

# Sensory ascending tracts of white matter

	Modality / receptor	1st order neuron	2nd order neuron	3rd order neuron	Decussation	Termination
<b>Posterior column</b>	Discriminative Touch Sensation (include Vibration) and Conscious Proprioception  Most receptors except free nerve endings	Cell body is in the dorsal root ganglion  Fibers ascend ipsilaterally	Cell bodies in the lower part of medulla oblongata  Form arcuate fibers Pass in fasciculus gracilis & fasciculus cuneatus	Cell body in thalamus (VPL) internal capsule Corona radiata	Lemniscal decussation in medulla oblongata	Primary Somesthetic Area (S I)
<b>Lateral spino-thalamic tract</b>	pain and temperature free nerve endings	Cell body is in the dorsal root ganglion	Cell body in substantia gelatinosa The axons of 2nd order neurons cross obliquely to the opposite side in the anterior gray and white commissures ; ascending Midbrain in the contralateral white column as the lateral spinothalamic tract	Cell body in thalamus (VPL) internal capsule Corona radiata	✓	<ol style="list-style-type: none"> <li>1. Primary Somesthetic Area (S I) and Widespread Cortical Region</li> <li>2. Reticular formation</li> <li>3. cingulate gyrus</li> <li>4. Insular gyrus</li> </ol>
<b>Anterior spino-thalamic tract</b>	crude touch and pressure free nerve endings	Cell body is in the dorsal root ganglion	Cell body in nucleus proprius The axons of 2nd order neurons cross obliquely to the opposite side in the anterior gray and white commissures ; ascending in the contralateral white column as the Anterior spinothalamic tract	Cell body in thalamus (VPL) internal capsule Corona radiata	✓	Primary Somesthetic Area (S I)
<b>Spino-tectal tract</b>		ascend in the anterolateral white column lying close to the lateral spinothalamic tract				superior colliculus
<b>Posterior spino-cerebellar tract</b>	muscle and joint sensation	Cell body is in the dorsal root ganglion	nucleus dorsalis or Clarks nucleus	Cerebellum	✗	cerebellar cortex (through inferior cerebellar peduncle)
<b>Anterior spino-cerebellar tract</b>	muscle and joint sensation	Cell body is in the dorsal root ganglion  the majority of axons of 2nd order neurons cross to opposite side and ascend as anterior spino-cerebellar tract in the contralateral white column	nucleus dorsalis or Clarks nucleus	Cerebellum	✓	Terminates in cerebellar cortex (through superior cerebellar peduncle)

# Pyramidal motor tracts

	Origin	Course	Lateral corticospinal tract
<p><b>Corticospinal tract</b></p> <p>For fine skilled movement</p>	<p>in the precentral gyrus of the cerebral cortex</p>	<ol style="list-style-type: none"> <li>In midbrain: middle three-fifths of the basis pedunculi of the midbrain</li> <li>In medulla oblongata: pyramids</li> <li>Most of the fibers (85 %) cross over (decussate) to the opposite side in the pyramidal decussation, where they continue to descend in the lateral funiculus of the spinal cord as the lateral corticospinal tract (LCST).</li> <li>Those corticospinal fibers which do not decussate in the medulla continue descending on the same (ipsilateral) side of the cord and become the anterior corticospinal tract (ACST).</li> </ol>	<ol style="list-style-type: none"> <li>descends the full length of the spinal cord.</li> <li>LCST fibers synapse with alpha and gamma nuclei of the: <ul style="list-style-type: none"> <li>Cervical region (55%) (great effect on the upper limb)</li> <li>Thoracic 20%</li> <li>Lumbar and Sacral 25%</li> </ul> </li> <li>synapses mainly by interneurons in laminae IV, V, VI, VII, VIII</li> <li>3% originate from the fifth layer of area 4 (giant cells of Betz) synapse directly. (Accurate movements)</li> </ol>
			<p><b>Anterior corticospinal tract</b></p> <ol style="list-style-type: none"> <li>acts on the proximal muscles of upper limb (shoulder muscle) of the ipsilateral and contralateral sides.</li> <li>Fibers leave the tract at various levels to cross over in the anterior white commissure to synapse on interneurons in the anterior gray horn.</li> </ol>
<p><b>Corticonuclear tract</b></p>	<p>in the precentral gyrus of the lower quarter of the motor cortex.</p>	<ol style="list-style-type: none"> <li>The descending fibers terminate in the motor nuclei of cranial nerves III and IV in the midbrain - V, VI, and VII in the pons- and IX, X, XI, and XII in the medulla.</li> <li>The corticobulbar fibers from one side of the brain project to the motor nuclei on both sides of the brainstem (bilateral input).</li> <li>The corticonuclear input is bilateral Except : <ul style="list-style-type: none"> <li>Part of 7th (which supplies LOWER facial muscles)</li> <li>Part of 12th (which supplies genioglossus muscle)</li> </ul> </li> </ol>	

# Extrapyramidal motor tracts

	Origin	Course	Decussation	Function	Tonically active?
<b>Rubrospinal tract</b>	Red nucleus		At the level of the red nucleus in the lateral white column	<ol style="list-style-type: none"> <li>facilitate the activity of flexors and inhibit the activity of extensors.</li> <li>supplies Mainly flexors muscles with little effect on the proximal muscles</li> </ol>	
<b>Pontine reticulospinal tract (PRST)</b>	Reticular formation (Pons region)	<ol style="list-style-type: none"> <li>Axons of the RF neurons Descend uncrossed into the spinal cord.</li> <li>descends in the anterior white column .</li> </ol>	No	activate the axial and proximal limb extensors	YES Normally under inhibition from the cortex
<b>Medullary reticulospinal tract (MRST)</b>	Medulla	<ol style="list-style-type: none"> <li>Axons of the reticular formation (medulla) neurons descend Crossed and uncrossed in the spinal cord.</li> <li>descends in the lateral white column.</li> </ol>	Yes	Inhibition of the axial and proximal limb extensors	No Normally under stimulation
<b>Vestibulospinal tract</b>	Vestibular nuclei in the pons and medulla beneath the floor of the 4th ventricle	<ol style="list-style-type: none"> <li>Descends uncrossed</li> <li>in the anterior white column.</li> <li>Axons of the VST synapse with neuron in the anterior gray column of spinal cord.</li> </ol>	No	<ol style="list-style-type: none"> <li>facilitate the activity of extensor muscles (balance) .</li> <li>inhibit the activity of flexor muscles in association with the maintenance of balance</li> </ol>	
<b>Tectospinal tract</b>	nerve cells in superior colliculus of the midbrain	<ol style="list-style-type: none"> <li>crossed.</li> <li>anterior white column close to Anterior median fissure.</li> <li>Terminates in the anterior gray column of upper cervical segments of spinal cord.</li> </ol>		responsible for reflex movement of head & neck in response to visual stimuli	