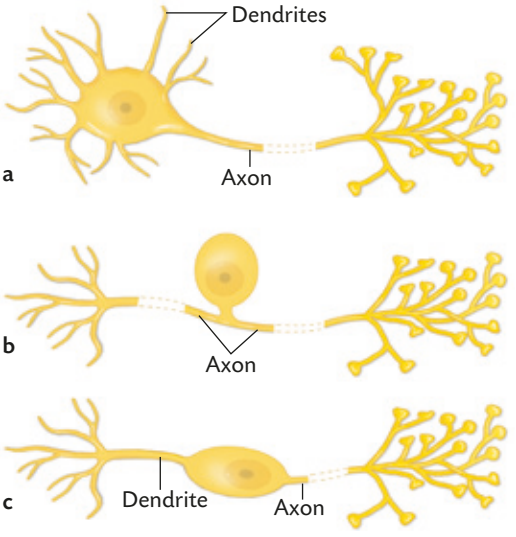

Figure 4.4 Examples of neurons with different patterns of extensions. **a** multipolar neuron, **b** pseudounipolar neuron, and **c** bipolar neuron.

Astrocytes communicate bi-directionally with neurons

astrocytes is bi-directional, because astrocytes may also modulate the activity of neighboring neurons through their own transmitter release.

The physiological roles of the bi-directional signaling between astrocytes and neurons are unknown. The phylogeny of vertebrates may provide clues regarding potential roles of astrocytes. The ratio between neurons and astrocytes is lowest in the more advanced species, i.e., the human brain contains the lowest number of neurons relative to astrocytes. Therefore, it has been suggested that astrocytes may be important for the cognitive functions of advanced brains, like learning and memory, but experimental evidence for such speculations is lacking.

Myelin is formed by oligodendrocytes in CNS and by Schwann cells in PNS

Oligodendrocytes and *Schwann cells* in the central and peripheral nervous system, respectively, are myelin-forming glial cells. Axons contained within a myelin sheath can conduct nerve impulses at high speeds (p. 119). During fetal development, numerous *Schwann cells* wrap themselves around the peripheral axons that are going to be myelinated. Schwann cells eventually lose most of their cytoplasm, leaving behind layer upon layer of tightly-packed lipid membranes around the axon (Fig. 4.6). Each Schwann cell covers a segment of 1–2 mm of myelin sheath. Between neighboring segments, the axon is denuded for a distance of 1–2 µm. These gaps in the myelin sheath are called *nodes of Ranvier*, and are important for conduction of impulses along the axon (p. 119). Oligodendrocytes form similar myelin sheaths around axons in the central nervous system. However, whereas one Schwann cell forms one myelin segment around one axon, one oligodendrocyte forms myelin segments around several axons (Fig. 4.5).

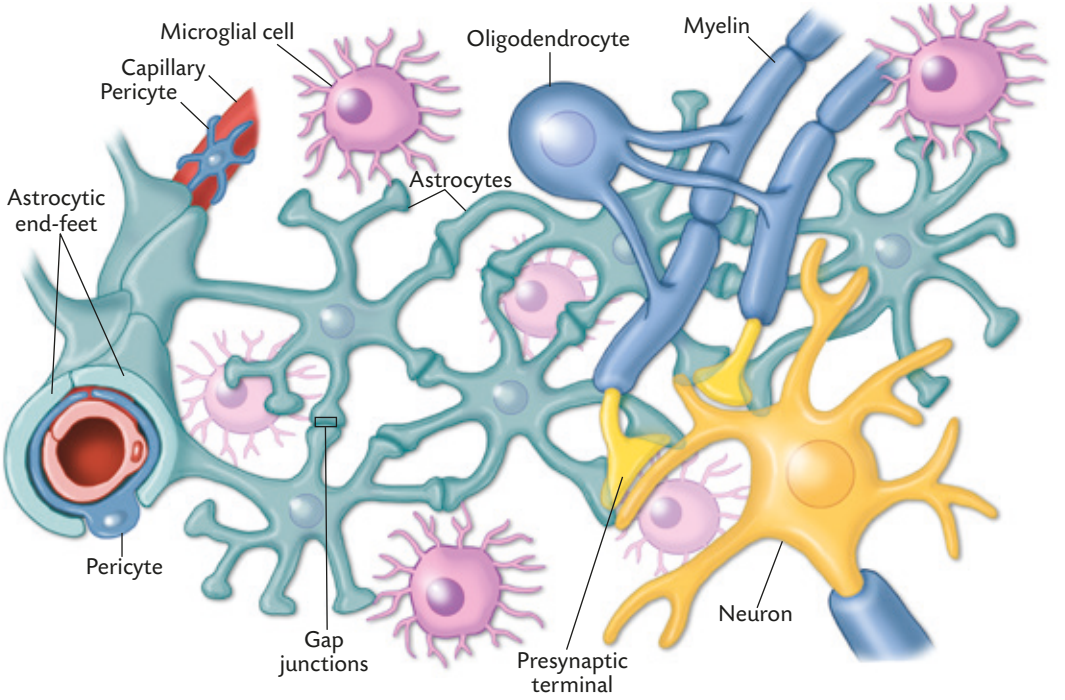

Figure 4.5 Connections between astrocytes, neurons, and brain capillaries. Groups of astrocytes are interconnected by gap junctions. Bidirectional communication occurs between local astrocytic networks and associated neurons. End-feet of astrocytic processes enwrap capillaries and contribute to the blood-brain barrier.