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The somatosensory system

The somatosensory system is a part of the sensory nervous system. The somatosensory system is a complex system of sensory neurons and neural pathways that responds to changes at the surface or inside the body. The axons (as afferent nerve fibers) of sensory neurons connect with, or respond to, various receptor cells. These sensory receptor cells are activated by different stimuli such as heat and nociception, giving a functional name to the responding sensory neuron, such as a thermoreceptor which carries information about temperature changes. Other types include mechanoreceptors, chemoreceptors, and nociceptorswhich send signals along a sensory nerve to the spinal cord where they may be processed by other sensory neurons and then relayed to the brain for further processing. Sensory receptors are found all over the body including the skin, epithelial tissues, muscles, bones and joints, internal organs, and the cardiovascular system.

Somatic senses are sometimes referred to as somesthetic senses,with the understanding that somesthesis includes the sense of touch, proprioception (sense of position and movement), and (depending on usage) haptic perception.

The mapping of the body surfaces in the brain is called somatotopy. In the cortex, it is also referred to as the cortical homunculus. This brain-surface ("cortical") map is not immutable, however. Dramatic shifts can occur in response to stroke or injury.

A somatosensory pathway will typically have three neurons:first-order, second-order, and third-order.

•The first-order neuron is a type of pseudounipolar neuron and always has its cell body in the dorsal root ganglion of the spinal nerve with a peripheral axon innervating touch mechanoreceptors and a central axon synapsing on the second-order neuron. If the somatosensory pathway is in parts of the head or neck not covered by the cervical nerves, the first-order neuron will be the trigeminal nerve ganglia or the ganglia of other sensory cranial nerves).

•The second-order neuron has its cell bodyeither in the spinal cord or in the brainstem. This neuron's ascending axons will cross (decussate) to the opposite side either in the spinal cord or in the brainstem.

•In the case of touch and certain types of pain, the third-order neuron has its cell body in the ventral posterior nucleus of the thalamus and ends in the postcentral gyrus of the parietal lobein the primary somatosensory cortex (or S1).