General Organization

- Vertebral column has 26 bones
  - 7 cervical
  - 12 thoracic
  - 5 lumbar
  - Sacral (fusion of 5 bones)
  - Coccyx (fusion of 3 bones)

- Spinal cord runs in the middle of the vertebral openings
The Spinal cord shows enlargements in those areas that will deal with the limbs:
- Cervical enlargement (scapular region)
- Lumbar enlargement (pelvic region)

The spinal cord has “segments” from which nerves exit on both sides of the spinal cord. These are mixed nerves:
- There are 31 segments
- Each segment has a pair of dorsal roots and a pair of ventral roots

The spinal cord tapers off at the level of L1 and L2. This is the conus medullaris.

Beyond this level, the spinal nerves extend inferiorly creating the cauda equina.

Fibrous tissue extends into this area as well and provides longitudinal support = filum terminale.
General Organization

• There are 8 cervical nerves, 12 thoracic, 5 lumbar, 5 sacral and one coccygeal nerve.
• Names of the spinal nerves are given to the segment from which they extend:
  - C2 starts below first cervical vertebrae
  - T2 below first thoracic
  - L2 below first lumbar
  - S1 out of first opening in sacral bone

Dorsal root brings in the sensory information: these neurons are mostly unipolar neurons and the cell bodies of are located in the dorsal root ganglion.

Ventral root has the outgoing motor neurons (cell bodies are located within the spinal cord).

Distal to the roots, sensory and motor neurons are bound together into a single spinal nerve.
General Organization

- Posterior surface of the spinal cord shows a shallow longitudinal groove = **posterior median sulcus**
- Anterior groove is deeper = **anterior median fissure**
- Interior of the spinal cord shows a typical butterfly arrangement of gray matter, surrounded by white matter
- In the enlargements of the SC, the amount of gray matter is expanded

Spinal Meninges

- Provide physical stability and shock absorption
- They are extensions of the cerebral meninges
- Three layers from superficial to deep
  - Dura mater
  - Arachnoid mater
  - Pia mater
- Epidural space (between bone and dura mater) contains fat tissue and blood vessel
- Subarachnoid space is filled with CSF
- Pia mater lies close to the neural tissue. Denticulate ligaments extend from pia to dura mater and provide lateral support.
Spinal Meningis

Sectional Spinal Cord

- White matter is mostly myelinated axons
- Gray matter is cell bodies, unmyelinated axons and neuroglia
  - Projections of gray matter toward outer surface of cord are called horns
- Posterior gray horn contains somatic and visceral sensory nuclei
- Lateral gray horn (only in Thoracic area) contains visceral sympathetic motor nuclei
- Anterior gray horn contains somatic motor nuclei
- Anterior and posterior gray commissure connects left and right side
Sectional Spinal Cord

White matter can be divided into 3 major columns or funiculi:

- Posterior white columns lie between posterior gray horn and posterior median sulcus
- Anterior white column between anterior gray horn and anterior median fissure
- Lateral white columns lie between anterior and posterior white columns
Sectional Spinal Cord White Matter

Where are the meninges? Where are the ependymal cells?
A nerve is a collection of axon bundles outside the CNS. A spinal nerve is a typical example. The organization of a nerve usually implies the existence of fascicles.

Spinal Nerves

- Remember the important definitions
- A Tract = collection of axons within CNS (sometimes also called a fasciculus)
- A Nerve = collection of axons within PNS.
- Every segment of the spinal cord has a pair of spinal nerves attached to it.
- Spinal nerve is the common extension of the dorsal root and ventral root.
- Surrounded by layers of connective tissue
  - Epineurium: the outer layer that surround the nerve
  - Perineurium: internal layer that divides the nerve into compartments called fascicles
  - Endoneurium: surrounds individual axons