considerable rocking and using boats of more advantageous forms than mine, if it will be possible to have a much higher speed than 2000 metres per hour. It appears also that the available force will be hardly sufficient to struggle successfully against strong winds and currents.

I do not therefore prognosticate too confidently any practical value to the motor, but should be very glad if some of your readers would inform me as to any similar experiments which may already have been made. H. LINDEN.

Zoological Station, Naples, February 19.

## Blind Animals in Caves.

As a reader of Mr. Herbert Spencer's writings and a disciple of his, I shall be very glad to lift Prof. Lankester's glove. In the first place I would point out that the process he describes is not natural selection in the ordinary sense; natural selection is the death of the unfit and the survival of the fittest. In the suggested process neither the animals with perfect eyes, nor those with imperfect, are destroyed in the struggle for existence; they are simply segregated. But this is of minor importance. The question is whether there is any foundation for the hypothesis suggested.

Prof. Lankester supposes that the individuals born with defective eyes have remained in the dark places, while those with perfect eyes have followed the glimmer of light and escaped. But he has overlooked the fact that blind cave-animals are *born or hatched at the present day with well-developed eyes*. It is clear, therefore, as in every other case to which the law of recapitulation applies, that the variations to which the evolution is due occurred at a comparatively late period in the life of the individual. Why did not all the individuals escape when they were young, and could still see without spectacles? When the imperfection of the eyes did occur, what ground is there for assuming that it was a congenital variation? It seems to me perfectly certain that it was a deterioration of the eyes caused by the fact that the individual had lived in the dark all its life. In short, I hold that the law of recapitulation in development, the law of metamorphosis, or biogenetic law, as Haeckel called it, is itself a sufficient proof of the inheritance of acquired characters. This argument has never been met or even considered by any of those who talk of congenital fortuitous variations without defining them.

The evidence for the statement I have made is, I confess, not quite complete, but it is sufficient for my present purpose. In Semper's "Animal Life," p. 80, there is an account of *Pinnotheres Holothuriæ*, based on the author's direct observations. This species lives in the respiratory trees of Holothurians, and in the adult the eyes are degenerate and invisible on the exterior of the animal. The young is hatched as a zoæa with perfect typical eyes; even when it enters the host it retains its eyes, but afterwards the eyes degenerate and become covered over by the carapace. In the common mole, to take an instance among mammals, the optic nerves are degenerate in the adult, so that there is no connection between eye and brain; but in the embryo both eyes are connected with the brain by well-developed optic nerves. I am not at present acquainted with any observations on the young of Proteus, or the blind fish Amblyopsis, or the blind Crayfish of the mammoth cave, but I am quite confident that the young in all these cases have relatively well-developed eyes. At any rate Prof. Lankester to support his theory must prove that they are blind from the beginning; for if they are not then it is clear that the variations which we have to consider took place during the life of the individual living in the dark, and consequently the support of Prof. Lankester's suggestion vanishes. Prof. Lankester again writes of the deep sea as though it were as destitute of light as the mammoth cave, or the subterranean home of the Proteus, but this is notoriously not the case. With regard to fishes, Dr. Günther says that below the depth of 200 fathoms small-eyed fishes as well as large-eyed occur, the former having their want of vision compensated for by tentacular organs of touch, whilst the latter have no such accessory organs, and evidently see only by the aid of phosphorescence; in the greatest depths blind fishes occur with rudimentary eyes, and without special organs of touch. Dr. Günther mentions fifty-one species of fishes living at depths beyond 1000 fathoms, and among these only three *Aphyonus gelatinosus*, *Typhlonus nasus*, and *Ipnops Murrayi* are blind. It is, I think, sufficiently evident that the biology of the deep sea is quite different from that of subterranean caves or habitats. J. T. CUNNINGHAM.

Plymouth, February 27.

BESIDES panmixia and emigration of the more perfect-eyed individuals, as explained by Prof. E. Ray Lankester, allow me to suggest another cause for the dwindling of the eyes in cave-dwelling animals.

Prof. Weismann says that the degeneration "can hardly be of direct advantage to the animals, for they could live quite as well in the dark with well-developed eyes." I submit, however, that in a place permanently dark the eye is not merely useless, but, as a delicate and vulnerable part, it becomes a positive source of danger to the animal. No longer helping the creature to avoid obstacles or danger, it is, in proportion to its size, exposed to injury, destructive inflammation, and the attacks of parasites in a manner which must not seldom lead to the death of the individual. As other senses become more acute, and the eye recedes, this danger diminishes, and when the eye has become a mere rudiment, "hidden under the skin," its presence ceases to be a disadvantage, and so degeneration does not proceed to complete suppression.

It is a wonder that Mr. H. Spencer should have overlooked Prof. Lankester's explanation, for the English editor of Prof. Weismann's fifth essay has not failed to call attention to it.

Mirfield, February 27. A. ANDERSON.

[Darwin has himself drawn attention, in regard to burrowing animals, to the conditions pointed out in the above ("Origin of Species," 6th edition, p. 110).—ED.]

## Foraminifer or Sponge?

I AM glad to find that Mr. Pearcey agrees with me in regarding *Neusina Agassizi*, Goës, as identical with *Stannophyllum zonarium*, Hæckel. But with respect to its systematic position I do not as yet see sufficient reason to differ from Prof. Hæckel in regarding it as a sponge, although I have never observed flagellated chambers and cells any more than he. The large masses of foreign bodies always present in this organism offer very serious difficulties in sectionising it, and as long as we are not absolutely certain about its cellular structure we are justified in thinking with Hæckel that general appearance and the presence of oscula, pores, subdermal cavities, horny skeleton, &c., are sufficient to characterise the form as a sponge.

Mr. Pearcey mentions six genera of Foraminifera which he thinks approach closely to *Stannophyllum*. I am sorry I cannot see much similarity. The chitinous lining in the tube-like body of some Foraminifera certainly bears not the slightest resemblance to the distinct fibrous stroma of *Stannophyllum*, which reminds me much more of the filaments of the true horny sponge *Hircinia*. If anything tells in favour of Mr. Pearcey's view, it is the concentric lines of *Stannophyllum*, which recall the foraminiferal rather than the sponge type of growth.

The final decision of this question can of course only be expected from an examination of the cell-structure.

University College, Liverpool, R. HANITSCH.
February 25.

## A Magnetic Screen.

DURING the last vacation St. John's College, Oxford, has been lit with the electric light, and a transformer of the dynamomotor type, weighing over seven tons, has been placed within about sixty feet of the electrical testing room of the Millard Laboratory, which is furnished with several reflecting galvanometers. I greatly feared that the instruments would suffer much from the magnetic field of the large transformer. When it was found that no other space could be given up for the machine, I devised a method of construction which the Oxford Electric Lighting Company very kindly carried out for me when building their dynamo house. My method is to construct a wall of scrap iron round the three sides of the dynamo nearest to our laboratory. The iron wall is about eight inches thick, and is made by building two brick walls parallel to one another, and filling the interspace with scrap-iron; a delicate magnetometer used for testing the field at unprotected and protected points equidistant from the magnets, when the machine is in action and not so, shows that the iron wall is an effective barrier to the magnetic influence. I venture to make known this method of shielding off a magnetic field, because in these days of electrical invasion it may be of use in protecting physical instruments from being seriously disturbed, and rendered useless for any but the roughest determinations. FREDERICK J. SMITH.

Trinity College, February 28.