

Structure of the Gray Substance.—The gray substance consists of numerous nerve cells and nerve fibers held together by neuroglia. Throughout the greater part of the gray substance the neuroglia presents the appearance of a sponge-like network, but around the central canal and on the apices of the posterior columns it consists of the gelatinous substance already referred to. The nerve cells are multipolar, and vary greatly in size and shape. They consist of (1) motor cells of large size, which are situated in the anterior horn, and are especially numerous in the cervical and lumbar enlargements; the axons of most of these cells pass out to form the anterior nerve roots, but before leaving the white substance they frequently give off collaterals, which reënter and ramify in the gray substance.¹ (2) Cells of small or medium size, whose axons pass into the white matter, where some pursue an ascending, and others a descending course, but most of them divide in a T-shape manner into descending and ascending processes. They give off collaterals which enter and ramify in the gray substance, and the terminations of the axons behave in a similar manner. The lengths of these axons vary greatly: some are short and pass only between adjoining spinal segments, while others are longer and connect more

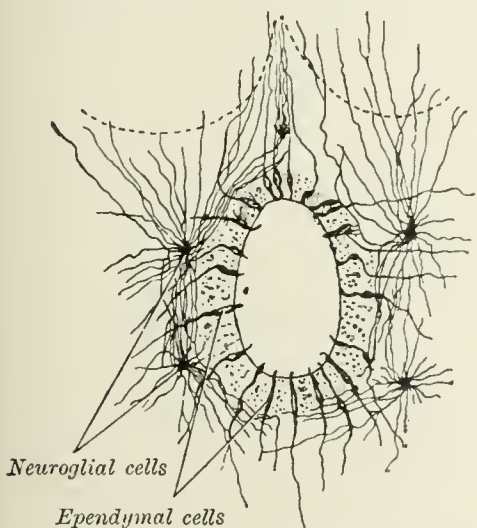


FIG. 667.—Section of central canal of medulla spinalis, showing ependymal and neuroglial cells. (v. Lenhossek.)

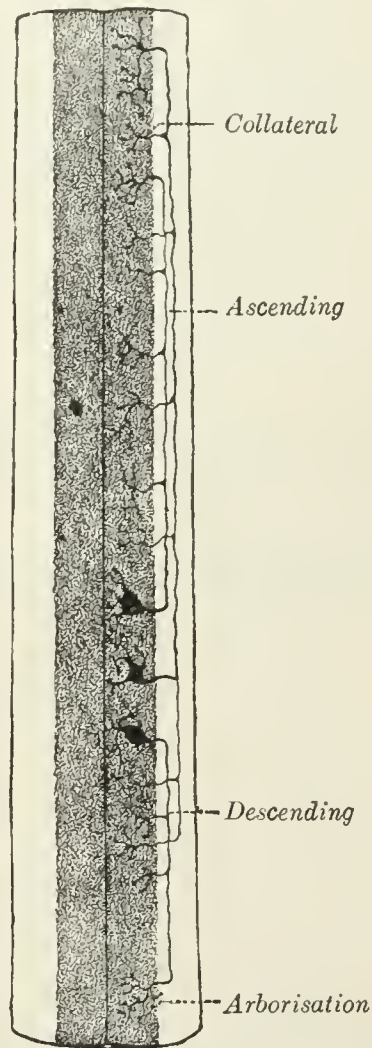


FIG. 668.—Cells of medulla spinalis. Diagram showing in longitudinal section the intersegmental neurons of the medulla spinalis. The gray and white parts correspond respectively to the gray and white substance of the medulla spinalis. (Poirier.)

distant segments. These cells and their processes constitute a series of **association** or **intersegmental neurons** (Fig. 668), which link together the different parts of the medulla spinalis. The axons of most of these cells are confined to that side of the medulla spinalis in which the nerve cells are situated, but some cross to the opposite side through the anterior commissure, and are termed **crossed commissural fibers**. Some of these latter end directly in the gray substance, while others enter the white substance, and ascend or descend in it for varying distances, before finally terminating in the gray substance. (3) Cells of the type II of Golgi, limited for the

¹ Lenhossek and Cajal found that in the chick embryo the axons of a few of these nerve cells passed backward through the posterior column, and emerged as the *motor fibers* of the *posterior nerve roots*. These fibers are said to control the peristaltic movements of the intestine. Their presence, in man, has not yet been determined.