

has characterized the workings of the present geological survey affords an example of the practical value of the academy's advice which should not be overlooked. While there may be one or two instances in which the opinions of the experts have not been justified by the results, we believe that the proportion of failure to success will, on critical examination, turn out to be less than in any other class of questions which the government has had to decide. The only reward received by the men who render these services is that of public appreciation. The damage which would be done by any act of the government, depriving the workers of this little reward, is a serious matter, and becomes all the more serious when we reflect, that, at more than one period in the history of the academy, the question whether it should continue its government existence hung in the balance.

LETTERS TO THE EDITOR.

The recognition, by marine animals, of the hour of the day.

THE changes produced by the tides are apparently much more important to marine animals than those which are due to the rotation of the earth; and the fact that many important physiological changes are regulated according to the hour of the day in these organisms, as well as in terrestrial animals and plants, is worthy of notice.

The phenomenon has almost escaped the notice of naturalists, although it is not at all unusual.

Claus in 1882, and Merejkowsky in 1883, have shown that the very young stages of *Aequora* and *Obelia* are found only in the morning; and Merejkowsky says that the successive steps in the formation of the planula of *Obelia* follow each other with such perfect regularity that each stage is met only at a definite hour in the morning. This author believes that the regularity is directly due to the action of light, but he gives no proof of this; and observations which have been made in the past three or four years at Beaufort, N.C., seem to show that the regularity is not due to external influences at all, but is determined within the organism, like the returning appetite which tells us that the dinner-hour has come.

The following are some of the instances which we have observed at Beaufort:—

Dr. E. R. Wilson finds that the eggs of *Renilla*, an Alcyonarian which lives upon the bottom below low-tide mark, are always laid at very nearly the same hour of the day; viz., 6 A.M. In a single case spawning took place at 5.30, and it was never observed later than 7 A.M.

The regularity appears to be independent of temperature, for the hour of spawning was the same in cold and warm days, although the temperature does have a very important influence on the rate of development of the embryo.

Dr. Wilson has observed a similar regularity in the spawning of *Leptogorgia*; and in this case, if I remember correctly, the hour was 4 A.M.

While *Obelia* lays its eggs early in the morning, I find that closely related Beaufort medusae spawn at night. Thus, *Entima*, *Eirene*, *Turritopus*, and *Liriope* discharge most of their eggs about 8 P.M., although captive specimens drop a few eggs irregularly at all hours. As one hydromedusa lays its eggs early in the morning, while another species lays them early in the evening, the regulating influence can hardly be the change of illumination. While studying the development of *Lucifer*, a pelagic crustacean, I found that sexual union occurs with great regularity between 6 and 8 P.M., while the eggs are laid between 8 and 10 P.M.; so that the early stages can be studied only between 10 P.M. and 7 A.M.

Dr. H. H. Donaldson has observed at Beaufort, that actinias of various genera are fully expanded only between 5 and 6 P.M. This is true of these animals in their natural homes, as well as in aquaria; and experiment showed that specimens which were kept in darkness expanded as promptly at the proper hour as those which were exposed to direct sunlight.

Among the animals which I have enumerated are some which live at the surface, as *Entima* and *Obelia*; some which live near low-tide mark, as the actinias; and some which live in deeper water, as *Renilla*. Some of them, as *Lucifer*, are vigorous swimmers, while some, as *Gorgonia*, are fixed.

Wilson's observations show that the regularity is not due to temperature, and Donaldson's experiments show that it is not the effect of light.

There is no evidence that it is due in any way to the direct influence of surrounding conditions, and I think we must believe that it has been established in each species by natural selection, on account of its advantage to the organism.

The phenomenon is especially important to the embryologist, for the failure to procure the fertilized eggs of any animal may be due to the fact that it is not captured or observed at the right hour of the day. It also shows the importance of marine observations when the naturalist may be on duty at all hours of the day and night.

W. K. BROOKS.

The star-nosed mole amphibious.

It is now more than fifteen years since Dr. Gilpin announced that the star-nosed mole (*Condylura cristata*) had been seen swimming, in winter, in Nova Scotia; and his record, so far as I am aware, remains unique.

Mr. Napoleon A. Comeau, who lives on the north shore of the St. Lawrence, near the point where the river widens into the gulf, has recently been fortunate enough to witness the habit in question. He writes: "On the 30th of April, 1884, I saw a star-nosed mole swimming under water like a muskrat. It swam directly across a small brook, keeping near the bottom, and moving very fast. The brook was about six feet wide and two feet deep. As the mole approached the bank, it turned up its snout, so that I plainly saw the 'star' on its nose, and took refuge under some branches where I could not get at it. Snow was still deep along the banks of the stream, and there was plenty of ice in places, though the mole crossed in an open space."

I have more than once caught this species in galleries that were half full of water, and have always found it most abundant in swampy situations along the borders of streams, but I never had the good fortune to see it swim.

C. HART MERRIAM.