But the worst of a pessimistic outcry about the over-rapid development of science is that it is taken up by the general public, one section of which is always hoping that what is unintelligible is really meaningless, and may be safely ridiculed or ignored. So it has happened that a strange sentence in Prof. Smithells's address, which I will quote directly, is made the text for a singular attack by a leading article writer in the *Times* of August 6 apparently against the Cambridge school of mathematical and experimental physicists, which for a long time now has been in the eyes of the world one of the scientific glories of this island.

The quotation is as follows:—

"There is never more cause for anxiety than when we see a mathematical theory awaiting the delivery of the confirmatory facts; and there is nothing more important for chemistry than the continual recruiting of that old guard which will be ever ready to stand to arms on the appearance of an eager theorist."

Now it is an old and recognised tradition that mathematical prediction of a fact to be subsequently confirmed by experiment is the highest achievement of science. The clearer the prediction, and the more rigorous the subsequent verification, the greater should be the joy among all those who wish for the advancement of natural knowledge.

That the theory should be completely intelligible to those comparatively ignorant of mathematics, until the fact has been arrived at experimentally, is not to be expected; and that a few should suppose that the prediction is only really forthcoming after the event—which is when they first hear of it—is also not unnatural. But the preparation of a theoretical niche for a fact, either just discovered or just on the verge of being discovered, is a piece of work involving the highest faculty of scientific insight; and it is to be hoped that the public are not going to be misled into a depreciation of the work of all except those who, very rightly, collect an assemblage of facts.

There is room for workers of all kinds towards the progress of science, and the encouragement and countenance of the public is one of the conditions; for often enough the difficulties of the work itself are more than discouraging, and if uncertainty as to its reception or appreciation by the contemporary human race is to be added, then it is to be feared that the discouragement may in some cases become complete. Such a catastrophe actually happened in the case of Thomas Young; but it was not the outcome of a meeting of the British Association for the Advancement of Science.

Probably the real intention of the president of Section B was to caution certain physical chemists, and perhaps to restrain or rebuke some of the Ostwald school in his own section; a matter well within his jurisdiction. Indeed, if he only wishes to express dislike at an attempted replacement of ordinary dynamics by a vaguer "energetics," he will find sympathisers among the physicists; as witness the following quotation from an article by the late G. F. FitzGerald in NATURE for March 12, 1896 (reproduced in his collection, "Scientific Writings," p. 387), with reference to an article by Prof. Ostwald called "Emancipation from Scientific Materialism." I must add, however, that FitzGerald was a keen admirer of the work of Prof. Ostwald in general, though in this particular doctrine, especially on its negative side, he did not consider that he was on a hopeful path. The quotation is as follows:-

"There are so many vague fallacies underlying it, that it would hardly be worth answering, only that there is considerable risk that others, chemists especially, may be carried away by the arguments of one whom they rightly value as a leader in their own domain, when he descants positively about the realm of mechanics."

For the present purpose I need not enter upon a discussion of this matter: there is doubtless much that can be said on both sides. If the president of Section B had so expressed himself as to drive home this kind of caution among the members of his own section, without appearing to refer to better known and more immediately prominent subjects of debate, I should have said no word; and I desire it to be clearly understood that I am not now expressing any opinion on this subject. But, unfortunately, that is not how his address has been regarded from outside, nor is it the interpretation to which certain phrases, such as "chemistry of phantoms," "exuberance of mathematical speculation," readily lend themselves. It is in the hope that damaging misunderstanding may be avoided that this article is written. OLIVER LODGE.

