

# Anatomy of the Somatosensory System

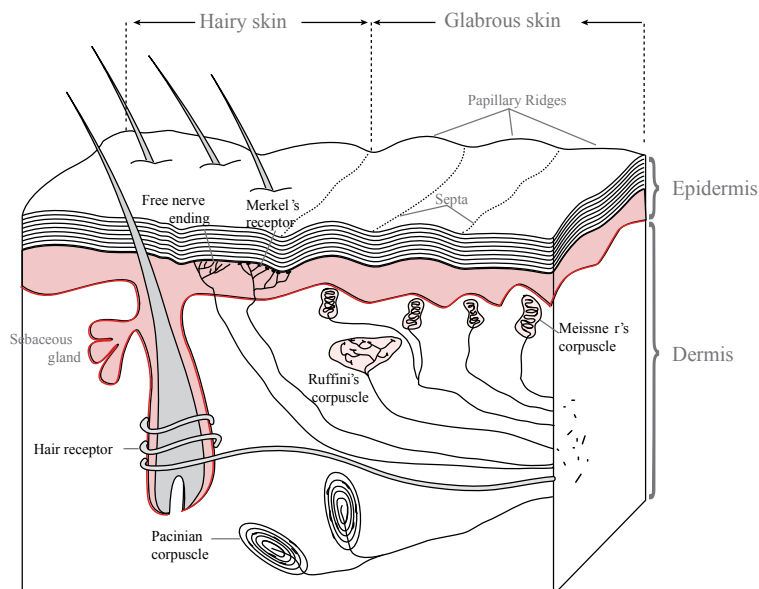
FROM WIKIBOOKS<sup>1</sup>

Our somatosensory system consists of sensors in the skin and sensors in our muscles, tendons, and joints. The receptors in the skin, the so called cutaneous receptors, tell us about temperature (*thermoreceptors*), pressure and surface texture (*mechano receptors*), and pain (*nociceptors*). The receptors in muscles and joints provide information about muscle length, muscle tension, and joint angles.

*This is a sample document to showcase page-based formatting. It contains a chapter from a Wikibook called Sensory Systems. None of the content has been changed in this article, but some content has been removed.*

## Cutaneous receptors

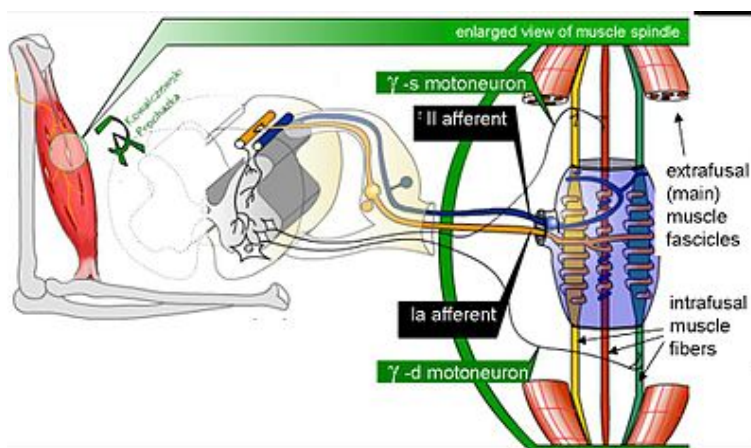
Sensory information from *Meissner corpuscles* and rapidly adapting afferents leads to adjustment of grip force when objects are lifted. These afferents respond with a brief burst of action potentials when objects move a small distance during the early stages of lifting. In response to



*Figure 1: Receptors in the human skin: Mechanoreceptors can be free receptors or encapsulated. Examples for free receptors are the hair receptors at the roots of hairs. Encapsulated receptors are the Pacinian corpuscles and the receptors in the glabrous (hairless) skin: Meissner corpuscles, Ruffini corpuscles and Merkel's disks.*

<sup>1</sup> The following description is based on lecture notes from Laszlo Zaborszky, from Rutgers University.

Figure 2: Mammalian muscle spindle showing typical position in a muscle (left), neuronal connections in spinal cord (middle) and expanded schematic (right). The spindle is a stretch receptor with its own motor supply consisting of several intrafusal muscle fibres. The sensory endings of a primary (group Ia) afferent and a secondary (group II) afferent coil around the non-contractile central portions of the intrafusal fibres.



rapidly adapting afferent activity, muscle force increases reflexively until the gripped object no longer moves. Such a rapid response to a tactile stimulus is a clear indication of the role played by somatosensory neurons in motor activity.

The slowly adapting *Merkel's receptors* are responsible for form and texture perception. As would be expected for receptors mediating form perception, Merkel's receptors are present at high density in the digits and around the mouth (50/mm<sup>2</sup> of skin surface), at lower density in other glabrous surfaces, and at very low density in hairy skin. This innervations density shrinks progressively with the passage of time so that by the age of 50, the density in human digits is reduced to 10/mm<sup>2</sup>. Unlike rapidly adapting axons, slowly adapting fibers respond not only to the initial indentation of skin, but also to sustained indentation up to several seconds in duration.

Activation of the rapidly adapting *Pacinian corpuscles* gives a feeling of vibration, while the slowly adapting *Ruffini corpuscles* respond to the lateral movement or stretching of skin.

## Nociceptors

Nociceptors have free nerve endings. Functionally, skin nociceptors are either high-threshold mechanoreceptors