
I.—Anatomy.

The attempt to unravel the course taken by the white fibres of the spinal cord has been made from various sides. The anatomical investigation of the fully-formed organ, physiological experiment, pathological observation, and the study of the development of the medulla, have all been employed. It is my intention to endeavour to give a (necessarily brief and imperfect) sketch of the results which have been attained by each of these methods.

The amount of knowledge which has been gained by direct anatomical investigation of the fully-formed spinal cord is, as regards the course of the conductors, extremely small. The compact and beautifully systematic accounts of the structure of the cord which were given by Van der Kolk and earlier writers have been shown by recent research to rest on imperfect observation directed by preconceived views of that structure which physiological experiment seemed to demand. The influence of these preconceptions has been forcibly pointed out by Vulpian,* whose position as

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* A Discourse delivered before the King and Queen's College of Physicians February 18, 1878.

b Physiologie du Système Nerveux. Leçon XV.
On the White Tracts of the Spinal Cord.

anatomist, physiologist, and pathologist enables him fully to appreciate their evil influence. Sensation is a cerebral function; hence it appeared necessary that fibres from the posterior roots should pass direct to the brain; these fibres were immediately seen in the posterior columns. Reflex action required that a connexion between the anterior and posterior roots should exist; forthwith some of the fibres of the latter were seen passing forwards and joining the processes of the cells in the anterior horn, or even a direct communication was demonstrated (Dean) between the fibres of the anterior and posterior roots. Next, physiological experiment seemed to show that some of the sensitive conductors passed downwards for some distance in the cord before passing up to the brain; immediately everyone saw the descending portions of the posterior roots. Finally, experiment seemed to prove that a decussation of sensitive conductors took place in the cord, when straightforward this decussation, hitherto unsuspected, was shown to admit of the easiest anatomical demonstration. "And do you ask me," Vulpian continues, "what would happen if to-morrow it should be proved by conclusive experiments that the transmission of sensitive impressions is not crossed, but direct? It is not difficult to foretell what would happen. The decussation of the sensitive fibres would disappear, and men would wonder how they had ever believed in its existence."

Accordingly, we find modern histologists, notwithstanding the greatly improved instruments and methods with which they work, expressing themselves with very great caution, and almost without exception admitting that the task of tracing the conductors through the cord is beyond the powers of anatomical art as it at present exists. Some valuable facts have, however, been ascertained, which would seem to rest on a solid basis. It is, I think, established that all the fibres of the nerve-roots, whether anterior or posterior, pass, sooner or later, into the grey substance. The anterior roots, passing in several bundles, obliquely, through the antero-lateral columns, plunge at once into the anterior horn. Here the bundles break up, and the fibres are seen to run chiefly in the neighbourhood of the groups of large, branching cells which form the most conspicuous feature of this part of the grey matter. These cells were shown by Deiters (whose observations have been confirmed by all subsequent anatomists) to have two kinds of processes. The greater number are freely branched, and, by their ramifications and interlacement, constitute a large part of the fibres which lie in the grey substance,