day's NATURE (January 13). The researches of Helmholtz and others have (as is well known) overthrown, to a certain extent, the old idea of the three primary colours—red, blue, and yellow—and have shown that if any *three* are to be selected, red, blue, and green have greater claims than the former. Now, in Mr. Barrett's diagram these correspond to the following notes :—

Red.	Yellow.	Green.	Blue-Indigo.
C.	E.	F.	G.
Tonic.	Third.	Sub-dominant.	Dominant.

The old triad, red, yellow, blue, correspond to the common chord ; but the new triad, red, green, and blue, to the *tonic, sub-dominant* (or fourth) and *dominant* (or fifth) ; or, in other words, to the three notes which constitute in music the *fundamental base* of the scale.

F. DE CHAUMONT, M.D.

Army Medical School, Netley, Jan. 14

Government Aid to Science

I CANNOT but feel flattered that my letter on this subject should have been thought so dangerous as to require a leading article in the same number by way of immediate antidote, but I must beg you to allow me to correct one or two errors into which you have fallen as to the views I really hold, and which it seems I failed clearly to express. You say, you "understand Mr. Wallace to mean that the main result of cultivating science is merely the gratification of those directly engaged in the pursuit, and that they who do not take this personal interest in it derive little or no benefit from it."

The first half of this passage does express, though imperfectly, what I believe to be the truth ; the latter half expresses the exact opposite of what I have ever thought or intended to write on the subject. The main result of the cultivation of science I hold to be, undoubtedly, the elevation of those who cultivate it to a higher mental and moral standpoint ; while the secondary, but not less certain result, is the acquisition of countless physical, social, and intellectual benefits for the whole human race. But if these are the *secondary* and not the *primary* results of cultivating science, it seems to me to be radically unsound in principle, and sure to fail in practice, if by means of any system of State support we seek to find a short cut to these secondary results.

The only logical foundation for advocating the furtherance of scientific discovery by the expenditure of public money, would be the belief that science can be most successfully pursued by those whose chief object is to make practical and valuable discoveries ; whereas the whole history of the progress of science seems to me to show that the exact opposite is the case, and that it is only those who in a noble spirit of self-sacrifice give up their time, their means, even their lives, in the eager and loving search after the hidden secrets of Nature, who are rewarded by those great discoveries from which spring a rich harvest of useful applications.

One more point. I do not admit that it is just to tax the community for all the Government institutions you name, but in the short space at my command I could not go into details. I have stated how I think some of these institutions require modification to make them accord with the fundamental principle of just government ; and if that principle is a sound one, it is easy to see in what way the others should be dealt with. As an example I may indicate, that a detailed survey, like that of the large-scale Ordnance-maps, being primarily a boon to the landowners of the country, should not be *wholly* paid for by the public.

ALFRED R. WALLACE

Food of Oceanic Animals

I FIND on my return home that Dr. Wallich is vexed at my not having given him the credit of having already answered the question which I ventured to put in the ninth number of NATURE, and that he apparently accuses me of inconsistency as regards my estimate of his observations on deep-sea life. I hasten to assure him that my opinion in that respect has never changed ; nor do the extracts which he has given from my reports warrant such an inference.

I certainly overlooked some of his remarks in the "North Atlantic Sea-bed" bearing on my question, in which he says (page 131), it may be asked "under what other conditions than exceptional ones can marine animal life be maintained without the previous manifestation of vegetable life, as must be the case if it exists at extreme depths?" And he answers this inquiry by submitting that "in the majority of the marine Protozoa—as for instance in the Foraminifera, Polycystina, Acanthometræ, Thalassicollidæ, and Spongidæ—the proof of these organisms being endowed with a power to convert inorganic elements for their own nutrition, rests on the indisputable power which they possess of separating carbonate of lime or silica from waters holding these substances in solution." But this does not appear to be a satisfactory answer to the inquiry ; because a limpet separates carbonate of lime from sea-water in order to construct its shell, yet it cannot be assumed that this animal (which is well known to be a vegetable-eater) has also the power of converting other inorganic substances for its own nutrition. Among the Protozoa, many, probably all, of the Rhizopods are animal-eaters. With regard to sponges, Dr. Bowerbank says (Mon. I., p. 122) that in the greater number their nutriment "is probably molecules of both animal and vegetable bodies, either living or derived from decomposition," and that "the fæcal matters exhibit all the characteristics of having undergone a complete digestion."

J. GWYN JEFFREYS

P.S.—In the 10th number of NATURE, Dr. Martin Duncan, under the head of "Deep-Sea Corals," opposes a statement in what he calls a postscript to my report on the "Deep-Sea Dredging Expedition in H.M.S. *Porcupine*." This statement was not part of my report, nor had I anything to do with it.

J. G. J.

MY attention has been directed to a paragraph in one of the late numbers of NATURE referring to Professor Dickie's interesting remarks on the bathymetrical distribution of Algæ, and raising the question of the mode of nutrition of the great sheet of animal life, which is now shown to extend over the bottom of the sea at all depths.

This curious problem was of course one of the first which engaged our interest when working up the results of the dredging cruise of the *Lightning*. In April last, I proposed a solution in one of the "Afternoon Scientific Lectures" in connection with the Royal Dublin Society, which was afterwards reprinted in full in the "Annals and Magazine of Natural History." I see from notices in several newspapers that this question has excited considerable interest ; I may, perhaps, therefore be allowed to quote the passage in the lecture specially bearing upon it :—

"The question of the mode of nutrition of animals at these great depths is a very singular one. The practical distinction between plants and animals is, that plants prepare the food of animals by decomposing certain inorganic substances which animals cannot use as food, and recombining their elements into organic compounds upon which animals can feed. This process is, however, constantly effected under the influence of light. There is little or no light in the depths, and naturally there are no plants : but the bottom of the sea is a mass of animal life. On what do these animals feed? The answer seems to be sufficiently simple : nearly all the animals—practically *all* the animals, for the small number of higher forms feed upon these—belong to one sub-kingdom, the Protozoa, whose distinctive character is that they have no special organs of nutrition, but that they absorb nourishment through the whole surface of their jelly-like bodies. Most of these animals secrete exquisitely-formed skeletons, sometimes of lime, sometimes of silica. There is no doubt that they extract both of these substances from the sea-water, although silica often exists there in quantities so small as to elude detection by chemical tests. All sea-water contains a certain proportion of organic matter in solution. Its sources are obvious. All rivers contain a large quantity : every shore is surrounded by a fringe which averages about a mile in width of olive and red sea-weeds : in the middle of the Atlantic there is a marine meadow, the Sargasso Sea, extending over three millions of square miles : the sea is full of animals which are constantly dying and decaying ; and the water of the Gulf Stream, especially, courses round coasts where the supply of organic matter is enormous. It is, therefore, quite intelligible that a world of animals should live in these dark abysses, but it is a necessary condition that they should chiefly belong to a class capable of being supported by absorption, through the surface, of matter in solution ; developing but little heat, and incurring a very small amount of waste by any manifestation of vital activity. According to this view, it seems highly probable that at all periods of the earth's history, some form of the Protozoa, rhizopods, sponges, or both, predominated greatly over all other forms of animal life in the depths of the warmer regions of the sea ; whether spreading, compact, and reef-like, as the Laurentian and Palæozoic eozoön;