tial address delivered before the London Mathematical Society in 1916.

Professor Larmor's most valuable contributions to science were made in the golden age of classical physics, and his papers abound in references to Faraday, Ampère, Helmholtz, Carnot, Clausius, Kelvin, Maxwell, Stokes, Kirchhoff, Boltzmann, Gibbs and Rayleigh. The last half of the nineteenth century and the early years of the present century was a period in which the ether held sway as the most controversial and devastating subject with which theoretical physics had to deal. For this reason the most interesting papers in this collection are those dealing with the properties of this suppositious medium. These papers appeared during the years from 1894 to 1897 under the title "A Dynamical Theory of the Electric and Luminiferous Medium." Part I outlined the broad underlying principles of the theory; Part II developed the theory of electrons, and Part III, relations with material media. Impressed by Kelvin's remarks, in connection with Stokes' suggested explanation of the aberration of light, that the motion of the ether outside of matter must be of an absolutely irrotational character, Larmor took for his dynamical model of the ether a medium with rotational elasticity such as that which had been proposed by MacCullagh in 1839 in the effort to give a rational basis to Fresnel's discoveries in optics. On this theory electric fields are explained as strains in the medium, magnetic fields as velocities. MacCullagh's ether, like Kelvin's quasi-labile ether, yields equations of motion identical in form with the electromagnetic equations. Therefore the proper dynamical application of either of these ether models must lead to the same results as Maxwell's equations. Larmor, however, introduced a new element in his hypothesis of 1895 that electricity exists in the form of discrete charges—electrons. In this series of monographs he deals not only with those phenomena—such as propagation of light in isotropic and anisotropic materials—which depend only on the macroscopic properties of the medium, but also with phenomena such as dispersion which involve its microscopic structure. Finally he does not ignore the optics of moving media.

Among other important contributions, that numbered fifty-one has perhaps proved of the greatest significance in connection with modern atomic theory. This paper, entitled "On the Theory of the Magnetic Influence on Spectra; and on the Radiation from Moving Ions," was published in December, 1897. It is the one in which Larmor's Theorem, familiar to every student of the theory of the Zeeman effect, is developed. This theorem is vital on account of its generality, for it enables us to assert that the dy-namics of the electrons in an atom—no matter how complicated the structure may be—is the same relative to rotating axes in the presence of a magnetic field as relative to fixed axes in its absence, provided only that second order terms are negligible.

These collected papers of a great mathematical physicist of the age when classical physics was at the height of its power constitute an important addition to the library of every student of the subject, and should have a place on the shelves of every departmental library.

LEIGH PAGE

A Chemical Dictionary, containing the words generally used in chemistry, and many of the terms used in the related sciences of physics, astrophysics, mineralogy, pharmacy and biology, with their pronunciations, based on recent chemical literature. By INGO W. D. HACKH, Professor of Chemistry, College of Physicians and Surgeons, School of Dentistry of San Francisco, California. Pp. 790. P. Blakiston's Sons & Co. Inc. Philadelphia, 1929.

THAT an individual should have undertaken, apparently singlehanded, to produce a book containing thirty to fifty thousand concise definitions of chemical and other scientific terms, portraits and a brief statement about the work of a considerable number of chemists and a short discussion of many of the most fundamental principles of chemistry seems almost incredible. The result is a book which is sure to prove very useful to chemists and to physicists, biologists, physicians and many others who make use of the facts of chemistry. No similar book has been attempted for more than a century.

The following illustrations of the varied and detailed information found in the book will give some indication of its value:

A table of alchemical and chemical symbols in parallel columns; a list of a dozen substances used in drying gases with accurate statements of the efficiency of each; the structural formulas of camphor, morphine, brucine, cocaine, nicotine, strychnine and dozens of other natural and synthetic alkaloids; list of the minerals containing nickel; table giving the composition of ten kinds of milk; a half-column about vitamins; diagram of the radioactive disintegrations.

Professor Hackh has long been known as a chemist with fresh and original ideas of his own, not always in accord with orthodox chemistry. These ideas are worthy of consideration and study and they are not obtruded in such a manner as to interfere seriously with the usefulness of the book.

