case no new type can possibly arise, and every plant and animal in the world is an "end group," which is utterly inconceivable from the evolutionary hypothesis.

Sunlight is pure and colourless. Under the stimulus of a prism it becomes red, yellow, and blue. If animal form and colour are no more than the prismatic separation of inherent characters preexisting in the germ plasm, it seems to me that the theory of "Darwinian" evolution falls to the ground, and that it is not logical to use arguments founded on that hypothesis to establish conclusions that are fatal to its existence; but I write with a certain trepidation, remembering the fate of the earthenware pipkin that ventured into the stream amongst the iron pots. E. C. SPICER.

Waterstock, Oxford, February 1.

THE slightly dogmatic tone of my original article (January 2, p. 193) under the above heading has called forth quite a number of confessions of failure to understand the modern attitude towards this question. But, though we admire the generous spirit of those who have come forward and made a public exhibition of this failure, we consider that we have contributed our fair share by enticing them out into the open, and that they are asking too much when they try to relieve their very natural embarrassment by appealing to us to tell them what the modern attitude really is.

Ideally, of course, those who by inclination or accident are in touch with recent thought on these subjects ought to be only too glad to impart what they know to others less fortunate—to the aged and to the remote. But practically it cannot be done. The Editor of NATURE would say, perfectly rightly, that the correspondence column of his journal was not the place for enlightening those who fail to keep abreast of modern biological thought.

Dr. Archdall Reid's statement of the real nature of the problem is not a final one of course (as he probably thinks it is), but it is undoubtedly an improvement on the chestnut-old one which asserts that acquired characters are inherited as well as innate ones—a statement which is meaningless, because all characters are both acquired and innate.

If Dr. Bastian and Mr. Spicer have read that part of Dr. Reid's book, "The Principles of Heredity," which deals with this subject, their letters show that they have been unable to understand it. If they have not, it does not seem to us to be profitable to discuss the matter until they have. A. D. D.

Atmospheric Electricity and Fog.

IN view of the interest recently shown in the subject of the dispersion or prevention of fog, it may be opportune to direct attention to a recent remarkable example of an atmospheric electricity phenomenon which usually accompanies London fogs. I should first explain that the method adopted at Kew for determining the absolute value of the potential gradient—*i.e.* the increase in the voltage per metre of height above the ground—certainly does not err in the direction of overestimating it. Taking eight years, 1898 to 1904, I found in a recent paper [1] that the mean value of the potential gradient at Kew was 159, the mean value for January being 201. The phenomenon referred to above is the occurrence during fog of specially high positive potentials, values double or treble that appropriate to the season being not unusual. At such times, however, there are usually large and frequent oscillations in the value of the gradient, so that the maintenance of an exceptionally high value for a number of consecutive hours is comparatively rare. On the morning, however, of January 21, during an intensely thick fog, the potential gradient at Kew exceeded 730 *continuously* from 1 to 9.30 a.m. How much it may have exceeded this value it is impossible to say, as the trace was beyond the limits of registration during the whole of this time. Both before the trace left the sheet and after its return the oscillations in the potential gradient were large, so that the maximum value was probably at least 1000.

A question of practical interest is whether the steepness of the potential gradient near the ground during fogs serves, or may be made to serve, a useful purpose in helping to clear the atmosphere of dust and smoke. It would also be interesting to know whether these high potentials are wholly without physiological effects on the human body. CHARLES CHREE.

National Physical Laboratory, February 5.

[1] Phil. Trans., A, vol. ccvi., p. 299.

The Penetrating Radiation.

MANY writers apparently assume that the penetrating radiation is due to γ-like rays coming from radio-active products in the ground, and is practically constant in amount. It seems probable, however, that the penetrating radiation comes largely from radio-active products in the air, and that it fluctuates greatly in value.

Taking the mean value found by Strutt and Eve for the radium content of sedimentary rocks as $0{\cdot}9(10)^{-12}$ grams of radium per gram of rock, one finds that it is the source of γ radiation which would produce an ionisation on the surface of the ground in air of less than 0·8 ion per c.c. per sec. Now the above value for the radium content is perhaps large for surface soils subject to constant erosion. The actual value found by Cooke for the ionisation in air as due to the penetrating radiation was 4·5 ions per c.c. per sec. McClennan takes the value as 9, and the writer has found a much larger value in the open country during the warm hours of the day. Assuming that the emanation of the radium differs from a depth of 50 cm. or 60 cm. of the ground, one gets a penetrating radiation that will produce a much greater ionisation.

If the penetrating radiation is due to radio-active products in the air, one would expect that it would vary very greatly in amount. The experiments of Jaffe, Campbell, Wood, Borgmann, the writer, and others would indicate this. On the other hand, if the penetrating radiation comes from radio-active products in the ground, its amount should be quite constant. Dike has found that the active deposit which gathers on a charged wire exposed to the air varies greatly with the time of day. Eve, by his charcoal method, has found widely different amounts of the radium emanation in the air at different times. The writer (*Science*, July 12, 1907) has found that during a heavy rain or snow the penetrating radiation decreases very greatly in amount. Rain and snow have been shown to carry down radio-active products, and if the penetrating radiation is due to radio-active products in the air, then its value should be less during a heavy rain or snow.

If the penetrating radiation is due largely to radio-active products in the air, its value in underground cavities should be less than on the surface of the ground. This is what Elster and Geitel found. The writer has found the ionisation in a closed electroscope to be approximately the same (*a*) in a cave; (*b*) in a cistern where there was 4 feet of water on all sides of the electroscope; and (*c*) inside a screen of lead and cast-iron blocks. In the open country during August and September (1907) this same electroscope showed an ionisation during the day some three or four times greater than during the night. In the cave and cistern the ionisation during the day and night was the same. It is natural to suppose that the penetrating radiation was greater during the day, and was due to radio-active products which had diffused out from the ground. During the night the ionisation was not much greater than for the electroscope in the cave or cistern.

Johns Hopkins University. W. W. STRONG.

Classification of Secondary X-Radiators.

THE relation between the character of secondary X-radiation emitted by elements when subject to the same beam of X-rays and the atomic weight of the radiating substance has been considered in various papers, but only brief reference has been made to the dependence of the character of the secondary on that of the primary radiation. We have recently made a more systematic study of the relation between the secondary and primary rays.

Although the behaviour of no two substances is exactly the same under the same conditions, yet substances may conveniently be divided into several groups, each consisting of elements which emit a radiation possessing many properties characteristic of that group.