SOIL SURVEY.

The soil survey was also in advance of anything previously attempted in the Bahamas. The men who conducted the soil investigations were experts in their particular subject and have succeeded in collecting a vast amount of information for future study and investigation. In all six of the more important islands of the archipelago were mapped in detail in such a manner as to show distribution of the principal soil types. These will be reproduced in color in the report. A large number of chemical analyses were made in a temporary laboratory erected in Nassau, in order to determine those properties of the soils which are apt to be lost if the samples are allowed to stand for any length of time. In addition to these preliminary investigations, more elaborate ones will be conducted later, in order to determine other properties of the soils essential to successful agriculture. It is too early at the present time to discuss the results of the soil survey at length, but I feel at liberty to say that when investigations are carried to their conclusion most valuable information will be at hand to direct the farmers of the Bahamas along intelligent lines of agriculture.

HISTORICAL INVESTIGATION.

The work of examining the public records and writing the history of the Bahama Islands has been going steadily forward all summer. The historian did not cruise among the out islands with the rest of the members of the expedition, but remained at work at Government House, Nassau, where the official records were kindly placed at his disposal by the governor. His paper, when completed, will treat of the development of the Bahama Islands as a crown colony of Great Britain.

COMMERCIAL GEOGRAPHY.

Material has been collected for a chapter on the commercial geography of the islands. This will discuss not only the products of the islands, but also the exports and imports, means of communication, condition of the people, etc.

These results and many others which can not be mentioned in this brief notice will be duly set forth in a report which is now being prepared.

Geo. B. Shattuck,
Director Bahama Expedition.

SCIENTIFIC BOOKS.

The Theory of Optics. By Paul Drude. Translated from the German by C. R. Mann and R. A. Millikan. New York, Longmans, Green & Co. 1902. Pp. xxi + 546.

During the past thirty years the science of optics has developed with surprising rapidity; in fact, in few of the branches of science have greater and more far-reaching changes in the fundamental concepts been made. This rapidity of growth may be attributed in large measure to the inspiration derived from the fertile hypothesis that was first suggested by Faraday and afterwards worked out in detail by Maxwell; for it was this hypothesis that called the attention of physicists to the possibility of unifying the sciences of optics and electricity under a single theory and of thus treating them both as manifestations of the phenomena of a common medium, the ether. The experimental work that was undertaken for the purpose of testing this Faraday-Maxwell hypothesis has led to extensions and modifications of the original supposition until it has now developed into an extensive and well-established theory, namely, the electromagnetic theory of light.

To the student of modern physics some comprehension of this fascinating theory is indispensable; yet such comprehension has been difficult to obtain because the various fragments of the argument by which the theory has been built up have been scattered in the

scientific journals and have hence been inaccessible to many who might otherwise desire to study them. Hence the gathering together into one volume of the main points of that argument, together with a discussion of how they have been used in the establishment of that theory and of the present tendencies and possibilities of that theory, is performing a great service not only to those who desire to learn of the theory, but also to the theory itself, since such work must help to show where modification and extension of the theory are possible and desirable.

It was a desire to meet these needs both of the student and of the theory that led Professor Drude to undertake the production of the work before us. Hence the purpose of the book is to supply a modern text embracing the entire subject of optics, and to make possible a deeper insight into the modern theory of light.

In order to attain this purpose, the author omits most of the older historical references, and gives only those later ones that will prove useful to the reader in finding the more extended discussions in the periodical literature. In fact, the greater part of the book treats of the work done during the last fifteen or twenty years. Hence it differs essentially from other treatises, many of which mention only the work done previous to the last fifteen or twenty years. Thus the discussion of the various mechanical theories of light, with their perplexities as to a mechanically incompressible ether and their shrewd and subtile attempts to annihilate the longitudinal vibrations by assumptions that lead to worse complications, give place in this book to a presentation of the electromagnetic theory, to a tracing of that theory in its consequences, and to a discussion of the problems that are now being solved or that ought to be solved in the near future.

