ress, and said: "they are often such as can only be successfully dealt with by the powerful arm of the State or the long purse of the nation."

If the Prince Consort had lived to continue his advocacy of science, our position to-day would have been very different. His early death was as bad for Britain as the loss of a great campaign. If we can not regain what we have lost, matters can not mend.

I have done what I feel to be my duty in bringing the present condition of things before you. It is now your duty, if you agree with me, to see that it be put right. You can if you will.

NORMAN LOCKYER.

THE EXPEDITION TO THE BAHAMA ISLANDS OF THE GEOGRAPHICAL SOCIETY OF BALTIMORE.

IN October, 1902, a number of citizens of Baltimore met at the residence of Dr. Daniel C. Gilman and organized the Geographical Society of Baltimore. The officers elected at that time were:

President—Daniel C. Gilman.
Vice-Presidents—Bernard N. Baker, Rev. John F. Goucher and Lawrason Riggs.
Treasurer—Robert Garrett.
Secretary—George B. Shattuck.

The purpose of organizing this society was the accumulation and distribution of geographic knowledge. The society rapidly increased in numbers, and within a few weeks included about 1,750 members, most of them citizens of Baltimore. A course of six lectures was given before the society in one of the large auditoriums of Baltimore. Early in the winter steps were taken to equip an expedition which should visit the Bahama Islands for the sake of prosecuting scientific work in that region. Several thousand dollars were quickly raised from various sources and the writer was asked to act as director of this expedition.

A large two-masted sailing vessel was chartered, provisioned and equipped for the work in hand and left Baltimore on the evening of June 1. The expedition was gone two months, arriving in Baltimore on the morning of July 30. With the exception of the inevitable seasickness, which many of the party experienced on the way out, the health of the entire company was excellent, not a single case of sickness arising.

The governor and residents of the Bahama Islands were advised of the purpose of the expedition many weeks before it left Baltimore and cooperated in every way possible to make the work successful.

The Johns Hopkins University in Baltimore, the National Museum, the United States Coast and Geodetic Survey, Agricultural Department, United States Weather Bureau and the Fish Commission of Washington and the University of Iowa also cooperated by either men, equipment or advice toward the success of the expedition.

The tide gauge now in operation at Nassau and the magnetic instruments used throughout the cruise were kindly loaned by the United States Coast and Geodetic Survey. Deep-sea thermometers, seines and other paraphernalia for marine work were loaned by the Fish Commission. The kites for high atmospheric work were loaned by the United States Weather Bureau.

The men who composed the scientific staff and took part in the investigations are as follows:

Dr. George B. Shattuck, director and chief of geological staff.

Dr. B. L. Miller, associate professor in Bryn Mawr College, associate geologist.

Dr. Clement A. Penrose, vice-director and surgeon of the expedition, chief of the medical staff.

Messrs. H. P. Cole, E. B. Beasley and T. H. Coffin, of the Johns Hopkins Medical School, assistants to Dr. Penrose.

Dr. W. C. Coker, of the University of North Carolina, chief of the botanical staff.

Messrs. C. A. Shore and F. M. Haynes, of the University of North Carolina, botanical assistants.

Mr. Barton A. Bean, curator of fishes in the United States National Museum, chief of staff of marine zoology.

Messrs. J. B. Custis and J. A. Lewis, of Johns Hopkins, assistants in marine zoology.

Mr. J. H. Riley, curator in the United States Museum, chief of staff for land zoology.

Mr. S. H. Derickson, assistant in land zoology.

Dr. Oliver L. Fassig, section director of the United States Weather Bureau, chief of staff of climatology and physics.

Mr. J. E. Ruth, Johns Hopkins University, assistant in climatology and physics.

Mr. C. N. Mooney, United States Department of Agriculture, chief of the soil survey.

Messrs. J. C. Britton and E. C. Hughes, United States Department of Agriculture, assistants in soil survey.

Mr. J. M. Wright, Johns Hopkins, historian.

Mr. A. H. Baldwin, of Washington, artist.

Mr. Frank Gilmore, foreign correspondent.

The results of the expedition may be briefly summarized as follows:

GEOLOGICAL SURVEY.

Work of Previous Investigators.—Many geologists have visited the Bahama Islands in times past, have studied the geological formations with more or less care and have arrived at the following conclusions:

1. The material of which the Bahama Islands are built is wind-blown coral sand.

2. The islands were formerly very much more extensive than now.

3. They are gradually being depressed beneath the surface of the Atlantic Ocean.

4. They are gradually being eroded by the waves.

5. They are slowly being elevated.

It will be noticed that there are two opposing views here, namely, that the islands are undergoing subsidence, and second, that they are being elevated.