In the opinion of the writer "univalent" and "bivalent" are more common American usage than "monovalent" and "divalent." There are some differ-

ences of opinion about this, however. The latter terms are mixed Greek and Latin. It is, of course, impossible to avoid errors in fact and some errors in proof in such a voluminous work. Users of the book who discover such errors will confer a favor both to the author and to future users of the book if they will notify Professor Hackh of such mistakes.

W. A. Noyes

University of Illinois

The Oedogoniaceae. By L. H. Tiffany. 253 pp., 64 pl., 25.5 x 17 cm. Published by the author, Columbus, Ohio, 1930.

THE algal flora of North America has been most incompletely explored, the modern studies mostly resulting in more or less elaborate local floras rather than general works. Regarding marine algae the situation is being materially improved, especially on the west coast, and a comprehensive monograph of North American diatoms has appeared, but the present work is different in character from almost anything else dealing with algae attempted in this country.

This monograph is expected to initiate a series of revisions of the groups of filamentous algae. The author is fortunate in dealing with a very distinct and highly specialized group, and has utilized the great diversity of form and stature presented to give concise and decisive keys to the many species. The great difficulty which a phycologist always meets in dealing with a large genus in its world-wide distribution, namely, the intergrading of a multitude of minor forms, seems to have been very effectively dealt with. Two of the genera, Bulbochaete (48 spp.) and Oedogonium (195 spp.), are large, with many varieties, but Oedocladium is small, three of its four species

resting on the largely unpublished work of I. F. Lewis. Nearly ten pages are devoted to a description of cell structure and the reproductive organs, and these give essential aid in the interpretation of the morphological peculiarities of the family. The description of cell division and the reproductive processes is more complete and modern than is elsewhere available. With data probably unequaled the writer discusses the habitats and periodicity of the major genera over the north central states area he, in conjunction with E. N. Transeau, has studied closely. Maxima in May and June are reported, with a few species showing in a second generation an October maximum. The length of time required to reach a normal full maturity, rather than subsequent environmental conditions, seems most significant in determining the time of fruiting. The family Oedogoniaceae is retained in the group Stephanokontae of the Chlorophyceae following the suggestion of Blackman and Tansley. By far the greatest bulk of the book is necessarily devoted to the systematic treatment of the various species and varieties, with the usual synonymy, descriptive data and distribution well and fully presented, though it would seem that a convenient grouping of countries was not followed. The critical notes care for changes of interpretation and close comparisons, and almost all the plants described are illustrated, mostly original, by redrawing of the original figures, or figures from some other authoritative source. Some seven novelties are described, but the discoveries of the author have largely been previously reported. Since the volume has no geographical limits, it is sure to be the standard reference work on the family for many years, and for all countries.

Wm. Randolph Taylor

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MANIFOLD DESICCATING APPARATUS FOR DETERMINING THE DRY WEIGHT OF SMALL SAMPLES OF WOOL[1]

THE desiccating apparatus discussed in this paper has been successfully used for some time in determining the dry weight of small samples of wool in connection with making determinations of the density in fleeces, that is, the number of fibers in a given area. Methods for taking these samples have been previously discussed by Burns,[2] Hultz[3] and Nordby.[4]

Burns and Hultz have also discussed the method of calculating the number of fibers in the samples taken.

In determining the density in wool, samples .25 square inch in area are usually taken in different parts of the fleece. Each sample is thoroughly cleansed and treated with a yolk solvent, such as ether, and then air-dried. A definite number of fibers is counted out of each sample and weighed. The balance of the sample is also weighed. The total number of fibers in the original sample is calculated by dividing the weight of the original sample (sum of two weights) by the weight of the fibers counted, and

[1] Approved for publication by the director of the Idaho Agricultural Experiment Station as Paper 67.

[2] R. H. Burns, "Some Phases of Wool Inheritance in F₁, Generation," *Proc. Am. Soc. An. Pro.*, 1924; "Wool Analysis Density Determination," *Wool Rec. and Textile World*, V. 30, No. 902, 1926.

[3] Fred S. Hultz, "Wool Studies with Rambouillet Sheep," Univ. Wyo. Agr. Exp. Sta. Bul. 154.

[4] Julius E. Nordby, "The Idaho Wool Caliper and Its Application in Making Density Determinations," Ida. Agr. Exp. Cir. No. 52.