the French capital." As to the justice of this remark we need only appeal to the recent numbers of the "Annales des Sciences Naturelles" and the "Nouvelles Annales du Muséum," which are replete with zoological memoirs of the highest interest, and to the great work on fossil birds, by Alphonse Milne-Edwards, recently completed, which is alone sufficient to refute such a sweeping accusation. That the spirit of scientific enterprise is still alive in France is, moreover, sufficiently manifest by the grand researches of Père David in Chinese Tibet, and of Grandidier in Madagascar, while there is certainly no lack of scientific experts to bring their discoveries before the public. A more baseless and unjust attack was certainly never penned against the savants of a sister nation.

But when our English critic proceeds to suggest that either the general editor of the present work, Prof. Milne-Edwards, or the joint author of the part devoted to the Reptilia—the late Prof. Dumeril (for his remarks may be intended for either of these gentlemen)—has appropriated the funds devoted to its preparation and left the labour to be performed by some inferior subordinate, the matter becomes still more serious. It is, however, sufficient to reply that no sort of evidence is given to support these statements, and that the value of Dr. Gray's *ipse dixit* is not sufficiently appreciated among naturalists to induce them to accept such an impossible supposition.

OUR BOOK SHELF

Sahara and Lapland. Travels in the African Desert and the Polar World. By Count Goblet D'Alviella. Translated from the French by Mrs. Cashel Hoey. (London: Asher and Co., 1874.)

AT first sight it would seem that no two countries had less in common than the two about which this book is written; but Count D'Alviella ingeniously and correctly shows, in his thoughtful preface, that they, or rather the Lapps and Arabs, have many circumstances in common. These two peoples "lead the same vagabond existence; they live exclusively upon their herds, they carry with them all they have and that they possess, and they make analogous migrations at the changes of the seasons—the Lapps from the Swedish steppes to the Norwegian valleys, the Arabs from the plains of Sahara to the pastures of Tell. In this manner of life they have both acquired the same strength of constitution, or rather the same power of resisting such fatigue, privations, and weather as would kill the most robust European. . . . Both the Lapps and the Arabs—who are rather the slaves than the masters of Nature—owe their consciousness of isolation and powerlessness to the same superstitions, the same beliefs in spirits, to the 'evil eye,' in amulets, and in incantations. . . . Both races—restricted for centuries to a form of society unsuitable to any kind of progress—affect the same respect for the routine of their ancestors, and the same disdain for the arts of civilisation." The author concludes rightly, we think, that both peoples, incapable as they are of transformation or civilisation, are doomed to disappearance. Many attempts have been made by the Swedish and French Governments to get these nomads to settle down into civilised life, but invariably without success. The author, on the authority of M. Charles Martins, relates that the French Government gave to a number of the poorest Arabs of the Sahara some fertile fields with a ready-built village, and even a mosque in the middle of it. They reserved the houses for their flocks, and pitched their tents in the streets; until one day the nostalgia of the desert seized upon them, and they returned rejoicing to their wandering life.

Count D'Alviella tells the narrative of his travels in these two regions very pleasantly. He is a cheerful and observant and somewhat philosophic guide, and we can assure anyone who cares to buy this work, that he will get the value of his money in enjoyment and information. The narrative of the Lapland journey is especially interesting, and contains information about a people and a country that we believe many know but little about. Here will be found an account of the mode of life of a people that in many respects may be taken as the living type of the men who, ages ago, struggled for existence amid conditions very different from those which now obtain in Europe, and whose implements and remains come within the province, not of the historian, but of the geologist.

Mrs. Hoey deserves credit for her excellent translation. The volume contains a number of fairly executed illustrations.

