been needed to convince the "practical man" of the ultimate advantage to the race of "pure" science and "pure" investigation that word would have been added in these latter days by the development of the science of bacteriology. To have given to the world for the first time a rational theory of infectious disease and to have indicated the therapeutic possibilities of the future are achievements that may well make the last quarter of the nineteenth century memorable in the history of human progress.

It is eminently fitting that Dr. Sternberg, who has himself done much to increase our knowledge of bacteriology, and who was one of the pioneers in the work in this country, should give to the English-reading public their first adequate survey of the bacteriological field. His manual at once takes its place as the standard bacteriology in the English language.

The bulky volume of 886 pages is divided into four parts, the first treating of classification, morphology, and general bacteriological technology; the second of general biological character; the third of pathogenic bacteria, and the fourth of saprophytes. An invaluable bibliography, covering over 100 pages, and an index conclude the volume. The press-work is on the whole excellent, but we must enter our protest against the thickness of the paper used. A thinner paper would have given even greater satisfaction to the eye, while its use would have considerably reduced the awkward size of the book. The use of needlessly thick paper, however, is so common a failing of American bookmakers that it is perhaps hypercritical to bring it up in this instance. The plates and text figures are executed in an unusually satisfactory manner, and the photomicrographs are of the high degree of excellence to be expected from one as expert in the technique of photomicrography as the author of this book.

Among the most timely and practical portions of the manual may be mentioned the chapters on antiseptics and disinfectants, the influence of physical agents upon bacteria, the practical direction for disinfection, etc. Lengthy quotation is made from the Report of the Committee on Disinfectants appointed by the American Public Heaith Association, principally to keep before the public the high merit of chloride of lime as a ready and reliable disinfectant. Reference is made, also, to the use of fresh bread for rubbing down the walls of an infected apartment. This method is based on experiments of Esmarch, which seem to indicate that this is the most reliable way of removing bacteria from the walls and ceilings of infected rooms.

A long and studied chapter is devoted to the consideration of the vital questions of susceptibility and immunity. Dr. Sternberg, while disposed to accord to phagocytosis an important rôle in some diseases, is profoundly impressed — as are most bacteriologists — by the remarkable evidence adduced during the last few years in support of the "anti-toxine" theory. It is becoming more and more probable that Metschnikoff's brilliant phagocyte theory embodies at most only a partial explanation of the facts of immunity. "The experimental evidence detailed," says Dr. Sternberg, "gives strong support to the view that *acquired immunity depends upon the formation of anti-toxines in the bodies of immune animals.*"

The sections devoted to the description of such bacteria as have a recognized pathogenic significance are compiled with the fullest reference to recent investigations. Some students may, however, wish that the wealth of material had been more critically arranged and more exhaustively indexed.

A great boon to the student of bacteria from the botanical and systematic side will be the descriptions of the common bacteria of air, water, and soil. Only those who have attempted to compare and identify forms encountered in every-day experience are aware of the labor involved in the compilation of these data. Dr. Sternberg's work ought to give a strong impetus to the movement to bring order out of the existing chaos of vague "species" and vaguer "forms."

As is well-nigh inevitable in a book covering so much ground — and ground, too, that is shifting under one's feet — various errors of omission and commission are apparent. In the first place, it is evident that the index to a work of such magnitude should be thoroughgoing and should not shrink from numerous cross-references. The fact that the index before us contains under the heading "Cholera" no reference to the pages dealing with Asiatic cholera (pp. 500–509), a topic which at present is always with us, indicates opportunities for expansion. The reader who turns the pages and sees something about "alexines" (p. 261) and something about "splenic fever" (p. 327) will find in the index no entry under either of these heads.

Among oversights in proof-reading may be mentioned the substitution of "Chamberlain" for "Chamberland" (pp. 57–59), the use of "aerobic" and "anaerobic" for the more usual nouns "aerobe" and "anaerobe" (pp. 78–83), "micrography" for "micrographie" (p. 8), etc. On page 237 is a singularly involved translation from a memoir by Pasteur. The following sentences fairly represent the style: "The fowls are then in the constitutional state of fowls not subject to be attacked by the disease. These last are as if vaccinated from birth for this malady, because the fœtal evolution has not introduced into their bodies the material necessary to support the life of the microbe, or these nutritive materials have disappeared at an early age."

These blemishes, however, do not seriously mar the general excellence of the manual. It is to be hoped that Dr. Sternberg may see his way clear to the preparation of successive editions of this valuable work. In a science that is advancing so rapidly as bacteriology, new facts are constantly coming to light and compelling frequent revision of our views. Dr. Sternberg has brought the present volume well up to the latest researches and thus encourages us to hope for a second edition as soon as the progress of bacteriology shall demand it.

