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### **SOMATOSENSORY PATHWAY:**

The somatosensory tract also referred to as the somatosensory system or somatosensory pathway, process information about somatic sensations such as pain, temperature, touch, position, and vibration. The somatosensory system is a part of the sensory nervous system. It is a complex system of sensory neurons and neural pathways that responds to changes at the surface or inside the body.

#### **Sensory receptors**

The four mechanoreceptors in the skin each respond to different stimuli for short or long periods.

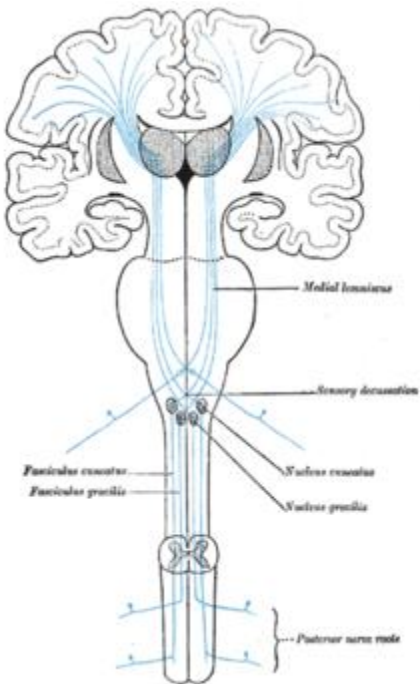
Merkel cell nerve endings are found in the basal epidermis and hair follicles; they react to low vibrations and deep static touch such as shapes and edges.

Tactile corpuscles react to moderate vibration and light touch. They are located in the dermal papillae; due to their reactivity, they are primarily located in fingertips and lips.

Pacinian corpuscles determine gross touch and distinguish rough and soft substances. They react in quick action potentials, especially to vibrations around 250 Hz (even up to centimeters away).

Bulbous corpuscles react slowly and respond to sustained skin stretch. They are responsible for the feeling of object slippage and play a major role in the kinesthetic sense and control of finger position and movement.

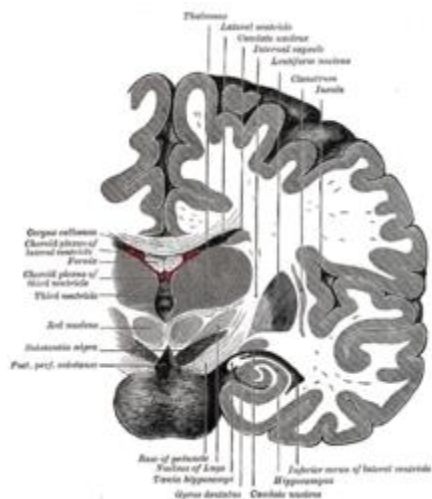
#### **Somatosensory cortex**



The postcentral gyrus includes the primary somatosensory cortex collectively referred to as S1. BA3 receives the densest projections from the thalamus. BA3a is involved with the sense of relative position of neighboring body parts and amount of effort being used during movement.

## Structure

The somatosensory system is spread through all major parts of the vertebrate body. It consists both of sensory receptors and afferent neurons in the periphery (skin, muscle and organs for example), to deeper neurons within the central nervous system.



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

1. The **first-order neuron** is a type of pseudo unipolar 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).
2. The **second-order neuron** has its cell body either 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.
3. 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 lobe in the primary somatosensory cortex (or S1).

The somatosensory cortex encodes incoming sensory information from receptors all over the body. Affective touch is a type of sensory information that elicits an emotional reaction and is usually social in nature, such as a physical human touch.



The cortical homunculus, a map of somatosensory areas of the brain.

A somatosensory deficiency may be caused by a peripheral neuropathy involving peripheral nerves of the somatosensory system. This may present as numbness or paresthesia.