The Regeneration of Earthworms —A Science Classic

Biology

AN ESSAY ON ANIMAL REPRODUCTIONS. By Abbé (Lazzaro) Spallanzani, F. R. S. and Professor of Philosophy in the University of Modena. Translated from the Italian. London: MDCCLXIX (1769).

Three parts may be considered in an earth-worm, transversely divided; the *fore part,* or head; the *hinder part,* or tail, and the *intermediate* part.

Having found that the anterior part, or the head, reproduced the tail, I was willing to try whether this took place, when the head was cut at different distances, and whether any difference in the method of dividing would prevent the usual reproduction.

It was, therefore, necessary to observe, whether the regenerative power existed in the whole length of the worm, so that the head, however long or short, would be equally fit to reproduce a tail. I found that nature has limits, which shall be determined in my work, and beyond which this reproduction of the tail can no longer be affected.

But as heads, differing in their length (within certain limits), still reproduce a tail, the following enquiries could not be omitted. 1. Are those tails equal, that are produced from unequal heads? 2. Do they become so in the same length of time? 3. Does that equality of the tails take place at every point, within the limits assigned for the reproduction? 4. And does it continue during the whole course of this operation?

These experiments, having first been made upon full-grown earth-worms, of one particular species, were repeated on others of the same species, young and still growing; and proper comparisons were made between the reproductions of the first and those of the last.

It was then proper to examine whether the heads in earth-worms of different species, likewise produce new tails. Having found it to be so, I inquired, 1. Whether there is any difference of time between the reproductions of the tails in different species. 2. And being convinced that there was a difference, what might be the reason of it. In the course of these researches, I met with one species of the earth-worm, distinguished from all others, not only by the very long time it requires to begin this reproduction, but likewise by the reproduction itself, which is entirely different from any thing that has been observed, not only on the reproduction of earth-worms, but also on that of other animals. And thus far I proceeded on the reproduction of the tail from the anterior part, or the head.

The next inquiry was, whether the posterior part, or the tail, likewise could produce a new head. I found that, upon cutting off a certain number of rings from the anterior part, the reproduction of the head took place in every species of earth-worms known to me; and I did not fail to attend in great measure to the same things I had noted in the reproduction of the tail.

If the number of rings taken off is such, that the quantity of the anterior part separated be considerable, the reproduction of the head will not take place till after a long time, and then with difficulty; and not in every species of these insects. But as reproduction is only delayed, not prevented, by this kind of section, it may be concluded, that earth-worms, or at least some species of them, not only reproduce the tail, but the head.

To settle this point, I shall examine the little that has been written upon the cutting of the earth-worm by Count Ginnani, Dr. Vandelli, and Valisneri, now professor of natural history at Padua.

When the rings cut off near the head are but few, the part reproduced is always equal to that which was taken off; but when there are many, the new head is commonly shorter, and has fewer rings, than the first.

The preceding facts deserved to be still more illustrated by the following queries. 1. Whether the reproduction of a small portion of head appears sooner than that of the tail? and as this is found to be true; 2. What proportion and what laws nature follows in the lengthening of these two productions? This having been found out, I examined, 3. Whence it comes to pass, that head springs forth sooner than the tail? 4. Why it happens, that, when much of the head is cut off, the reproduction is so much retarded, and so very quick when but little is taken off? 5. What is the reason, that in the first case the new head does not, for the most part, equal the first, either in its length, or the number of its rings? 6. Why in many other species of earth-worms the reproduction of the head does not take place, when the separated part is considerable?

