that they are conducted. Hence the gray substance forms the essential constituent of all the ganglionic centers, both those in the isolated ganglia and those aggregated in the brain and medulla spinalis; while the white substance forms the bulk of the commissural portions of the nerve centers and the peripheral nerves.

Neuroglia.—Neuroglia, the peculiar ground.substance in which are imbedded the true nervous constituents of the brain and medulla spinalis, consists of cells and fibers. Some of the cells are stellate in shape, with ill-defined cell body, and their fine processes become neuroglia fibers, which extend radially and unbranched (Fig. 623, *B*) among the nerve cells and fibers which they aid in supporting. Other cells give off fibers which branch repeatedly (Fig. 623, *A*). Some of the fibers start from the epithelial cells lining the ventricles of the brain and central canal of the medulla spinalis, and pass through the nervous tissue, branching repeatedly to end in slight enlargements on the pia mater. Thus, neuroglia is evidently a connective tissue in function but is not so in development; it is ectodermal in origin, whereas all connective tissues are mesodermal.

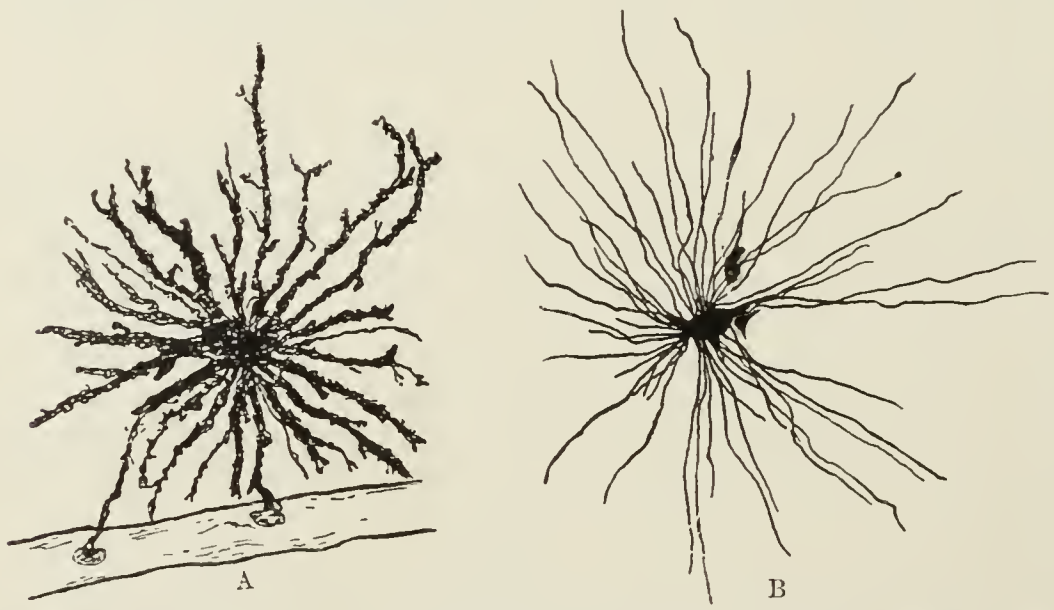

Fig. 623.—Neuroglia cells of brain shown by Golgi's method. *A*. Cell with branched processes. *B*. Spider cell with unbranched processes. (After Andriezen.)

Nerve Cells (Fig. 624).—Nerve cells are largely aggregated in the gray substance of the brain and medulla spinalis, but smaller collections of these cells also form the swellings, called ganglia, seen on many nerves. These latter are found chiefly upon the spinal and cranial nerve roots and in connection with the sympathetic nerves.

The nerve cells vary in shape and size, and have one or more processes. They may be divided for purposes of description into three groups, according to the number of processes which they possess: (1) **Unipolar cells**, which are found in the spinal ganglia; the single process, after a short course, divides in a T-shaped manner (Fig. 624, *E*). (2) **Bipolar cells**, also found in the spinal ganglia (Fig. 625), when the cells are in an embryonic condition. They are best demonstrated in the spinal ganglia of fish. Sometimes the processes come off from opposite poles of the cell, and the cell then assumes a spindle shape; in other cells both processes emerge at the same point. In some cases where two fibers are apparently connected with a cell, one of the fibers is really derived from an adjoining nerve cell and is passing to end in a ramification around the ganglion cell, or, again, it may be coiled spirally around the nerve process which is issuing from the cell. (3) **Multipolar cells**, which are pyramidal or stellate in shape, and characterized by their large size and by the numerous processes which issue from them. The