

THE REACTION OF NEREIS VIRENS TO UNILATERAL TENSION OF ITS MUSCULATURE.

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In a recent paper on muscle tension and reflexes in *Lumbricus*, the writer has considered the part played by the central nervous system in reflex orientation of the head when the posterior part of the worm is passively bent. In this reaction, if the tail be bent to one side, for example to the left, the head actively turns to the right. This movement results in maintaining the line of progress parallel to the enforced orientation of the tail. For this reason the reaction has been termed the homostrophic reflex. It was found that the afferent impulses of this reflex travel through the ventral nerve cord in the forward direction only, and, further, that the efferent impulses pass to the muscles only from the anterior 15 to 20 segments, since if these segments are cut off the reflex no longer appears.¹

It was next of interest to determine whether the homostrophic reflex occurred in the polychæte annelid, *Nereis virens*. This was accomplished best by putting the animal on a piece of filter paper wet with sea water. If, now, the tail be moved to the left, the head moves to the right, and if the tail be bent to the right, the anterior segments bend to the left. In general it can be said that passive unilateral tension in any region of the worm is followed by reflex bending of the head segments. The receptors for the reflex are therefore distributed throughout the entire length of the body.

If the ventral nerve cord is cut in the median region of the body, then impulses rising from the unilateral tension posterior to the point of section no longer pass forward to affect the orientation of the head. This proves that the ventral nerve cord is the pathway of forward conduction of the homostrophic reflex in *Nereis*. Removal of the

¹ Moore, A. R., *J. Gen. Physiol.*, 1922-23, v, 327.

head with the supraesophageal ganglion greatly weakens the reaction in its speed and definiteness, while section of the cord posterior to the subesophageal ganglion in the second or third segment abolishes any reaction to passive tension of the tail. The effector mechanism of the homostrophic reflex in *Nereis* is concerned, therefore, with a much more limited number of ganglia than in *Lumbricus*. Mediation of the reflex by the brain and the anterior two or three ventral ganglia is consistent with the high degree of cephalization in *Nereis* as compared with *Lumbricus*.

It is also important to note that in reversed locomotion in *Nereis*, as in the earthworm, an enforced asymmetrical position of the anterior segments does not affect the orientation of the tail. Indeed, it frequently happens that, in reversed locomotion, the tail will crawl across in front of the head or even over the body of the worm itself. The fact that the afferent impulses of the homostrophic reflex are propagated in one direction only, namely forward, is another proof of the existence of functional polarity in the annelid nerve cord.

It can be shown that the homostrophic reflex in *Nereis* may be weakened or even entirely masked by the interference of stereotropism. For this reason, if the tail be turned to the right and at the same time the anterior segments be gently stroked on the right side, the head may be oriented to the right, thus responding to contact and not to passive tension of the musculature of the tail, which, acting alone, would have induced orientation of the head to the left.

SUMMARY.

1. The anterior segments of *Nereis* are oriented reflexly by passive unilateral tension of the posterior musculature.
2. The afferent impulses of the homostrophic reflex rise from any part of the worm and are conducted forward by way of the ventral nerve cord.
3. The efferent impulses flow out from the brain and anterior two or three ventral ganglia.
4. The homostrophic reflex may be partially or wholly masked by stereotropism.