In order to give the reader some idea of the nature of the questions discussed, a few of the more interesting ones will be mentioned. In the chapter on physical conditions for image formation the modern method of attacking the problems of spherical and chromatic aberration is discussed. The chapter on interference contains a presentation of the manner in which interference is used for obtaining high spectroscopic resolution by introducing a great difference of path between the two interfering beams, and discusses the problems of molecular vibrations to which this use of interference leads. The chapter on diffraction takes up not only the regular treatment of the grating, etc., but also goes into the question of resolving power in general, and the limit of resolution of optical instruments. In the chapter on absorbing media the reader learns of the optical properties of the metals and of the relations that have been established and proposed between the optical and electrical constants. The chapter on dispersion is particularly well done. Starting with the assumption that the smallest particles of a body possess natural periods of vibration, Professor Drude shows how these natural periods of the particles are involved with the period impressed upon the body from without and the index of refraction and the dielectric constant in determining when the dispersion is normal and when anomalous. He also shows how from the observed dispersion, together with other optical and electrical constants of a substance, the position of the absorption bands may be calculated. In the chapter on bodies in motion the reader is introduced to the present state of scientific opinion upon the questions: 'Is the ether at rest? Is its state of rest disturbed by the motion of matter through it?' His attention is also called to the points that need further investigation and discussion. The last portion of the book is given up to a presentation of the relations that have been discovered between thermodynamics and optics. Here important questions concerning the efficiency of a source of light and the conversion of other forms of energy into light are discussed. The last chapter takes up the properties of incandescent vapors and gases and presents the electron theory, calculating the probable size of an electron from optical data. This last portion of the book contains descriptions of work and theories that are not discussed extensively in any other English text.

A glance at the list of questions just pre-

sented must convince the reader that the topics discussed in the book are not only most interesting, but are also those with which science is to-day grappling. The method of presentation is also forceful, since it gains power and simplicity because of the unifying influence of the great theory that pervades it throughout. By thus giving a coherent treatment of the problems that are in process of solution at the present moment, Professor Drude has produced a book that is bound to have great influence for good upon the science of optics, since it must impress the student that, to use the author's own words, 'optics is not an old worn-out branch of physics, but in it there pulses a new life.'

In doing this the author has in addition given a valuable hint to writers of texts—for how much greater would be the interest in physical science among the people generally if many of the time-worn, cut-and-dried (particularly dried) discussions that have clung tenaciously to the texts could be rewritten so as to present the subject entirely from the present and future point of view instead of from that of the past? In such a presentation stress would be laid, as Professor Drude has done, not only upon that which had been settled, but also upon that which still remains to be settled; so that the reader would not be tempted, after reading the book, to think that he knows it all, since everything is finally settled and he can and has committed it to memory.

Thus all students of physics owe a debt of gratitude to the author of this 'Theory of Optics,' not only because he has woven together for them the scattered threads of the electromagnetic theory into a web of pleasing and symmetrical pattern, but also because he has, in so doing, shown how to present a scientific subject in such a way that the student is left with a realization of the fact that the science is alive and teeming with future possibilities, instead of with a feeling of disgust at having had thrust upon him the usual glorified and embalmed image of past grandeur—a corpse fixed in death.

Thus this work impresses us as a very able and original presentation of a difficult subject. We, therefore, welcome it as a distinct addition to the literature of optics. We congratulate the publisher on having made this book accessible to those to whom German is a barrier. They could perform another service to science if they could persuade Professor Drude to revise his earlier work on the 'Physics of the Ether,' for this work helps much in the understanding of his 'Theory of Optics.'

C. R. Mann.
University of Chicago,
September, 1902.

Medical Microscopy. By T. E. Oertel, M.D. Philadelphia, P. Blakiston's Son & Co. 1902. Small 8vo. Pp. 362.

The facts which a working knowledge of microscopy may reveal to aid in diagnosis are so important that the profession demands an acquaintance with this subject which is coming to be recognized more and more as fundamental in medicine.

This small volume is offered in response to a legitimate voice, as the author believes, coming especially from that part of the medical profession which graduated before much instruction was given in the subjects in which the microscope serves so great a purpose.

Naturally the microscope is the first to receive attention. The various parts are named and their functions explained. The terms used in manipulation are defined and some of the phenomena are considered.

The summary of the facts regarding the habitat, pathogenesis, morphology and cultural characteristics of many of the more important pathogenic bacteria will be of much assistance to those unfamiliar with the subject. The following topics are also briefly treated: preparation of tissue, tumors, blood and the various secretions and excretions of the body.

An author is certainly justified in compiling a work upon medical microscopy in order that the rudiments of the somewhat scattered knowledge may be accessible to all, yet, on the other hand, when such a book compiled from works upon subjects which are experiencing such rapid changes and additions reaches the reader, there will be an opportunity to take exceptions to certain portions of it. This