

interest it is necessary to be instructed; and in an immense number of cases it is impossible to convey in non-technical language, so as to be understood by the uninstructed, in what the interest consists. Hence it follows that a large number of scientific workers have conceived a decided contempt for all attempts to popularise science. Their position is so far sound. Still, it is extremely important in the interests of science itself that its investigations should not be wholly withdrawn from the notice of the general community and confined to a small esoteric class. Here the function of the evangelists needs to be properly recognised; we want men with Dr. Macmillan's sympathy with the subject-matter and liking for exposition to take a wider view of it in respect to general interest than it will ever be possible for the special student to take. If public funds are to be devoted to scientific purposes, it is absolutely necessary that the public mind should have some idea that they are being expended on something of more general importance than individual hobbies, as they will be too apt to believe, unless their sympathy with the work is occasionally kindled. It is not every branch of science which is capable of yielding results which can at once be turned to commercial profit, and though knowledge in every line of investigation may be expected to yield practical applications in the most unexpected directions, it would be an evil time for scientific advancement when the community determined to shut its eyes and close its ears to everything which could not be shown to pay. It is very likely, however, to begin to do this unless scientific men take measures to excite intelligent interest where there is no obvious suggestion of profit to gratify the natural cupidity of a commercial country.

It is worth while making these remarks, because it deserves to be borne in mind that the work—though apt to be contemned—is not easy to do; nor is it easy to find men fit to do it. And the criticisms which we shall now proceed to make on Dr. Macmillan's book are made by no means from a desire to find fault, but rather to bring into prominence the inherent difficulty which exists in writing such a book as it should be written. If the author has not had a thorough drilling in the technicalities of the subject, then, as Dr. Macmillan has done, he will make some exceptionable statements and stray into sundry grievous pitfalls. If, on the other hand, he is quite and fully competent to write the book, it is tolerably certain he will never write it at all. The general reader wants his science skimmed for him—and this is an operation which a competent student particularly dislikes to perform.

It is a pity that some of Dr. Macmillan's friends "whose scientific position lends weight to their opinions" did not assist him in issuing the work in its new form. This in fact seems to be the only chance of doing the thing properly. The aid of those who would not actually write such books might at any rate be given for the purpose of keeping them free from glaring blunders.

Mosses, for example, we are told (p. 27) belong to the highest division of flowerless plants. This statement can only be met by a categorical negative. As to their being "puffballs of the flowering plants, epitomes of archetypes in trees and flowers," if this is the alternative for technical language, the general reader can hardly be congratulated on the change. But the author seems not to have

a very clear conception of the structural rank of mosses. He tells us on the next page that "through the cone-like spikes of the club-mosses they approximate to the pine tribe in their fructification." This is a *rapprochement* which no modern systematist would think of making. In fact, mosses and club-mosses have the same kind of relationship and no more than ants have with white ants or the albumen of an egg with the albumen of a seed.

On p. 37, it takes one's breath away to read, "Besides these curious capsules there are other organs of fructification which clearly demonstrate the sexuality of mosses." It hardly at first occurs to the reader that the author has no notion that the capsules are really the fertilised product derived from the sexual apparatus. The capsule—and this is one of the most remarkable things in the whole vegetable kingdom—is gradually developed from the oospore; its being composed of modified leaves, as Dr. Macmillan explains on p. 40, is an antiquated idea. There is something indeed to strike an intelligent curiosity on almost every page. At p. 80 we are told of Lycopods "becoming slightly arborescent in tropical countries, particularly New Zealand." On p. 84 "some species" are said "to have little cone-like spikes at the tips of their branches under the scales of which, as in the pine tribe, lurk the reproductive embryos." This is simply utter nonsense. In so far as the process is understood we have spores borne in spore cases at the base of the upper surface of the fruiting scales, and these spores when disseminated undergo a further process of development, which results in the formation of an embryo.

Dr. Macmillan dismisses Schwenderer's theory of lichens in a very *ex cathedra* fashion. *En revanche*, he is equally decided in rejecting Dr. Bastian's views on heterogenesis.

We regret that this book has not been put into a more satisfactory shape, for the author has industriously collected a great deal of very interesting matter.

W. T. T. D.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

Bright Meteors

ON Saturday last I saw *two* very bright meteors, each coming from the Perseus radiant point, and isolated from smaller ones by such a length of time that my (possible) watch error of perhaps one minute will not prevent their being identified if they have been observed at other stations.

A very bright one, almost like a rocket, passed exactly over Vega at 10.35.

Another, nearly as bright, passed through the intersection of the diagonals of the quadrilateral of Monoceros at 10.55.

P. G. TAIT

St. Andrew's, N.B., Aug. 13

Mr. Herbert Spencer and Physical Axioms

I CANNOT help thinking that something of importance still remains to be said on the subject of the laws of motion, recently argued in your columns with so much ability by Spencer, Tait, and others.

There are three species of magnitude, viz., number, extended magnitude, and magnitude of degree. Magnitude of degree ad-