Mariano L. Schiaffino, Chief Electrical Engineer of 'Campania de Luz de Guadalajara,' Belen, No. 2, Apartado 260, Guadalajara, Mexico.

Lawrence F. Schmeckebier, Ph.D., U. S. Geological Survey, Washington, D. C.

Samuel C. Shaffner, Engineer, Mobile Gas Light and Coke Co., Mobile, Ala.

French Simpson, Jr., Medical Student, Columbus, Texas.

George P. Singer, Professor of Physics, Central State Normal School, Lock Haven, Pa.

Dr. Robert L. Slagle, President State School of Mines, Rapid City, S. D.

Edwin E. Slosson, Professor of Chemistry, University of Wyoming, Laramie, Wyo.

Martin Smallwood, Professor of Biology and Geology, Allegheny College, Meadville Pa.

C. C. Sprague, 1900 Locust St., St. Louis, Mo.

William Stanley, Great Barrington, Mass.

Dr. Halbert S. Steensland, Director of Pathological Laboratory, College of Medicine, Syracuse, N. Y.

Frederick G. Strong, Box 959, Hartford, Conn.

H. A. Surface, Professor of Zoology, Pennsylvania State College, State College, Pa.

James Taussig, Jamestown, R. I.

Wilber J. Teeters, Instructor in Pharmacy, State University, Iowa City, Iowa.

Wm. Mayo Venable, Civil and Electrical Engineer, 713 Hennen Building, New Orleans, La.

Dr. Alex S. von Mansfelde, 'Quality Hill,' Ashland, Nebr.

Frederick K. Vreeland, Electrical Engineer, Box 1877, New York, N. Y.

Miss Kate Elizabeth Williams, 1450 Pearl St., Denver, Colo.

Wm. C. Woodward, Consulting Electrical Engineer, Union R. R. Co., Providence, R. I.

Alfred F. Wuensch, 1556 Detroit St., Denver, Colo.

SCIENTIFIC BOOKS.

RECENT BOOKS ON PHYSICS.

Natural Philosophy for General Readers and Young People. Translated from Ganot's 'Cours élémentaire de physique,' by E. ATKINSON. Ninth edition, revised by A. W. REINHOLD. Longmans, Green & Co. 1900. Pp. 752.

Elements of Physics. By C. HANFORD HENDERSON and JOHN F. WOODHULL. D. Appleton & Co. 1900. Pp. 388.

A Brief Course in General Physics. By GEORGE A. HOADLEY. American Book Company. 1900. Pp. 463.

One Thousand Problems in Physics. By WILLIAM H. SNYDER and IRVING O. PALMER. Ginn & Co. 1900. Pp. 142.

A Manual of Laboratory Physics. By H. M. TORY and F. H. PITCHER. John Wiley & Sons. 1901. Pp. 288.

Advanced Exercises in Practical Physics. By ARTHUR SCHUSTER and CHARLES H. LEES. England, Cambridge University Press; New York, The Macmillan Company. 1901. Pp. 368.

It was in 1863 that Dr. Atkinson first put before English readers his excellent translation of Ganot's 'Éléments de Physique,' a book which quickly won favor by its good arrangement and lucidity. In the first edition he graciously apologized for the use of the metric system. It has passed through fifteen or more editions since its introduction. A demand soon arose for the more elementary course by the same French author, as a text-book for the middle and upper classes of schools preparatory to college. The popularity of this is manifested by the appearance now of its ninth edition, a considerable part of which had been prepared for the press before the death of Dr. Atkinson. The present volume has all the excellences of its predecessors, the illustrations being abundant, and some of them possibly a trifle too expensive. Colored lithographs of metallic spectra and of Geissler tube discharges were formerly fashionable, but in a general treatise to-day they seem almost out of date. For the general reader it would be hard to find a more pleasant and satisfactory book than this volume. For American school purposes, however, it is too diffuse; and it seems adapted only for recitatorial purposes where oral answers are given to questions relating to descriptive details and general principles. Physics is nothing if not a quantitative science. This idea is best instilled into the elementary student, even though his mathematical attainments be not sufficient to warrant the use of complex problems.

The present volume illustrates the difficulty of maintaining a text-book up to date by slight modifications and additions applied in succession to a long series of new editions. As years pass on, the necessity for omissions becomes as

important as for additions. On page 207 a paragraph about the audiphone states that "not merely deaf people, but even those who are deaf *and dumb*, can hear musical sounds and *even speech*." The amiable admission implied in what the present writer italicizes is evidently due to the acceptance of a Chicago advertisement. On page 370, in discussing the mechanical equivalent of heat, the name of Rowland has been forgotten by the reviser. A few wood cuts might have been omitted, such as that (page 27) in which the source of the wind that propels a sail-boat is a cherub face nestled among the clouds, its cheeks distended to the bursting point.

The 'Twentieth Century Text-book,' by Henderson and Woodhull, is decidedly more modern, and is comparable with Ganot in the abundance and attractiveness of the illustrations. An appeal is made to the student's human sympathies by the introduction of portraits, with short life sketches, of men whose researches have enlarged the domain of physics, such as Newton, Franklin, Tyndall, Faraday and Lord Kelvin. To this list is added Mozart, naturally in the chapter on music. A comparison of this chapter with those on heat and electricity indicates plainly, without reference to the title page, that the book has been prepared by two men of quite different tastes and aptitudes. The introductory chapters and those on sound and music indicate a writer whose fondness for metaphysics and æsthetics is quite equal to his appreciation of physics. A prosaic student, after studying through the first chapter, is stimulated by such problems as these:

1. "Select five events and analyze them into their matter and motion content."