Being, lastly, come to the middle parts, I was desirous to know whether both a new head and a new tail could be reproduced. I found that they really are both renewed, provided a large portion of the head be taken off; for then the same thing will happen that we mentioned before. If a small portion of the anterior part be cut off, both head and tail will spring forth; but as we have already (*Turn to page* 127)

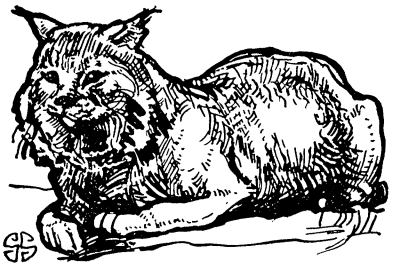
This little tract having been composed at my request, and sent me from the author, as a present to the Royal Society, I was encouraged to think a translation of it would not prove unacceptable to English Naturalists. Most of the experiments are entirely new, and, for that reason, as well as on account of the singular conclusions that may be deduced from them, deserve to be repeated by different hands, and seen by different eyes. This is what our Italian observer wishes may be done, both in his own country and in this, before he publishes his large work. Facts in appearance so little reducible to the known laws of animal economy, must be duly authenticated in order to be believed; and that evidence, which is sufficient in things more analogous to the general course of nature, can hardly be thought so in the case of discoveries, which seem to be deviations from it. But universal laws are few, and exceptions to them are grown more and more common. In this age, when the talent of observing has been so much improved, and experience has taught us the vanity of opinions and systems, it would be imprudent to reject, without trial, observations, or even hints, which, at the same time that they enlarge our views of nature, tend to increase proportionally our admiration of its GREAT AUTHOR, and may become in time not only instructive, but useful to mankind.

M. MATY.

British Museum,
June 20, 1769.

Nature Ramblings

By Frank Thone



The Lynx

Of all the members of the cat family in America, the lynx is about the wickedest. Though nowhere near the size of a mountain lion or puma he is far more formidable, for the larger beast is a sneak and a coward and flees from any trace of man. The lynx, however, is as truculent as a leopard, and a great deal more likely to go out hunting for trouble. Compactly built, with a strong neck and blocky shoulders, he is a formidable fighter even when pitted against a pack of dogs or a man with a long knife or heavy club, and he sometimes mauls his hunters if he is brought to bay or steps into a trap.

The gleaming yellow eyes of the lynx, shining balefully out of his den. have given the big cat a reputation for seeing better than he does. Many people believe that in addition to seeing in the dark—which of course no cat or any other animal can do—the lynx can see straight through wood, metal or any other substance! A penetrating glance indeed.

The common wild cats of the East are all members of the lynx family, but the true lynx of the northern woods is the Canada lynx, the "loup cervier" of the French-Canuck habitant, about which all sorts of superstitious legends have been woven. It seems to be practically identical with the European lynx, with no more difference than one would expect from changes due to separation in time and geography.

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Knotted cords were used for keeping government records in ancient China as well as in prehistoric Peru.

Whooping cranes are almost extinct; so there was excitement when an ornithologist saw two recently in the Louisiana marshes.

Regeneration of Earthworms—*Continued*

observed, the head appears first, and then the tail, according to the law which nature was found to adhere to.

The difficulty, therefore, with regard to the intermediate parts, lies in the reproduction of the head; and although this often fails, the tail will still begin to be regenerated; but this dies sooner or later, together with the middle part.

But how comes it to pass, when equal portions are cut off from the two extremities, viz. the head and tail, of an earth-worm, that, although both extremities perish, yet if they are kept in a proper situation, the point of the tail survives that of the head?

These reproductions take place in the earth-worm, when it is cut across with a pair of scissors; but what happens, 1. If instead of being cut, the insect be torn asunder; 2. or if fire be applied to the divided part?

Hitherto the animal is supposed to have been cut in three parts, viz. the head, the tail, and the middle piece.

I was then induced to enquire what happened to the earth-worm, when cut in four, five, six, or more parts, which I ascertained by a great variety of experiments.

I should not have done justice to the system of animal reproductions, had I omitted to consider three different states in the earth-worm; one preceding the section; another attending the operation; and a third which succeeds it.

As to the first, we know that an earth-worm being placed upon loose and moist ground, hides itself by boring it with its head. It avoids every obstacle in its way; it generally advances forwards, or with its head foremost; it glides without any difficulty along the sides of vases, etc.

Now do the same phenomena appear in a head just deprived of its tail? in the intermediate part? or in the tail alone?

Science News-Letter, February 22, 1930

In the city of Cologne, Germany, pedestrians who violate traffic regulations get tickets and fines, just as offending motorists do.