A TRIAD OF SPORTING BOOKS.[1]

TO the author of the volume standing first on the list given below, the wilderness from time to time calls with such persistence and force that to hear is practically to obey; and, whether to shoot wild goats in the Taurus, to collect vultures' and eagles' eggs in Asia Minor or Spain, or to track the lordly moose and the branching-antlered caribou in the wilds of the far North-West, Mr. Selous returns year after year with unabated zest to the roving life of his earlier South African days. That the public benefits from this restless disposition can scarcely be denied, for although he cannot be credited with anything special in the matter of literary style, the author of "Recent Hunting Trips" writes with that freshness and *verve* that almost transports the reader to the very scenes of his adventures and triumphs. Nor is this all, for Mr. Selous is essentially of a generous nature, and it is but seldom that he returns from one of his sporting trips without some important addition accruing to the national museum.

In the volume now before us, the author gives an account of his experiences during several shooting trips to British North America, undertaken between the years 1900 and 1906 (inclusive) in search of moose, caribou, and wild sheep; these, which include two visits to Newfoundland, comprising the whole of his hunting in this portion of the New World. In the preface, Mr. Selous records his opinion with regard to the closure to the sportsman of the central districts of American Alaska—an opinion worth quoting, as it has a bearing on so-called game-preservation in other parts of the world. Although the sportsman, who would be content with a few good trophies of male animals to add to his collection, is completely shut out, the game is by no means protected. The Indians, for instance, armed with modern weapons, can apparently shoot as they will, and spare no animals of either sex or of whatever age which come in their way, while meat-hunters of European blood are no less destructive. Although the Indian doubtless has the justification that he shoots, in part, at any rate, for his own maintenance, yet it is he and his white fellow-countrymen who, in the author's opinion, will ultimately bring about the extermination of the game with which the land now abounds, unless the whole system of game legislature is altered, and that speedily.

[1] "Recent Hunting Trips in British North America." By F. C. Selous. Pp. 400; illustrated. (London: Witherby and Co., 1907.) Price 16s. net.
"Game and Game Coverts." By John Simpson. Pp. 83; 16 plates. (Sheffield: Pawson and Brailsford.) London: County Gentlemen's Association, Ltd., 1907.) Price 15s.
"How to Fish: a Treatise on Trout and Trout-fishing." By W. E. Hodgson. Pp. xii+377. (London: A. and C. Black, 1907.) Price 3s. 6d. net.

Although from the point of view of bodily stature the moose (or elk, as it is commonly called in England) is undoubtedly the finest animal in this part of the world, the various races of caribou (or reindeer) are calculated to attract the interest of naturalists to a special degree on account of the incredible numbers in which they occur, not only on the mainland, but also in the almost untrodden heart of Newfoundland; while their periodical migrations in certain districts are among the most wonderful phenomena in big-game life. Not the least marvellous feature in these "treks" is the manner in which whole herds sometimes swim in company, so as to form in certain cases, as described by a recent traveller in Labrador, a veritable living bridge. In other cases, however, they travel in small parties, or even in pairs, lying down to rest or pausing to feed as their inclinations prompt.

FIG. 1.—Caribou on migration. From "Recent Hunting Trips in British North America."

"On one occasion," writes the author, "herd after herd of caribou passed the end of the lake in full view from where we were sitting. These herds were all small, consisting of from three or four to ten animals. They were all following the same trail, and were evidently migrating from the north-east to the south-west. Although they kept stopping to feed they travelled fast, often trotting as if alarmed."

With the assistance of various friends, the author has been able to illustrate his book with a number of striking photographs of migrating caribou, some showing the animals as they traverse the scrub in well-beaten tracks, and others their appearance when swimming lakes or rivers. As a permanent memento of the latest trip, reference may be made to the two magnificent caribou shot by the author and presented by him to the British Museum (Nat. Hist.), where they are now set up in the mammal gallery, one of these representing the large dark-coloured *Rangifer tarandus osborni*, and the other the smaller and whiter *R. t. terrae-novae*. Special interest, it may be added, attaches to the mention (p. 73) of the manner in which the spreading feet of the caribou enable the animal to traverse boggy ground, where horse, ox, or ass would be helplessly mired. Lack of space prevents mention of a number of interesting points in this fascinating book of adventure and sport, but we must refer to the author's measurement of his finest bull moose (p. 215), the height of which is given as 6 feet 11 inches. Reference must also be made to an interesting opinion in connection with wild sheep, namely, that the white *Ovis dalli* probably grades into the grey *O. fannini*, and the latter into the black *O. stonei*. The view that these sheep are but local races of the Kamchatcan *O. nivicola* is supported; the true *O. canadensis*, like the true grizzly bear, having departed further from the northern type owing to its having travelled further south, and perhaps having entered the country at an earlier date than the others.

