The Regeneration of Heads on Opposite Ends of Long Pieces of *Dugesia tigrina*

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The regeneration of lost parts of planarians is well known due to the classical work of Child and his colleagues. It has been the custom of the elementary biology class at Earlham College to begin the second semester's work by variously cutting pieces of planarians, usually *Dugesia tigrina* or *D. dorotocephala*, to watch the phenomenon of regeneration and the conditions under which it occurs. Usually the worms for the experiments have been purchased from a biological supply house and kept in the laboratory for several days to two weeks and the regeneration occurs completely along the line of expectancy.

This year (February, 1954), on the day before they were to be used, several very large, well-fed specimens of *Dugesia tigrina* were taken from beneath the ice of a nearby creek. These were kept in a refrigerator until time for use on the following day. Specimens were variously cut according to the desires of the students, but most specimens had their heads and tails removed. These animals were left in watch glasses at room temperature and watched daily for signs of regeneration for the next two or three weeks. The students were much surprised to find in 10 instances of some 75 cut specimens heads growing on opposite ends of long cut pieces, that is, animals with only heads and tails removed. They had been told of the possibility that heads might grow on both ends of short cut pieces from the middle of the bodies, but were unprepared for the phenomenon as it revealed itself.

Child, in his explanation of the gradient theory, points out that the process of cutting sometimes raises the metabolic gradient so that in short pieces heads at each end may reasonably be expected. In the case of the present animals the cutting plus the raising of temperature from that near the freezing point of water to normal room temperature would account for raising of the metabolic gradient of the tail end of the cut pieces so that heads instead of tails regenerated.

Inasmuch as the unexpected phenomenon occurred 10 times over, it did not seem to be due to an abnormality of the worms themselves. So far as is known to the writer, no previous record has been made of the conditions under which long cut pieces of *Dugesia tigrina* regenerate heads at opposite ends. This phenomenon is not at variance with the axial gradient theory of Child but in complete conformity with it. The rise in temperature and cutting of heads and tails appears to have a cumulative effect in raising the metabolic gradient to the point where heads can sometimes regenerate even at posterior ends of long cut pieces.