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SOMATOSENSORY PATHWAYS

Somatosensory pathways start by specialized receptors in the periphery receiving information and transmitting this through a series of neurons and synaptic relays in the central nervous system. The two main sensory pathways are the dorsal column pathway which conveys information regarding fine touch, vibration, proprioception, and two-point discrimination and the spinothalamic or anterolateral pathway which conveys information on crude touch, pain, and temperature.

Sensory information may involve special senses - so vision, hearing, taste, and smell - as well as general somatic senses, so the somatosensory system, which is involved in the sense of touch, proprioception, pain, and temperature. These sensations are transduced by sensory receptors, which are present in the cell membrane of highly specialized cells found all over the body. According to the stimulus they respond to, sensory receptors are classified as mechanoreceptors for touch and proprioception, nociceptors for pain, and thermoreceptors for temperature. Now, neurons are the main cells of the nervous system. They're composed of a cell body, which contains all the cell's organelles, and nerve fibers, which are projections that extend out from the neuron cell body. These are either dendrites that receive signals from other neurons, or axons that send signals along to other neurons. Where two neurons come together is called a synapse, and that's where one end of an axon sends neurotransmitters to the dendrites or directly to the cell body of the next neuron in the series. To trigger the release of neurotransmitters, neurons use an electrical signal that races down the axon, known as

the action potential. To help speed up that electrical signal, some axons are intermittently wrapped by a fatty protective sheath called myelin, which comes from glial cells like oligodendrocytes in the central nervous system, and Schwann cells in the peripheral nervous system. Since the axons in the somatosensory system can be very long, the fact that myelin helps speed up action potentials is super important! But myelin requires energy to generate and takes up space, so not all fibers are myelinated. Somatosensory fibers are classified as non myelinated fibers, small myelinated fibers, and large myelinated fibers. Non myelinated or type C fibers are the slowest, and they sense burning pain and hot temperatures. Small myelinated or type A delta fibers are faster than C fibers, because they're myelinated, and they sense sharp pain, gross touch, and cold temperatures. Finally, large myelinated or A alpha and A beta fibers are the fastest fibers, and they sense proprioception, vibration, and fine touch. Through these fibers, somatosensory information travels up the spinal cord to the brain, forming the somatosensory pathways. If you take a cross-section of the spinal cord, there's grey matter on the inside and that contains the nerve cell bodies arranged in three grey columns or horns that look a bit like a butterfly, when you put both sides together. The three pairs of grey horns are divided into anterior or ventral horns, posterior or dorsal horns, and lateral horns. The anterior or ventral horns receive information from the motor cortex of the brain, and then send it to the skeletal muscles to trigger voluntary movement. The neurons in the posterior or dorsal horns take sensory information from the outside world and process it. Finally the lateral horns are mainly involved with the sympathetic division of the autonomic motor system. Surrounding the grey matter is white matter, which consists of the myelinated axons that form paired funiculi, which are bundles of nerve fibers that make up the neural tracts or pathways that carry information to and from the brain. The somatosensory system consists of the two main paired pathways that take somatosensory information up to the brain: the medial lemniscal or posterior pathway, and the spinothalamic or anterolateral pathway.