the apparatus required, then treats of the Algæ as a class, and the main divisions into which they have been separated by botanists, and in most of the remaining part of the book describes species, "choosing as types of each genus such species as are most likely to be met with, and leaving out those which are either rare or possess few points of interest for the beginner." Mr. Smithson himself points out that the volume leaves much to be sought elsewhere; but, if used intelligently, it will do sound work by preparing the way for wider study.

Rambles and Reveries of a Naturalist. By the Rev. William Spiers, M.A., F.G.S., &c. (London: Charles H. Kelly, 1890.)

MR. SPIERS does not profess to give in this little book a full account of any one of the subjects with which he deals. His aim has been "to awaken or to stimulate a love for Nature in the minds of some who may not as yet have suspected what wondrous and ever-varying beauty lies everywhere about us, in ditch and pond, in rock and stone, in river and sea, on earth and in the skies." With this end in view, he describes, in a series of short sketches, various phenomena which he himself has had opportunities of observing; and he does his work so well that to a good many readers his book may be of considerable service. There is nothing new or brilliant in Mr. Spiers's descriptions; but they are fresh and clear, and display not only a genuine love for Nature, but a capacity for appreciating the scientific significance of many different orders of facts. Besides other essays, the volume includes papers on seaweeds, rambles in Cornwall, a visit to the Channel Tunnel, St. Hilda's snake-stones, tiny rock-builders, and an evening at the microscope.

Sketches of British Sporting Fishes. By John Watson. (London: Chapman and Hall, 1890.)

A PREFATORY note to the "Sketches" tells us that "the subject-matter has, for the most part, been gleaned directly from the waterside, and should be looked upon more as the notes of a naturalist than the jottings of an angler." Accordingly, it was with anticipation of interest that we turned to the opening chapter, on salmon.

So little is known of the natural history of the salmon, and so great is its value, both for sport and for food, that we eagerly scan the pages of a naturalist and an angler who may tell us what he has seen and knows. Mr. Watson has nothing to tell us. He disposes of the salmon in 12 pages, and the impression produced upon us is that his acquaintance with that noble fish is confined to the fishmonger's slab, and to the dinner-table.

The chapter on trout is little more satisfactory. That on grayling is by another hand.

LETTERS TO THE EDITOR.

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Coral Reefs, Fossil and Recent.

DR. VON LENDENFELD has (June 12, p. 148) quoted cases to contest my statement that there are no coral reefs whose slopes are known to descend steeply to greater depths than about 4000 feet. I must take these seriatim.

(1) "Fitzroy's no-bottom sounding of 7200 feet at a distance of 6600 feet from the breakers at Keeling Island."

I hope I shall not be misunderstood when I say that I cannot accept this as conclusive evidence. Experience daily shows us how little confidence can be placed in a single deep sounding, taken before the days of suitable apparatus, and with no description of the means employed, either to fix the position exactly, or to obtain the cast. It may be correct, but on the other hand it may not be.

(2) "Maldives, &c., rise from a bank of 1000 fathoms very abruptly."

I cannot find any deep soundings near these groups at all. One sounding of 1243 fathoms at a distance of 10 miles is the closest.

(3) "Bermudas rise abruptly out of a depth of 12,000 to 13,000 feet."

There is only one sounding of 12,000 feet anywhere near Bermuda, and as that is six miles from the nearest shallow water, the isolated Challenger Bank, it represents a slope of only 19°.

In point of fact, very few slopes of coral formations have yet been accurately measured. Among the most remarkable that I know are:—

Bougainville Reef in Coral Sea, which drops perpendicularly from the water-level to 360 feet; at a mean slope of 76° to 780 feet; and at 53° to 1500 feet.

Dart Reef, in same sea, has a mean slope of 64° to 1200 feet.

Macclesfield Bank, a so-called, "drowned" atoll, in China Sea, has a mean slope of 51° to 4200 feet, and possibly more.

The existing conditions of the steep outer slopes of atolls are sufficiently astonishing. All I wish to maintain is that we should argue upon proven facts, and not assumptions, which tend to exaggerate difficulties, and to lead us astray.

With regard to Dr. von Lendenfeld's explanation of the limitation of depths of lagoons, I must await a better before I am convinced. My point is that it is very remarkable that no matter how vast the lagoon, and how deep the steep outer slopes, no lagoon has more than a certain depth, and that such a limited depth that isolated coral heads can spring out of it; and I cannot make this general fact fit with a general theory of subsidence, even when varied by occasional elevations.

The "drowned" atolls are no deeper than others whose rims are at the surface; *vide* Great Chagos Bank, and Suadiva Atoll in Maldives.

W. J. L. WHARTON.

June 14.

ELECTRO-MAGNETIC RADIATION.[1]

IN order to discover whether actions are propagated in time or instantaneously, we may employ the principle of interference to measure the wave-length of a periodic disturbance, and determine whether it is finite or no. This is the principle employed by Hertz to prove experimentally Maxwell's theory as to the rate of propagation of electro-magnetic waves. In order to confine the experiments within reasonable limits we require short waves, of a few metres' length at most. As the highest audible note gives waves of five or six miles long, and our eyes are sensitive only to unmanageably short waves, it is necessary to generate and observe waves whose frequency is intermediate between them, of some hundred million vibrations per second or so. For this purpose we may use a pair of conducting surfaces connected by a shorter or longer wire, in which is interposed a spark-gap of some few millimetres' length. When the conductors are charged by a coil or electrical machine to a sufficiently high difference of potential for a spark to be formed between them, they discharge in a series of oscillations, whose period for systems of similar shape is inversely proportional to the linear dimensions of the system so long as the surrounding medium is unaltered. When the surrounding non-conducting medium changes, the period depends on the electric and magnetic specific inductive capacities of this medium. Two such systems were shown: a large one, whose frequency was about 60 millions per second; and a small one, whose frequency was about 500 millions per second. The large one consisted of two flat plates, about 30 cm. square and 60 cm. apart, and arranged in the same way as is described by Prof. Hertz in *Wiedemann's Annalen*, April 1888. The

[1] Friday Evening Lecture delivered at the Royal Institution, on March 21, by Prof. G. F. Fitzgerald, F.R.S.