Conclusions Arising from the Present Survey.—The geology of the Bahama Islands is not difficult or extremely varied. It presents a number of most interesting problems and exhibits a number of most instructive types of topography. The present survey has been able to determine that the material composing the Bahama Islands is not entirely made up of wind-blown coral and lime sand, but the lower portions of many of the islands, extending up to ten or fifteen or twenty-five feet above the present level of mean tide, has been deposited by the ocean and contains marine organisms in large numbers. Above this lies the deposit of wind-blown material which has up to this time been regarded as the sole type of deposit visible throughout the archipelago.

In regard to the question of elevation or subsidence, the survey has determined that both processes have taken place. The islands were doubtless much higher at one time than to-day, and it is equally certain that they were formerly more depressed beneath the Atlantic Ocean than they are now. It is impossible to say whether they are being elevated or submerged at the present time, as the process is extremely slow at best, and can only be detected by careful measurement extending over long periods of time. It is for this reason and to settle this question that a bench mark and tide gauge have been erected at Nassau.

BOTANICAL SURVEY.

Previous Investigations on Plants.—A number of botanists have made more or less extensive investigations on the plants in the Bahama Islands, but as a rule their studies have tended toward purely systematic classification of the flowering plants and published lists of the same with their localities throughout the archipelago.

Present Botanical Survey.—The work of the present survey has been:

1. To supplement the systematic work of earlier investigators by visiting islands

heretofore unstudied and by collecting some five hundred or more plants for future study and report.

2. The collection and study of lower forms of plant life, such as seaweed, fresh- and salt-water algæ, fungi, lichens and myxomycetes. The work on this latter group is new, as none have heretofore been reported from the Bahama Islands and the present survey has secured about twenty or thirty species.

3. The principal work of the botanical survey, however, has been, not so much the systematic study of forms, as the study of plants in their adaptation to their environments, the grouping of plants in societies and on certain formations and soil types and the variation of the same plants under different conditions to special changes in environment. A large number of photographs of typical plants were also secured.

SURVEY OF MARINE LIFE.

Survey of Marine Fauna.—Much work has been done on the marine life of the Bahamas and many valuable results secured.

Present Survey.—The aims of the present survey have been:

1. To secure color sketches of a number of the most interesting and important fishes of the Bahama Islands which have not been figured from other waters.

2. To secure specimens of fishes for the United States National Museum.

3. The study of the distribution of the Bahama fishes in reference to other fishes of the West Indian waters.

4. In prosecuting this work the marine survey has secured a thousand or more specimens of marine life.

5. The artist has made about twenty-five color sketches of the fishes of the Bahama waters, certain of which will be published in color in the proposed report.

SURVEY OF LAND FAUNA.

Work of Previous Collectors.—The Bahama Islands have been exhaustively studied by zoologists in previous years and large collections of birds have been made from time to time. Notwithstanding these investigations, problems have constantly come to light which have required further study, and in order to prosecute this work short expeditions have been made to the Bahama Islands for special purposes, such as the study of the habits of certain birds and the collection of certain types of life.

Present Survey.—The objects of the present survey have been:

1. To augment the collection of the United States National Museum along certain lines in the types of reptiles, birds and mammals.

2. To note the habits of certain birds as occasion offered.

3. To collect especially bats for future study in the United States National Museum.

4. To secure as representative a collection as possible for display in one of the institutions of Baltimore city.

5. In prosecuting this work about two hundred and sixty skins of representative birds, a hundred specimens of reptiles and about three hundred mammals have been secured.

ATMOSPHERIC SURVEY.

Work of Previous Investigators.—Previous investigations have consisted of a comprehensive and excellent collection of daily weather observations which have been published from time to time and have afforded the basis of the present work.

Work of the Present Survey.—1. The discussion of previous observations.

2. The securing of a continuous record of climatic conditions by means of self-recording instruments in regard to pressure, temperature and humidity from the

date of the arrival of the expedition at Nassau to the time of its departure.

3. The flying of kites in order to make observations of meteorological conditions in the upper atmosphere. Six ascents have been made ranging in altitude from four thousand to eight thousand feet and excellent records have been secured in each one of these ascents. This work has never before been attempted in these latitudes. A most interesting feature of these kite investigations was the successful flight of a kite from the deck of a steam launch to the elevation of eight thousand feet in the open sea.

Survey of the Tide and Erection of Bench Mark.—This work is entirely new for the Bahama Islands, and as stated above has for its aim the solution of the problem whether the islands are being elevated or submerged. The bench mark erected at Nassau, as far as I know, is the first to be established throughout the West Indian region. The tide gauge which has been established is a self-recording instrument that will run for one year, and its records will afterwards be reduced and the computation of mean tide level for Nassau harbor will be determined by the United States Coast and Geodetic Survey.