The second (like the third) work on our list is entirely for the stay-at-home sportsman, and is intended to emphasise the importance of much greater care being exercised by game-preservers as to the culture of covert suitable for different kinds of game. Hitherto the general practice has been to let coverts grow more or less as they will; but the author, who has had great practical experience of the subject, shows that this is altogether wrong. Not only is one kind of tree or bush specially suited to particular species of game, but care is needed in order that such trees or bushes may have proper opportunities for full development. A case in point is afforded by the blackberry bramble, which needs open space and sun, when it affords not only excellent covert, but also a valuable food-supply. In this connection it may be mentioned that in Mr. Simpson's opinion gamekeepers err in over-feeding their charges; which, to say nothing of economical considerations, would be far better in many ways if left to get their own living in properly planted coverts. Game-preservation, according to the author, is likely to become more and more profitable to English landlords; and special attention is directed to the economic value of rabbits on estates. The special feature of the book, which should be in the library of every landowner and game-preserver, is the beauty of the illustrations of different kinds of covert, when properly developed; the most exquisite of all being the photograph of a mound of blackberry bramble in fruit.

Sometimes we venture to think that authors do not select sufficiently comprehensive titles, but in the case of Mr. W. E. Hodgson's book, standing third on our list, the main title seems to err in the opposite direc-

tion. For in place of instructing the angler in the art of alluring river-fish of all kinds, this volume, as, indeed, is indicated in its supplementary title, tells him only how to capture the wily trout. Since, however, this is, *par excellence*, the sporting fish of English rivers, there may be some justification for the designation. The author has already published a more ambitious work on trout-fishing, which has, we believe, been well received by anglers; but that volume is intended mainly for the benefit of those who are already experts in the gentle art, whereas in the one now before us it is sought to instruct the beginner in the elementary principles of trout-fishing.

Mr. Hodgson is evidently one of those who believe that salvation is to be found otherwise than by "dry-fly" fishing; and a considerable portion of his work is accordingly devoted to other methods, inclusive of spinning with minnows, and luring with the luscious wasp-grub. That the author will not please every angler in all details may be regarded as a matter of course; but, speaking generally, he seems to have treated his subject in a manner which ought to satisfy those who are making their first essays at trout-fishing. The book is well illustrated, and likewise contains a number of observations on the natural history of the subject, and, indeed, on nature-study generally. R. L.

GENETICS.[1]

THE last contribution to the fast-increasing pile of Mendelian literature is unique. It is at once the bulkiest within the limits of two covers, that has been made to this subject, and at the same time the most condensed, the most varied, and the most valuable.

