Jena, that he presented to the botanical public the first manual in any language for the guidance of the student in vegetable physiology. It was a work of over 350 pages, issued in 1888, and although at the time it was said by some of his colleagues not adequately to represent the current state of the science, yet time has shown that for an initial work it was exceptionally well achieved, and that to produce a more representative and serviceable volume has been a task that few have since attempted. After a decade the work has passed into a second edition, so much changed and amplified as to almost constitute it a new book, but retaining the characteristics that have made its predecessor so acceptable to many instructors and students.

Although a French edition appeared in 1890, no English version has been prepared until the present time. That it has now been made available to the English-speaking student will be welcome information to many instructors who have heretofore made less use of the work than desired. It is gratifying to find that the translation has been well done, and that it adequately expresses not only the facts of the volume, but the sense of the author's personal interest, which lends a charm to both German and English versions. An unusual feature of the translation is the rendering of the whole volume without addition or alteration. This is, in some respects, a good method, as one receives from the hands of the translator the unsophisticated result of the author's labor, but when it extends to the translation of an appendix giving the places in Germany where apparatus may be obtained, it seems as if the substitution of names of firms in the countries where the book is expected to be used would have been a meritorious deviation.

The outline of the work embraces the food of plants, the molecular forces in plants, metabolic processes, movements of growth and movements of irritation. It contains but little matter not truly a part of physiology, according to strict interpretation of the term. The two hundred experiments, or, more properly speaking, studies, into which the work is divided, cover a great variety of topics and are drawn largely from the memoirs of the most distinguished investigators. But it is to the labors of the author in testing, modifying and adapting the experiments to the condition of pedagogical requirement that give them much of their value in this connection.

It would be easy to find fault with some parts of the work. The first experiments given in the book, those of water cultures, are likely to prove discouraging to the beginner, as they re-

quire much attention, extend over a long period, and are often failures owing to conditions that require experience to foresee and control. Some of the experiments require technical knowledge and skill not to be expected of the average pupil who presents himself for this class of work, as, for example, where the directions say to determine the nitrogen by Kjeldahl's method or by Stutzer's method, and with a reference to a chemical treatise proceeds to the next step in the experiment as if the quantitative determination of nitrogen were an everyday affair in a botanical laboratory.

But these defects, or limitations, may be dismissed as not impairing the usefulness of the work, if it be understood at the outset that the book is not adapted to seriatim study by the classes of any institution, unless it be those of the author, at least not those in any American institution. But a sufficient wealth of material is provided so that the instructor may select what best suits his purpose, and under this eclectic system the work must commend itself as highly satisfactory and serviceable.

J. C. Arthur.

Quantitative Chemical Analysis by Electrolysis. By Dr. Alexander Classen, Privy-Councillor, Professor of electro-chemistry and inorganic chemistry in the Royal School of Technology at Aachen; in cooperation with Dr. Walter Löb, lecturer on electro-chemistry in the Royal School of Technology at Aachen. Authorized translation, third English from the revised and greatly enlarged fourth German edition, by William Hale Herrick, A.M., formerly professor of chemistry in Iowa College and in the Pennsylvania State College, and Bertram B. Boltwood, Ph.D., instructor in analytical chemistry in the Sheffield Scientific School of Yale University. New York, John Wiley & Sons; London, Chapman & Hall. 1898. Pp. 301.

The earlier editions of Classen's book are so well known that it is only necessary to call attention to the difference between this and preceding editions. The book is greatly improved by the introductory chapter on the theory of electro-chemistry. Says the author in his preface: "The present edition, revised with the assistance of Dr. Löb, differs from the previous editions in that the introduction has been augmented by the insertion of a section devoted to theory. This was made the more necessary since the investigations of recent years have been chiefly devoted to the explanation of reactions in solutions and the determination of electrical magnitudes." This chapter deals with the theory of electrolytic dissociation, the laws of Faraday and Ohm, the significance of tension, current strength, and resistance, the theory of electrolytic precipitation.

The remainder of the 'general part' of the book takes up the methods of measuring the strength of the current, the measurement of current tension, the sources of current, including primary and secondary batteries, and physical means of producing the current, such as electro-magnetic machines and thermopiles. Given the means of producing, regulating and measuring the current, it remains to apply the methods to the precipitation and separation of the metals. These are described in the 'special part' of the book, and it is safe to say that most of the best electro-chemical methods are included here. The appendix contains a number of practical examples of electro-chemical analysis.

This book comes from one of the leading authorities, and is generally recognized as a standard in the field which it covers.

H. C. J.

Introduction to Electro-chemical Experiments. By Dr. Felix Oettel. Translated by Edgar F. Smith. Philadelphia, P. Blakiston, Son & Co. 1897. Pp. 143.

Practical Exercises in Electro-chemistry. By Dr. Felix Oettel. Translated by Edgar F. Smith. Philadelphia, P. Blakiston, Son & Co. 1897. Pp. 92.

The first of these two little books by Oettel deals with the conditions necessary for electro-chemical experiments, such as sources of the current, methods of measuring the current, including different forms of the voltameter and galvanometer, and methods of measuring pressure. The arrangement of apparatus and electrolyte in carrying out an experiment is then taken up. This is followed by a brief discus-