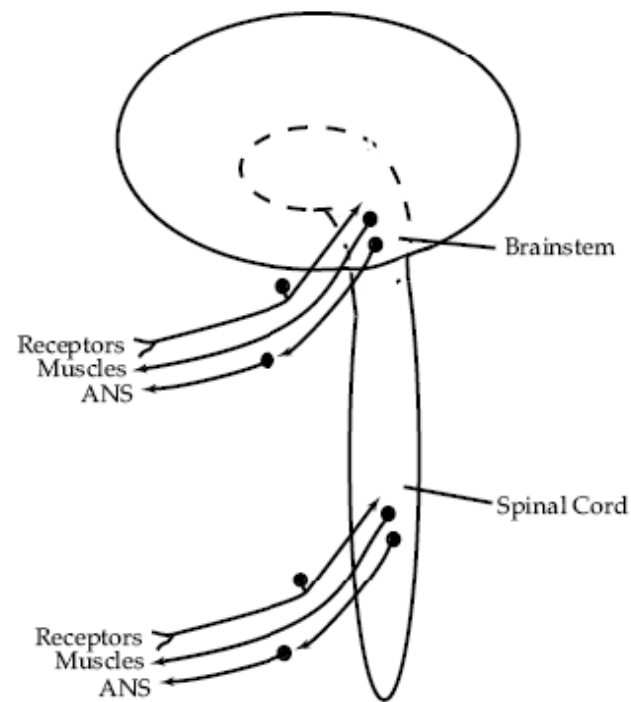


for governing cardiac muscle, smooth muscle or glands. By the conclusion of this and the next tutorial, you will learn how to locate:

1. nuclei that are the destination of all primary somatic sensory, visceral sensory, and special sensory *input* into the CNS (i.e., the location of all of the second-order neuronal cell bodies that receive the primary sensory input), except for olfaction and vision. The olfactory nerve and the optic nerve are not included in this discussion; for several reasons they are atypical.
2. nuclei that are the origin of all of the somatic and visceral motor *output* of the CNS (i.e., the location of all of the alpha motor neurons and preganglionic visceral motor neurons).

**Fig. 1.** Both the spinal cord and brainstem receive input from primary sensory neurons; the cell bodies of these neurons lie in sensory ganglia. In addition, both the spinal cord and brainstem give rise to motor output to striated muscles and to the autonomic ganglia (ANS, autonomic nervous system; synonymous with visceral motor system). (Illustration by N.B. Cant)



From the viewpoint of clinical practice, the most important general principle of organization in the central nervous system is that each **CNS function** (e.g., perception of sensory stimuli, control of motor behavior) **involves groups of neurons—interconnected through synapses—that are spatially distributed throughout several CNS subdivisions**. Groups of neurons that together subserve a particular function are called a ‘system’; for example, there are the visual, motor, and somatic sensory systems. The structures containing the neurons and axons of a particular system are collectively referred to as a ‘pathway’. (The term ‘system’ has a functional connotation, whereas the term ‘pathway’ refers to the structures involved.) We will study several important sensory and motor pathways in detail in future tutorials.

## Simple tests of cranial nerve function provide clues for localization of neurological injury and disease

One means for reinforcing your understanding of the functional significance of the cranial nerves is to actually test their functions in yourself and a willing friend or family member. Review **Table A2** below (from Purves et al., *Neuroscience*, 5<sup>th</sup> Ed., Sinauer Assoc., Inc.), which lists the cranial nerve nuclei from which the sensory and motor components of each nerve arise. Then, consider the means by which you would assess the functional integrity of the cranial nerves. Actually, there are a number of tests of cranial nerve function that can be done with very simple materials. These tests provide considerable information about the presence or absence of normal function in the brainstem and the nerves