most closely and here experimental morphology must have its basis.

3. With the incorporation and excretion of matter, metabolism and growth, the sources and uses of energy, irritability, and the minute constitution of living matter. In this last are included many of the most fundamental problems, not necessarily problems involving the question 'What is life?' but problems concerned with the resolution of those factors and an intimate knowledge of those materials which make life possible.

BENJAMIN M. DUGGAR.

SCIENTIFIC BOOKS.

THE BAHAMA ISLANDS.*

This handsome volume on the Bahama Islands is of merit in two regards. It is an appropriate expression of the energetic initiative of its editor in developing an interest in geography in Baltimore, and it is a serious scientific study of a peculiar group of islands.

Professor Shattuck offered a course of lectures on physical geography to the teachers of Baltimore several years ago. The course proved attractive and was well attended; it was followed by an association of the teachers for more lectures and for field excursions under Shattuck's guidance. This association was soon succeeded by the organization of the Geographical Society of Baltimore under the presidency of D. C. Gilman and the direction of a distinguished board of trustees. The membership in the society rose to something like 1,500 in its first year of existence. Its objects were to place before the public of Baltimore an annual course of lectures dealing with geographical subjects, to foster geographical research, and from time to time to publish monographs of geographical investigations. All these objects have now been realized; hence although the activity of the society has been sadly interfered with during the past year by the disastrous conflagration of 1904, the secretary, as director and editor of the Bahama expedition, has had so notable a success in bringing out a monographic volume on the first investigation undertaken by the society that we confidently expect a revival to full activity in due time, and a vigorous continuation of the work thus begun.

Shattuck having made a preliminary visit to the Bahamas in 1902, the expedition of over twenty members left Baltimore June 1, 1903, in the *Van Name,* a hundred-ton schooner, provisioned for a two-months' cruise, and with an equipment to which the governmental bureaus at Washington and the Johns Hopkins University had contributed. The results of the expedition are now set forth in sixteen chapters by nearly as many authors. Shattuck and Miller describe the geology and physiography of the islands; Dall discusses the fossils and the non-marine mollusks; Fassig reports on magnetic and climatic observations, and Shidy on tides. The soils are elaborately classified by Mooney; Coker describes the vegetation, and Coffin tells of the mosquitoes. The fishes, birds, reptiles and mammals are reported on by Bean, Stejneger, Riley and Miller; the sanitary conditions by Penrose. The longest chapter is a history of the islands by Wright, and the volume closes with some general geographical considerations by Shattuck. The illustrations are numerous and good.

Earlier observers have shown that the Bahamas consist of 29 islands, some of which are mere skeletons or strips of land, with numerous small keys and rocks, in all some three thousand in number, rising from a shallow submarine platform or plateau, which in turn stands up rather abruptly from the deep ocean floor. The material of the platform as far as known and of all the islands is altogether calcareous, of shell and coral origin, worked over by waves and winds. On the islands the rock is weathered into a ragged and pitted surface; its texture is so weak that it is sawed or chopped into blocks for house building. The area of the islands is but a fraction of that of the platform, partly be-

* The Geographical Society of Baltimore. The Bahama Islands. Edited by George Burbank Shattuck, Ph.D., associate professor of physiographic geology in the Johns Hopkins University. New York, Macmillan. 1905. 630 pages, 93 plates, 7 figures.

cause of submergence from a time of a more continuous land surface, partly because of shore erosion, which goes on furiously during autumnal hurricanes. The submergence is inferred to have amounted to 300 feet, because the islands are honeycombed with caverns, of which the deeper ones descend 300 feet beneath present sea level.* Observations by the geologists of the expedition indicate that the submergence of the islands has recently been somewhat greater than now, for stratified deposits containing fossils of living marine species are found at altitudes of fifteen or twenty feet at many places. Whether the islands are now rising or sinking is not asserted, but the bench marks that were set up and carefully measured with respect to sea level will make it possible to answer this question within a few score years.

The shallower parts of the submarine platform are so thickly studded over with coral reefs that it has proved impracticable to chart them. At certain points the platform is pierced with 'ocean holes,' or areas of deep blue water in the midst of the shallower green sea. Here the tide ebbs and flows through sub-platform passages; in one instance that is described a descending eddy was noted, with concave surface and foaming center. The tides were carefully observed at Nassau and thus better determined than ever before for these islands; they are shown to be of the Atlantic type, that is, with two subequal high tides in each lunar day; and not of the Gulf type, in which, as a rule, only one tide occurs each day. The mean tidal range is 2.634 feet, with spring and neap means of 3.051 and 2.129 feet; the mean lunitidal interval or corrected establishment of the port is 7 h. 22.8 m.; but the variation of this interval due to priming and lagging may amount to 45 minutes. The well-known uniformity of the Bahaman climate is attested; even in early summer, temperatures of 80° or 90° were not oppressive, the air being moderately dry and usually in motion. Flights of kites and observations on clouds indicated a diminution in the velocity of the prevailing easterly trade wind above 4,000 feet altitude, a curious contrast to the conditions obtaining in temperate latitudes where an increase of velocity with height is the rule.