Discussion of the Precision of Measurements. By SILAS. W. HOLMAN, S.B. New York, John Wiley & Sons. 1892. 176 p. 8°. $2.

PROFESSOR HOLMAN, perhaps even more than the average physicist of experience in experimental work, has made a specialty of the science of exact measurements. His work, like that of Dr. A. M. Mayer and of Dr. Rowland, has involved, more than is common, the application of refined methods of determinations of quantity to the investigation of those insensible physical phenomena which ordinary modes of measurement are incompetent even to reveal; methods formerly little known or practised in this country, but now familiar to the younger physicists through the work of these leaders in this department of research. In the volume before us are collected a series of articles originally prepared for the *Technology Quarterly* and *Electrical Engineer*, revised and given more complete and formal shape for permanent preservation, and for the use of students and their instructors, both in pure physics and in the applied science of the engineer. These studies are valuable, not only as giving useful knowledge and power of accomplishment of professional work, but as stimulating the young aspirant for learning and reputation and giving him an attitude of mind in itself desirable and fruitful of good result. As remarked by its author, "An experimental result whose reliability is unknown is nearly worthless. The grade of accuracy of a measurement must be adapted to the purpose for which the result is desired. The necessary accuracy must be secured with the least possible expenditure of labor. These statements apply no less to the roughest than to the most elaborate work which the engineer is called upon to perform; they are no more true of refined scientific research than of ever-day engineering and industrial practice." The book is thus of especial value to both classes, whose methods, indeed, are daily becoming more and more alike in their refinements, and in their purposes and applications. In modern researches, especially, in the development of the phenomena underlying the operation of the steam-engine, in the construction of the dynamo-electric machine, in the transfer and transformation of energies, of whatever kind, the contemporary engineer and physicist are working together, and sometimes each doing important work in the special field reserved to the other. Especially is this the fact in electrical physics, in which branch the department of pure science occupied by the physicist and that of applied science which constitutes engineering, blend insensibly, and their work is performed, within a large area of boundary territory, by members of both professions alike. The electrician is sometimes confounded with the electrical engi-

neer, and the reverse. But whether the reader is proposing to work in the department of science or in that of construction, Dr. Holman's work will prove a most useful and instructive aid. Direct measurements and the theory of errors, the method of least squares and the establishment of criteria, indirect measurements and the best ways of planning their applications, estimates of precision and approximation in the solutions of the most important problems, illustrations of good work, with instructions for special cases, as for calibration of instruments, measurements of efficiency, and other similar matter, make the book one which the engineer and the physicist alike will find valuable, and they may place beside Kohlrausch as an authority, and as a useful supplement, if not a substitute, to that standard work.

The work of the publishers is, as usual, well done. We notice the imprint of Drummond, as its compositor and electrotyper, and take it to be an assurance of careful work in composition, and especially in the mathematical portion of the work. Supplementing the proof-reading of so accurate an author, it gives comforting assurance of freedom from those usually too frequent errors which annoy the reader of the first edition of a work of this kind.

Seventh Annual Report of the State Board of Health of the State of Maine, 1891. 399 p 8°.

BY far the greater part of this report is devoted to the consideration of school hygiene and school-houses in a paper by Dr. A. G. Young, secretary of the Board. This interesting compilation should prove of value in stimulating reform in school methods and school buildings. It clearly and forcibly presents those fundamental principles of individual and public hygiene about which there is substantial agreement among sanitarians. It is humiliating to have to believe that too often those having immediate charge of such matters either disregard these principles or are ignorant of them altogether. Reform can be brought about only by adding line to line and precept to precept.

In the reports of the local boards of health it is observable that cases of typhoid fever occur with ominous frequency in the reports of the small towns where well-water is used for drinking.

The Mound Builders, Their Works and Relics. By Rev. STEPHEN D. PEET, Ph.D. Vol. I. Chicago, Office of the American Antiquarian, 1892. 376 p. 8°.

IT appears from the preface that this is the first of a proposed series of five volumes relating to the ancient history of the area of the United States. The author is well known to students of that branch as the founder and editor of the *American Antiquarian*, a specialist's journal, which has survived for many years, and is a repertory of much valuable information.