LETTERS TO THE EDITOR

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

M. Barrande and Darwinism

IN the article in NATURE (vol. ix. p. 228) on M. Barrande's "Trilobites," published in 1871, several statements are made which require not only considerable modification as to the facts then known, but which are entirely misleading when made to appear to represent the state of our knowledge of these acts at the present time. M. Barrande is well known to be a determined opponent to the theory of evolution, and doubtless this strong bias has prevented him from seeing and accepting many facts which would otherwise, to so keen and careful an observer, have seemed inconsistent with such strong views. The list of fossils given by him from the Cambrian formation, and which is reproduced in NATURE, is most incomplete and inaccurate when made to refer to the Cambrian fauna of this country, as will be evident at once by referring to p. 249 of the same work, where a list of fossils discovered by me in the "Harlech or Superior Longmynd" group of Wales is given, and which includes several trilobites; and yet in the above-mentioned article it is stated "that no trace of a trilobite has been found in the Cambrian formation." Surely no English geologist will be bold enough to deny to the name Cambrian its right to these Harlech and Longmynd rocks, whatever else it may not be entitled to. Nor, indeed, did Sir R. Murchison and the Geological Survey ever attempt such a breach, and I cannot believe that M. Barrande has realised what such an assumption means, or what it would lead to; nor can I believe that it is possible for him to have followers in this country in such a "violation of historic truth," and, as observed by Prof. Sterry Hunt (in the *Canadian Naturalist*, vol. vi. p. 448), for no other reason than "that the primordial fauna has now been shown by Hicks to extend towards their base." Surely this country, which has not only given to scientific nomenclature the name Cambrian, but which has given to all other countries the groundwork upon which to build up theirs, should have a right to explain the succession in its own way, and especially when it is proved that its succession of these rocks is clearer and more natural than has been hitherto found to be the case in any other country. Indeed it is quite clear that M. Barrande has not yet succeeded, in Bohemia, in reaching this early fauna, and it is evident also that his first zone of life is only equal in order of appearance to the latter part of our second zone, and hence the mistake to attempt to correlate our fauna with his zone.

At St. David's in South Wales, the Cambrian of the Geological Survey, consisting of red, purple, and green rocks, attains a thickness of over five thousand feet of beds resting conformably, and of these beds over four thousand feet have yielded evidence, in the form of fossils, of life having existed in the seas in which they were deposited. The forms of life comprised annelids, brachiopods, pteropods, bivalve crustaceans, trilobites, and sponges, and I think it would be seen on examination that the picture offered by this early fauna is not one in discordance with Darwinism, as assumed in the article in question. But as M.

Barrande and the author of the article have restricted their remarks almost entirely to the trilobites, I will only ask to be allowed space to reply to the facts stated with regard to these forms of life. Trilobites have now been discovered as low down as 4,000 ft. in these red and green rocks at St. David's, that is, in the very earliest fauna known, and amongst them are forms hitherto not discovered in any other country; still if we are to believe with some that we are here near the beginning of life on the globe, or even of trilobitic life, we can expect but little evidence to support or to disprove Darwinism. For, considering the frequent changes in the sea bottom which must have taken place at this period, to produce at one time a shingle, then a sand or grit, and then a fine muddy deposit, and such beds frequently repeated, we cannot possibly expect that during all these physical changes an unbroken record of these forms should be preserved to us. No, rather we should expect to find that the necessary migrations would produce alterations in the forms, and that they should now and again return modified and altered in proportion to the time which had intervened and the circumstances which surrounded them. And this is really what we do find, and which is apparent at once to the palæontologist, who is prepared to allow and to recognise in these very marked physical changes a controlling influence capable of greatly affecting the life of the period. Again, can any one really believe, when thinking of the enormous time which must have elapsed during the accumulation of the great Laurentian series, and possibly of other series previous and succeeding, all antecedent to the time when the Cambrian fauna made its appearance, that the seas in which these were deposited were entirely barren of life? Surely not; therefore, why so readily jump at conclusions when there is so much room for doubt? Again, this Cambrian fauna is not without evidence in favour of evolution. Trilobites we know develop by increase of the body segments, and therefore M. Barrande says that the earliest trilobites should have the smallest number of segments in the thorax—"but that those of the primordial fauna are generally characterised by the opposite condition, while the number is less in those of the succeeding faunas." Now it does not seem to have occurred to M. Barrande that trilobites show every indication of having culminated at or about this period, that they had attained their maximum size and development, and that from this time they seem to have gradually diminished in size, and to have degenerated, doubtless much in the order in which they had previously progressed. This will explain also why the number of segments should, as he says, diminish in number in the genera of succeeding faunas. One of the very earliest trilobites we know of is the little *Agnostus*. It is also the simplest and apparently the most rudimentary of the group. It has no eyes, only two segments to the thorax, and usually an ill-defined glabella. In tracing a species of *Paradoxides* from the earliest stage upwards, I was struck with the very great resemblance which, at an early stage, it had to the little *Agnostus*. The glabella was indistinct, and much shorter in proportion to the length of the head than in the fully grown specimen, and the eye very faint, scarcely marked out, and the outline of the head more evenly rounded, with scarcely any indication of spines. Before the discovery of the Cambrian fauna at St. David's, no genus of trilobites had been found with four segments to the thorax, therefore we had to jump from one with two to one with six, as in *Trinucleus* or *Amplexus*. Now, however, since the discovery of *Microdiscus* with four segments, the gap has been filled up, and the genus, unfortunately for those holding M. Barrande's views, appears in our earliest fauna, and where the evolutionist would be most inclined to look for it. It is also a most interesting and instructive genus. It is somewhat larger than *Agnostus*, but like it, has no eyes. The glabella is better formed, more distinctly marked off from the cheeks, and instead of being irregularly grooved, as is usually the case with *Agnostus*, it is furrowed regularly as in an advanced stage in the development of *Paradoxides*. In the caudal portion the axis is partly divided into segments, and in one species the lateral lobes are slightly grooved as if into rudimentary pleuræ. It is very plentiful in the beds at St. David's, and since its discovery there, species have also been found in Canada and elsewhere.

