CNS & PNS

Nerves, pathways
• **CNS**
  - Brain, spinal cord
  - Processing center
  - Nuclei

• **PNS**
  - Spinal and cranial nerves
  - Information relay system
  - ganglia
Meninges (spinal cord)

- **Dura mater**: outer layer
  - Subdural space; Serous fluid (lubricant)
- **Arachnoid mater**:
  - Subarachnoid space (between arachnoid and pia) filled with CSF & blood vessels
- **Pia Mater**: inner layer
  - Shrink wrapped to spinal cord & brain
Spinal cord anatomy

- **Gray matter**: cell bodies & unmyelinated axons
- **White matter**: Myelinated axons
Organization

- Dorsal = Sensory
- Ventral = Motor
Ascending sensory tracts

- Dorsal column
- Posterior spinocerebellar tract
- Lateral spinothalamic tract
- Anterior spinocerebellar tract
- Anterior spinothalamic tract
Ascending somatosensory pathway

- Crossover in MO, to opposite side of body
- Synapse in thalamus
- Projection to cerebral cortex
### Sensory tracts

**Table 8.4 Ascending Tracts**
(see figures 8.26 and 8.27)

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinothalamic</td>
<td>Pain, temperature, light touch, pressure, tickle, and itch sensations</td>
</tr>
<tr>
<td>Dorsal column</td>
<td>Proprioception, touch, deep pressure, and vibration</td>
</tr>
<tr>
<td>Spinocerebellar</td>
<td>Proprioception to cerebellum</td>
</tr>
</tbody>
</table>
Descending motor tracts

- Lateral corticospinal
- Rubrospinal
- Anterior corticospinal
- Reticulospinal
- Vestibulospinal
- Tectospinal
Descending Motor pathway

• Project from motor cortex
• Crossover @ lower MO
• Synapse in spinal cord
• Project to effector
## Motor tracts

### Table 8.5  Descending Tracts (see figures 8.29 and 8.30)

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct</strong></td>
<td></td>
</tr>
<tr>
<td>Lateral corticospinal</td>
<td>Muscle tone and skilled movements, especially of the hands</td>
</tr>
<tr>
<td>Anterior corticospinal</td>
<td>Muscle tone and movement of trunk muscles</td>
</tr>
<tr>
<td><strong>Indirect</strong></td>
<td></td>
</tr>
<tr>
<td>Rubrospinal</td>
<td>Movement coordination</td>
</tr>
<tr>
<td>Reticulospinal</td>
<td>Posture adjustment, especially during movement</td>
</tr>
<tr>
<td>Vestibulospinal</td>
<td>Posture, balance</td>
</tr>
<tr>
<td>Tectospinal</td>
<td>Movement in response to visual reflexes</td>
</tr>
</tbody>
</table>
Neural pathways

From brain

To brain
Spinal reflexes

- Sensory & motor nerves - where are they?
- Somatic - skeletal
- Visceral - smooth, cardiac, glands
Reflex Arc

1. Sensory receptor
2. Sensory neuron
3. Interneuron
4. Motor neuron
5. Effector organ

CNS

Skin

Skeletal muscle

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Withdrawal reflex

Diagram showing the withdrawal reflex pathway involving sensory neurons, interneurons, and motor neurons.
Disorders

- **Paralysis** - Some amount of loss of sensation or motor ability (long- or short-term); associated with spinal injury or infection

- **Neuritis** - Inflammation of a nerve, due to trauma or infection
  - Prolonged swellings leads to loss of sensory or motor function
Disorders

- **Sciatica** - Intense pain (neuralgia) along sciatic nerve
  - Often caused by herniated lumbar disc (fibrocartilage) putting pressure on lumbosacral spinal nerves

- **Herpes** virus - resides in ganglia of sensory nerves; produces lesions at nerve endings
  - Herpes zoster - chicken pox/shingles virus
  - Genital herpes
Nerves of PNS

- Cranial nerves: 12
- Spinal nerves: 31
- Collected in plexuses
  - Convergence & divergence of nerve tracts
Divisions of PNS

- Somatic
  - Voluntary
- Autonomic
  - Visceral (involuntary)
Autonomic division differences