The third International Conference on Genetics, held under the auspices of the Royal Horticultural Society, and under the presidency of Mr. Bateson, was a veritable Mendelian orgie. The history of all new theories is the same. They are judged not so much on their own merits as on the number and variety of natural processes, previously unintelligible, which they explain. The result of the publication of the "Origin of Species" was, as Mr. Bateson has pointed out, the distraction of the attention of biologists from the process of evolution itself and its diversion into the hitherto dry channels of palæontology, classification, embryology, comparative anatomy, and distribution. It was not until the end of the nineteenth century that men returned to the study of evolution. The relation between man and a new theory is the same as that between a child and a new toy. When we first get the toy we are occupied in playing with it in every possible way, and as often and as much as we can. But when all legitimate sources of interest have been tapped, we tire of playing with the toy and begin to wonder how it works; and, to satisfy our curiosity, we pull it to pieces. The result of the attempt to satisfy this curiosity in the case of Darwin's theory was the growth of a conviction that natural selection did not provide a sufficient explanation of the diversity of organic forms. The history of Mendelism has been like that of Darwinism. The flood of energy let loose by the re-discovery of Mendel's papers has spent itself rather in work based on the assumption that the interpretation which Mendel put on the facts he discovered was true than in the attempt to discover whether that interpretation were true or not; and in our opinion it is right that this should be so. The merely critical spirit is a barren one. The enthusiasm of the kind which follows the birth of a new theory such as Darwin's or Mendel's has been as productive of discovery in the case of the latter as it was in that of the former. At the same time, we should not forget that Mendelism is now in the stage in which Darwinism was before it was subjected to the process of being overhauled; and though we may perhaps be right in holding that criticism is barren of discovery, we should guard against the possibility of entering that frame of mind which regards criticism as blasphemy. Mendel's peas have already been called classical; and it is a very remarkable fact that no one has repeated Mendel's experiments with the deliberate intention of testing the Mendelian interpretation of the results. People speak as if Mendel got to the bottom of the inheritance of roundness and wrinkledness, yellowness and greenness, and as if there was nothing more to be said on the subject. On p. 88 of the report before us there is a table exhibiting the result of crossing a yellow with a green pea to the fifth generation. The proportion of pure yellows, impure yellows and greens is given both for the fourth and for the fifth generation as 1 : 2 : 1, and it is stated on the bottom of p. 88 that this process of segregation will be continued "practically for ever." It is highly probable that the three categories do form respectively 25, 50, and 25 per cent. of generations four and five; but Mendel never published any figures which prove this to be so. All he said was: "The proportions in which the descendants of the hybrids develop and split up in the first and second generations presumably hold good for all subsequent progeny. Experiments one and two have already been carried through six generations, three and seven through five, and four, five, and six through four, these experiments being continued from the third generation with a small number of plants, and no departure from the rule has been perceptible."[1]

We offer no apology for adopting this critical attitude towards Mendelism. There is plenty of admiration for "Mendel's incomparable achievement," and we share it; but we do not find it impossible to combine it with a suspicion that Mendel's interpretation of his results may not have been right after all.

The report is, of course, absolutely indispensable to every student of genetics, whether his interest is purely scientific or purely horticultural, or both. The keynote of the conference was struck by a pealing of the marriage bells of Science and Practice. We could have no better guarantee that their union will be fertile than that their hands were joined by the Rev. W. Wilks, who has earned the gratitude of every study of heredity by editing this report, and of every lover of flowers by creating the Shirley poppy.

[1] Report of the Third International Conference, 1906, on Genetics. Edited by Rev. W. Wilks. Pp 486. (Printed for the Royal Horticultural Society by Spottiswoode and Co., Ltd., n.d.) Price 15s.

NOTES.

PROF. H. LE CHATELIER has been officially nominated professor of chemistry at the Paris Faculty of Sciences in succession to the late Prof. Henri Moissan.

IT has been decided by the Paris Municipal Council to perpetuate the memory of Prof. Berthelot by re-naming the Place du Collége de France the Place Marcelin Berthelot.

WE regret to have to record that Prof. Karl Vogel, director of the Astrophysical Observatory at Potsdam, died on August 13.

WE regret to have to announce the death of the Rev. Dr. John Kerr, F.R.S., formerly lecturer on mathematics in the Glasgow Free Church Training College.

[1] This is Bateson's translation, Mendel's "Principles," p. 57. The original may be consulted, most accessibly, at p. 16 of No. 121 of Ostwald's *Klassiker der exakten Wissenschaften*, Versuche über Pflanzenhybriden Price 1 mark.