From this stage forms have been found to represent every step in development as to the number of segments, and indeed often to show marked stages in other parts. *Anopolenus* is really a *Paradoxides* with enormous eyes, reaching to the hinder margin, and with several of the hinder pleuræ consolidated together to

form a large spinous pygidium. Another *Paradoxides* has the eyes nearly as large as *Anopolenus*, but with a few more segments to the thorax, and a smaller pygidium. Other species show various gradations in the eyes and in the pygidium until we attain to *P. Davidis*, which has small eyes, a small pygidium, and the greatest number of thoracic segments. Indeed there are forms to represent almost every stage, and there can I think be no doubt that in the fauna of the Tremadoc group, which is separated from the earlier Cambrian by several thousand feet of deposits indicating a period of very shallow water in which large brachiopods and phyllopod crustaceans were the prevailing forms of life, we witness a return to very much the same conditions as existed in the earlier Cambrian periods, and with these conditions a fauna retaining a marked likeness to the earlier one, and in which the earlier types are almost reproduced, though of course greatly changed during their previous migrations. The *Niobe* (?) recently found in the Tremadoc rocks is truly a degraded *Paradoxides*, retaining the glabella and head spines, but with the rings of the thorax, excepting eight, consolidated together to form an enormous tail. Instead therefore of having here, as stated by M. Barrande, "a very important discord between Darwinism and facts," we find in these early faunas facts strongly favouring such a theory, and in support of evolution.

Hendon, Jan. 27

HENRY HICKS

ACCORDING to a notice in NATURE, vol. ix. p. 228, a distinguished continental naturalist finds an important discordance between Darwinism and certain facts connected with Trilobites and other fossil crustaceans. But his argument appears to be based on an assumption that we are acquainted with a "primordial fauna," that we are justified in dating the beginnings of life at or near some known geological period. This, however, the whole history of geology ought to make us less and less inclined to believe. It is one of those assumptions, essentially based on ignorance, on which so little dependence can rightly be placed. We have no right to call any fauna the *earliest*, merely because, as it happens, we know of none *earlier*.

A point is made of the fact that the earlier known Trilobites have more segments than the later, while individual Trilobites, as they develop, increase in number of their body segments. It may be granted at once that in this case the development of the individual is not an accurate picture of the past development of the species. But Fritz Müller has long ago shown that we could not, on principles of Darwinism, expect it always to be so; and surely, if Trilobites have been gradually developed rather than abruptly created, there must have been Trilobites with *few* before there were Trilobites with *many* segments, so that after all, the development of the individual will carry us back to an early stage in the history of the family. It could scarcely be expected to give us all the alternations and complications which that history may have presented in its whole course.

Those who on other grounds accept the theory of evolution, far from finding any obstacle to it in the large number of genera of Silurian Trilobites, will consider the largeness of that number clear evidence that life in general, and Trilobite life in particular, must have flourished on the globe for a very long period prior to the Silurian age.

The argument that we do not find connecting links between different genera has little immediate force. It must await the verdict of time and further investigation. Of 252 species of Trilobites, 61 are assigned to England. The true reading of this piece of statistics must surely be that that which great research has done for a small area may be equalled, and far surpassed, when as close a scrutiny is applied to the whole available surface. If no gaps between species, and genera, and orders are filled by the results of such a search, then it will be time to say that we have "an important discord between Darwinism and facts."

Torquay, Jan. 27

THOMAS R. R. STEBBING

Perception in Lower Animals

I RELATE the following, as it has some bearing on a question lately ventilated in NATURE.

A friend and myself were watching on one occasion the actions of two half-bred Persian cats on seeing for the first time a freshly caught cobra, which had been placed in a wire-gauze covered box near the verandah. First of all one of the cats, a black one, stalked carefully up to the box in which the snake was keeping up a perpetual "swearing," with extended hood, and after a