The soils of the islands are described in greater variety than one might expect on a foundation exclusively calcareous, seven types being recognized. The most important are the black loam and the red loam. The former occupies about three fourths of the surface, and makes what is known as 'provision land,' because of its use for subsistence crops. It is good for citrus fruits, among which the shaddock or grape fruit takes the lead; but this soil is so thin that when fruit trees are planted, a hole is first blasted in the underlying rock. Sisal, which is destined to be an important product, and cotton, more important formerly than now, also grow in this soil; the cotton plant grows tree-like, living over several seasons and having to be pruned to keep its branches within reach. The red loam soil is the best for pineapples, a very important crop, as over seven million dozens were exported in 1902, yielding almost $200,000; but the prices have fallen in recent years, partly on account of the poor treatment of the pineapple in marketing it. The receipts from this source are at present much exceeded by those from sponges.

We shall pass rapidly over the biological chapters. There is an elaborate list of plants,

* This line of argument is in accord with current geological opinion, yet it does not appear to be altogether proved that submarine caverns may not be dissolved out by fresh-water streams which descend beneath the level of the sea and rise again to the sea floor; just as caverns are conceivably formed beneath the level of the ground-water table on the land. Many land caverns now above the water table are filling with calcareous deposits; the excavation of such caverns by solution may have taken place before the neighboring valleys were worn to their present depth, or when the region stood at a lower level, so that the cavern zone was beneath the water table, and the growing cavern was filled with water. Whether the cavern zone was beneath the land or beneath the littoral sea floor is immaterial, so long as the ground water is kept in motion. Is it not indeed possible that the excavation of some submarine caverns was begun as well as continued by the tidal currents now flowing through them?

950 species of native and naturalized forms being noted, including seven indigenous palms, several figs and thirty orchids. Many species are shared with the United States, but most of our deciduous forest trees are wanting. The important geographical element of distance shows its effect in the less number of continental plants in the southern than in the northern islands. Although the yellow fever mosquito was found, thus making a properly screened quarantine desirable at Nassau, the absence of *Anopheles* indicates that, from the standpoint of malarial diseases, the islands are a good health resort; on a later page, the islands are described as favorable for consumptive cases also. The only marine forms described in detail are fishes; these are noted as having a popular interest for the tourist because of their extraordinary colors and forms, well seen when watched through the floor of a glass-bottomed boat. Of reptiles and batrachians, no less than 22 out of 35 species and subspecies are restricted to the islands. Forty-four endemic species of birds, out of a total of 204 species and subspecies, are described in detail in their bearing on the derivation of the Bahaman avifauna. Only eight mammals are found whose presence is not certainly due to man; these include rats, mice, the rat-like hutia, raccoons and bats.

The chapter on sanitary conditions is of unusual and pitiful interest. Some of the islands have only white inhabitants; some have nearly all blacks; others are variously mixed as to race. The island of New Providence, on which Nassau is situated, has a well-civilized mixed population; the island of Andros, the largest of the group, has a relatively barbarous population of blacks. The islands of only white population have many degenerates. At Hopetown there has been an excessive amount of intermarriage, and although the original stock was good, the present condition is deplorable, the climax being found in a family of eight children, of whom five are idiots. An instructive genealogical tree is given in connection with this case. Leprosy is not uncommon, but except at Nassau there is no isolation of those suffering from this dread disease. The expedition was provided with an excellent medical outfit, and at each town a free dispensary was established during the stay there. The people were timid at first, but after gaining confidence they came in throngs; when the party had to return to the schooner, it was with difficulty that the outfit was packed up, and a way forced through the crowd; the more determined invalids followed on boats, climbed on board the schooner and begged to be cared for. A special account is given of the most important diseases met with.

The chapter on the history of the islands is a book of 160 pages in itself. After brief description of the early buccaneering days, special attention is given to the problems of slavery, with sufficient indication of the wretched treatment that too often occurred, and little illustration of the obsolete argument that the conditions of the blacks was then better than under freedom. Yet to-day the condition of the people must certainly be low, for one of the governors, recently appointed by the crown, thinks that there is not enough good material in the islands to provide the twenty-nine members of the legislature which is to share the government with him. "What is wanted here," says the governor, "is a system based on that so ably conducted by Mr. Booker Washington, at Tuskegee, Alabama, United States of America, and until that or some similar scheme based upon industrial training as the main factor in the educational method is adopted, I fear that no improvement in the condition of the large native population in this colony will be manifested." In view of all this, one must conclude that the islands, with their mild and attractive climate and the beauty of their oceanic setting, must, nevertheless, be taken as illustrating the unfortunate and depressing consequences of monotony and isolation.

W. M. D.

SOCIETIES AND ACADEMIES.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 602d meeting was held May 13, 1905.

Mr. L. W. Austin read a paper on 'The Specific Heat of Gases at High Temperatures,' describing experiments made by Professor Hol-