

*On the SPINAL NERVES of AMPHIOXUS.* By F. M. BALFOUR,  
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IN an interesting memoir devoted to the elucidation of a series of points in the anatomy and development of the Vertebrata, Schneider<sup>1</sup> has described what he believes to be motor nerves in Amphioxus, which spring from the anterior side of the spinal cord. According to Schneider these nerves have been overlooked by all previous observers except Stieda.

I<sup>2</sup> myself attempted to show some time ago that anterior roots were absent in Amphioxus; and in some speculations on the cranial nerves, I employed this peculiarity of the nervous system of Amphioxus to support a view that Vertebrata were primitively provided only with nerves of mixed function springing from the posterior side of the spinal cord. Under these circumstances, Schneider's statement naturally attracted my attention, and I have made some efforts to satisfy myself as to its accuracy. The nerves, as he describes them, are very peculiar. They arise from a number of distinct roots in the hinder third of each segment. They form a flat bundle, of which part passes upwards and part downwards. When they meet the muscles they bend backwards, and fuse with the free borders of the muscle-plates. The fibres, which at first sight appear to form the nerve, are, however, transversely striated, and are regarded by Schneider as muscles; and he holds that each muscle-plate sends a process to the edge of the spinal cord, which there receives its innervation. A considerable body of evidence is requisite to justify a belief in the existence of such very extraordinary and unparalleled motor nerves; and for my part I cannot say that Schneider's observations are convincing to me. I have attempted to repeat his observations, employing the methods he describes.

In the first place, he states that by isolating the spinal cord by boiling in acetic acid, the anterior roots may be brought into view as numerous conical processes of the spinal cord in each segment. I find by treating the spinal cord in this way, that processes more or less similar, but more irregular than those which he figures, are occasionally present; but I cannot persuade myself that they are anything but parts of the sheath of the spinal cord which is not completely dissolved by treatment with acetic acid. By treatment with nitric acid *no such processes*

<sup>1</sup> 'Beitrag z. Anat. u. Entwick. d. Wirbelthiere,' Berlin, 1879.

<sup>2</sup> "On the Spinal Nerves of Amphioxus," 'Journ. of Anat. and Phys.,' vol. x, 1876.

are to be seen, though the whole length and very finest branches of the posterior nerves are preserved.

By treating with nitric acid and clarifying by oil of cloves, and subsequently removing one half of the body so as to expose the spinal cord *in situ*, the origin and distribution of the posterior nerves is very clearly exhibited. But I have failed to detect any trace of the anterior nerve-roots. Horizontal section, which ought also to bring them clearly into view, failed to show me anything which I could interpret as such. I agree with Schneider that a process of each muscle-plate is prolonged up to the anterior border of the spinal cord, but I can find no trace of a connection between it and the cord.

Schneider has represented a transverse section in which the anterior nerves are figured. I am very familiar with an appearance in section such as that represented in his figure, but I satisfied myself when I previously studied the nerves in Amphioxus, that the body supposed to be a nerve by Schneider was nothing else than part of the intermuscular septum, and after re-examining my sections I see no reason to alter my view.

A very satisfactory proof that the ventral nerves do not exist would be found, if it could be established that the dorsal nerves contained both motor and sensory fibres. So far I have not succeeded in proving this; I have not, however, had fresh specimens to assist me in the investigation. Langerhans,<sup>1</sup> whose careful observations appear to me to have been undervalued by Schneider, figures a branch distributed to the muscles, which passes off from the dorsal roots. Till the inaccuracy of this observation is demonstrated, the balance of evidence appears to me to be opposed to Schneider's view.

<sup>1</sup> 'Archiv f. Mikros. Anatomie,' vol. xii.

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