2. "If a monkey sit on the top of a pole, and always face a man who walks around the pole, with his face always turned toward the monkey, can the man be said to walk around the monkey?"

The mathematical solution of the second problem is easy. Teachers may differ about the metaphysical solution. In the chapter on music are introduced themes from Beethoven, Schumann and Palestrina, in musical notation, as illustrations of melody, harmony and coun-

terpoint, respectively. The authors in their preface give the opinion that "laboratory exercises, questions and problems given in a text-book are manifestly inadequate and unsatisfactory." This expresses quite a reaction from the popular tendency manifested some years ago, especially in the text-books by Gage and Avery. Many will sympathize with them in thinking that the laboratory guide book and the class text-book should be kept separate. Printed questions are often less valuable than those formulated for the occasion by an experienced teacher. It is not so obvious, however, that problems should be excluded; indeed there are probably few teachers of physics who would agree with the present authors on this point. In fact the first part of the book includes several dozen problems and experiments, a few of which are not very well selected. The general style, selection of material and mode of treatment are, however, good, and the book will probably be popular, particularly on account of the emphasis given to the relations of physics on all sides to human life and the interests of educated people.

The leading idea in Hoadley's text-book is to insure the coordination of reliability in the text, class demonstrations of stated laws, practical questions and problems on the application of these laws, and personal experimentation in the laboratory. The volume is a combination of text-book and laboratory manual intended to cover the work of a scholastic year in the high school. If it be admitted that two small separate volumes should be so combined—and every teacher has a perfect right to judge for himself about this—the work done by the author is exceedingly good. Considerable labor, it is true, will be required of the teacher who uses this book for the first time, and therefore has to secure the construction of the special apparatus for which the laboratory exercises are adjusted. But these exercises are well selected and well described. The practical questions and problems are numerous, and every page indicates that the author is methodical, careful and well informed regarding the needs and limitations of the class of students for whom he writes. He does not shun algebraic formulas or 'dodge' any real difficulties. Some formulas are given,

without deduction, as statements of physical laws. For elementary students this is often necessary, and the mathematical formulation is quite as desirable as verbal expression. Statements of fact are so generally accurate that the author can afford to be reminded of an error on page 188, where he has defined 'discord' more sharply than the facts warrant, by failure to recognize Mayer's law, which expresses the duration of the residual auditory sensation as a function of vibration frequency, the equation being expressible in a curve which Professor Mayer published in 1894 (*Am. Jour. Sci.*, Jan., 1894). In the chapter on electricity a very clear elementary discussion is given of such recent developments as the Wehnelt interrupter, self-regulating vacuum tubes, and wireless telegraphy. The book is abundantly worthy of commendation.

Snyder and Palmer's little volume on 'Problems in Physics' is a good collection intended for use in secondary schools, every problem having borne already the test of class use. For the convenience of overworked teachers it seems very desirable that a collection of answers should be published. Any competent teacher can work out all these problems for himself; but in the majority of cases it is only necessary that the pupil should work out such as have been assigned him. The teacher may assume the labor of verification wherever this may seem desirable, but he should not be subjected to unnecessary burdens.

Tory and Pitcher's 'Manual of Laboratory Physics' constitutes the course of elementary physics given in the laboratory of McGill University, Montreal. For each experiment there is a list of references, a list of apparatus, a short statement of the theory involved, practical directions, and a tabulated example. The arrangement is excellent, and the deductions of formulæ under the head of 'Theory of Experiment' constitute a good review of principles which the student is supposed to have mastered before entering the laboratory. Like all manuals of this kind, the book is a collection of the separate manuscripts prepared by the authors, while they were associated together as demonstrators in the physical laboratory of McGill University.

The manual by Schuster and Lees covers much the same ground as that of Tory and Pitcher, but the instructions given are more discursive and the book is not so well methodized. For somewhat advanced students, who are not so dependent as the beginner is apt to be on the oral guidance of an instructor, the book will be found very valuable. The authors have not aimed at completeness, 'being convinced that a student learns more by carefully working through a few selected and typical exercises, than by hurrying through a large number, which are often but slight modifications of each other.' They attach great importance to neat and accurate work, recorded in good form. The introductory chapter includes a satisfactory discussion of errors of observation.

The acceptability of a new book depends jointly on the author and the publisher. On opening it the reader expects to be able to consult any page without doing roughly by hand what the publisher ought to have done neatly by machinery. The manual just noticed is mechanically unsatisfactory, because the publishers have been guilty of the unreasonable slovenliness of issuing it with edges untrimmed. This fault is bad enough in the case of a magazine, where the insufficient excuse is to make allowance for future binding; but in the case of a book already bound it is inexcusable. American publishers have for the most part risen superior to such a senseless fad; but in England it seems still to hold sway. The present volume of 368 pages is most readily commended to any one who is willing to cut its leaves, to submit to the inconvenience of frayed edges, and to endure the untidiness of such edges after the book has been in use for some time in the laboratory.

W. LECONTE STEVENS.

Lehrbuch der vergleichenden Anatomie der wirbellosen Thiere. Von ARNOLD LANG. Zweite umgearbeitete Auflage. Zweite Lieferung. Protozoa, vollständig neu bearbeitet von Arnold Lang. Jena, G. Fischer, 1901. Mk. 10.

That this account of the Protozoa in the second edition of Lang's well-known 'Lehrbuch' is practically a new work is at once evident on