In several respects Dr. Peet's opinions about the mound-builders differ from those current in Washington or Boston. To him, "There was a mound builders' age in this country as distinctive as the Neolithic age in Europe" (p. 31). This age "began some time after the glacial period and ended about the time of the advent of the white man" (p. 34). Geographically, he limits them to the Mississippi Valley, but nevertheless attributes to them the mica mines of South Carolina, the shell-heaps of Florida, and the rock-inscriptions wherever found. He is not in sympathy with the theory that the mound-builders were the ancestors of any of the natives met by the early explorers, but believes they had a civilization and a religion of their own, not to be identified with those of the Redskins of later date. He thinks it likely that the much-discussed "elephant pipe" and "Davenport tablet" attest their knowledge of alphabetic signs and their familiarity with the mammoth and the mastodon; and perhaps he is not wrong when he asserts of these relics (p. 47), "The evidence in their favor is certainly as reliable as that which has reference to the rude stone relics which have been described in Wright's 'Ice Age.'" He himself is not quite convinced that there were any palæolithic people in the Mississippi Valley,—in which he is in accord with some very recent debaters of that question. He says (p. 36): "We imagine that the mound-builders were the first people who occupied the territory after the close of the glacial period." Whence they came he answers as follows: "The same race that built up the ancient cities of Mexico pushed eastward and colonized the Mississippi Valley" (p. 112).

Having solved to his satisfaction these questions, Dr. Peet proceeds to describe at length, and in part from personal observation, many of the mounds, enclosures, earthworks, implements, ornaments, and other relics which he attributes to this mysterious people. He devotes chapters to their religions, their "water cult," their "solar cult," their symbolism, and their sacrificial rites.

Much of the work, most of it, we believe, has already appeared in the pages of the *American Antiquarian;* but those who sympathize with the opinions of the author will doubtless be pleased to have his contributions collected into a convenient form. He is unquestionably an earnest and honest student of the facts before him, and the conclusions he reaches should, therefore, receive careful consideration.

Some Strange Corners of our Country: The Wonderland of the Southwest. By CHAS. F. LUMMIS. New York, The Century Co. 270 p. Illustrated. 12°.

FOR those readers who have read but a few books of travel on the Southwest, this snug little volume will be quite a revelation. The contents of the twenty-two chapters scarcely contain anything that has been written or sketched before, except a few pages on the Moqui snake dance and Indian superstitions. The thoroughness of his familiarity with Pueblo customs and folk-lore is only equalled by the graphic qualities of his style. In looking about "the strange corners" which the author describes, we are first attracted by a prairie-dog hunt, to which the Navajo Indians resort to fill their larder. White people of the Southwest never think of killing this rodent for food, because it is so difficult to attain with a rifle-ball; but these natives utilize abundant downpours of rain to conduct the floods into their tunnels, and afterwards haul up their dead bodies for a feast. To get rid of the prairie-dog plague, people have proposed to kill them with poisoned apple-quarters. The belief in witchcraft is as potent among the whites and Indians of New Mexico as it ever was during the Middle Ages. Manslaughter is committed for any act arousing even the suspicion of witchery, and the fact that one-half of the Isleta people are wizards and witches speaks loudly enough. The "finishing an Indian boy" shows principles of education in full force now, which our northern Indians began to drop as early as a century ago. In the chapter, "The American Sahara," the wide waste is delineated in colors none too sharp or cruel. Lieutenant Wheeler is mentioned by mistake as its earliest explorer instead of Lieutenant Whipple. The marvellous wealth of objects presented in Lummis's volume will attract ever and again the class of readers and tourists which seeks instruction rather than pleasure in books of travel, and they will hold it dear as a publication of really scientific value, standing far above most of the productions of our present sensation-loving period of literature.

"The Wanderings of Cochití" is another very interesting sketch from our "Wonderland" on the upper Rio Grande. It is printed in the *Century Magazine*, January, 1893, and describes and also pictures in photographic reproductions the people, customs, history, and scenery of Cochití, one of the Quéres pueblos of northern New Mexico and the celebrated gorge of Tyu-on-yi and its rock-carvings in the vicinity of that pueblo. The scene of Bandelier's archæologic novel, "The Delight-Makers," is placed in that locality.

First Steps in Etruscan. By F. W. NEWMAN. London, 1892.

The Etrusco Libyan Elements in the Song of the Arval Brethren. By D. G. BRINTON. Philadelphia, 1893.

THESE two pamphlets are the latest contributions to the study of the Etruscan problem. The first is written by the eminent and venerable emeritus professor of University College, London, now close to ninety years of age. It is worth while to find a man willing to take "first steps" in any branch of learning at that time of life. The questions he examines are: By what route came the Etruscans into Italy? He inclines to believe that they came by sea from Asia Minor, and not across the Alps from the northwest, as Taylor teaches. The Etruscan alphabet he con-