MAGNETIC SURVEY.

Work of Previous Investigators.—In the past hundred years from twenty-five to thirty observations have been made at ten or twelve stations throughout the archipelago. These observations have been almost entirely confined to the observation of magnetic declination.

The Work of the Present Survey.—The work of the present survey has been:

To determine the declination, dip and intensity of the terrestrial magnetism at a number of points in the Bahama Islands, especially at points previously occupied. Full sets of observations have been made at Nassau, Watling's, Clarence Town and Abaco. These observations will be reduced by the United States Coast and Geodetic Survey.

MEDICAL SURVEY.

The medical staff has stopped at and examined from a medical and sanitary standpoint the following settlements on the different islands of the Bahamas: New Providence, including Nassau and the surrounding country, with especial attention to the hospitals, etc., several of the largest schools and a number of private cases shown through the courtesy of the resident physicians. The water supply from a number of wells in the hospital grounds, Nassau, Grants Town and other parts of the island have been examined chemically and microscopically.

At those settlements or islands where there were no resident physicians the medical and surgical equipment was carried on shore and free dispensaries opened up. In some cases where the ship was able to anchor close to the shore, free clinics were held on her decks or in the main cabin, especially whenever it was necessary to operate on any of the conditions met with. In the settlements where the resident physicians were found they were in all instances sought out and questioned concerning the nature of their practice, diseases found, their treatment, condition of the people, etc. The homes of the natives were studied from a sanitary standpoint, a number of their dwelling places entered and inspected and physical and blood examinations made.

In a brief summary it would be impossible to go into the special studies to be included in a future report on these islands, but in general we were much impressed with the following:

1. The prevalence of leprosy. This disease included the three types, anæsthetic,

mixed and tubercular. Little care is taken in the isolation of these cases, as they mix freely with their fellows in the ordinary routine of life. In one or two instances pilots who desired to take our ship into harbors were found to have leprosy in more or less advanced stages.

2. The much better physical types presented by the pure blacks or whites in contrast with those of mixed blood. This was true especially of the pure blacks, probably from the reason that they have intermarried less than pure whites. Arranging the natives in order from the standpoint of their immunity to disease, we would place the pure blacks first, the pure whites second and mixed types last.

3. The direct relation of health to food. The islands where most farming was done presented a better type of people than those relying chiefly on fishing and sea industry for support.

4. The great prevalence of locomotor ataxia, rheumatism, neuralgia, ainhum or ring-toe, genito-urinary diseases, including syphilis, gonorrhœa, etc., eye diseases, including pinguicula, pterygium, ophthalmia, gonorrhœa, etc., interstitial keratitis, cataracts and errors in refraction, muscle balance, etc., dyspepsias and some diarrhœa due to poor food and exposure.

5. The presence of the filariæ sanguinis in the blood of one of the patients examined in the Nassau hospital. This case is said to have come from Long Island.

6. One case of elephantiasis in the leg of a woman living at Current Settlement, Eleuthera.

7. The type of malaria. It showed the malignant variety of parasites in the blood, but was of a mild type and not typical in its behavior. This alone would make an interesting scientific investigation.

8. Distribution of mosquitoes. The mosquitoes have been studied at all the different places visited with the result that several known varieties and unknown species, at least to our collector, have been found, and the places where obtained carefully noted. This collection has been purchased by Dr. L. O. Howard and will be worked up by him.

9. Most interesting studies were made of the inhabitants of Hope Town, Abaco, in order to determine the amount of degeneracy due to close intermarrying. At the close of the Revolutionary War this settlement was peopled by tories from America who desired to continue under British rule. For over a hundred years the inhabitants of Hope Town have intermarried so closely that now a man is related to his wife by more than one line of relationship. Charts constructed by Dr. Penrose established this point. The result has been that frightful degeneracy has taken place, resulting in many disorders and serious bodily deformations.

In all over a thousand people were seen professionally, and although many of these were not given medicines, nevertheless a number, possibly one half, received treatment, medical or surgical and advice regarding living, food, general hygiene. The cleanliness of the people as a whole and their good health in spite of poor food much impressed us, due unquestionably to the balmy climate of the Bahamas and the fact that the settlements are not yet overcrowded.

Special examinations for conditions interesting to the expedition were made in one hundred and fifteen cases and records kept of each one. Forty-three blood examinations were made, some of these at night. Owing to the short stops at the different settlements it was impossible to follow the effect of treatment in many of the cases that came to us for assistance.

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