

Cerebellum

Regions of the Cerebellum

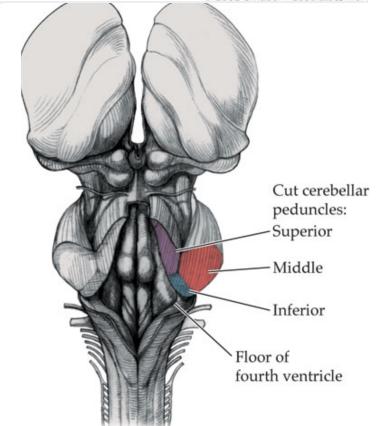
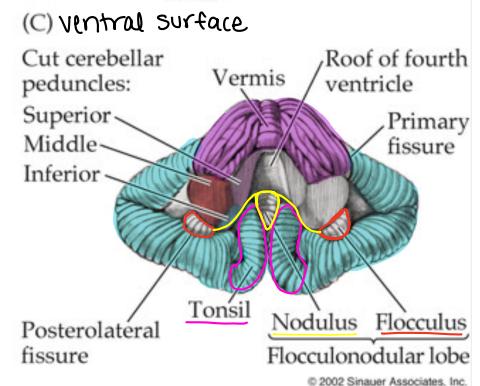
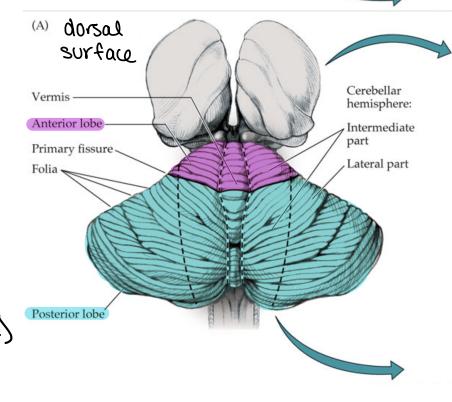
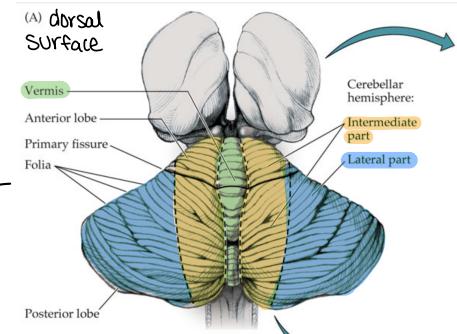
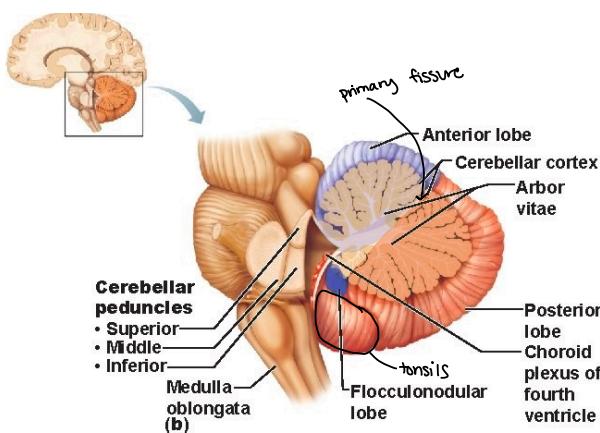
1. Left and Right hemispheres - composed of intermediate (medial) part and lateral part
2. Vermis - separates the left and right hemisphere (sometimes called arbor vitae)
3. paravermal - specifies medial hemispheres excluding the vermis

Lobes of the Cerebellum

1. Anterior Lobe
2. Posterior Lobe → contains the tonsils (seen on ventral surface)
 - tonsil herniation - results in coma
3. Flocculonodular Lobe - important for balance
 - Flocculus - hemispheric part
 - Nodus - vermal part

Cerebellar Peduncles

1. Superior - brachium conjunctivum
 - output to midbrain and thalamus
 - small spino cerebellar input
2. Middle Peduncle - brachium pontis
 - input from pons (pontine nucleus)
3. Inferior Peduncle - Restiform Body
 - inputs and outputs from medulla and spinal cord



Internal Spinal Cord Anatomy

Spinal Cord Levels

Cervical

- large ventral horn
- more white matter than grey matter

Thoracic

- small ventral horn → blc not a lot of fine motor control
- more white than grey matter
- lateral horn

Lumbar Cord

- large ventral horn and more white than grey

Sacral Cord

- large ventral and dorsal horn
- more grey matter than white matter
- can sometimes see cauda equina → fibers circle some sacral levels

Lamina/Nuclei of Grey Matter

- dorsal horn contains sensory nuclei and ventral horn contains motor nuclei

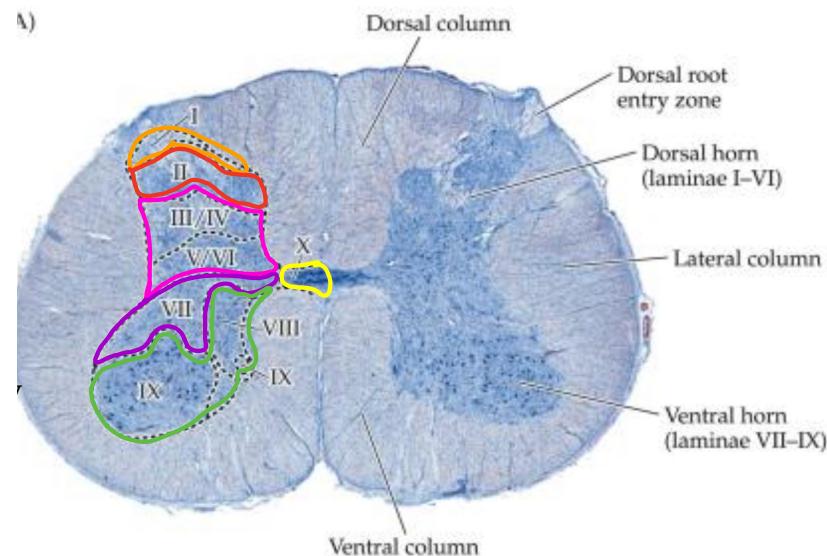
- Lamina 1 (Postermarginal nucleus) + Lamina 2 (substantia gelatinosa) → temperature + pain

- Lamina 3-6 → touch and pain

- Lamina 7
 - Medial Lamina 7 (Clarke's nucleus)
 - dorsal spinocerebellar tract originates from Clarke's nucleus
 - Lateral Lamina 7 (intermediolateral nucleus)
 - cell bodies contribute to autonomic and visceral motor function

- Lamina 8 and 9
 - contains cell bodies of somatic motor neurons
 - damage produces paralysis at the level of damage

- Lamina 10 → visceral pain



EUROSCIENCE, Fourth Edition, Appendix, Figure A6 (Part 1)

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White Matter

- 3 funiculi / columns → composed of many fasciculi
 - ① dorsal / posterior
 - ② ventral / anterior
 - ③ lateral
- many fasciculi / tracts, which are groups of fibers w/ somatotopic organization

Motor and descending (efferent) pathways

- damage produces paralysis at or below the lesion

1. Pyramidal Tracts

1a. lateral corticospinal

2b. anterior corticospinal

2. Extrapyramidal tracts

2a. rubrospinal

2b. reticulospinal

2c. vestibulospinal

2d. olivospinal

Sensory and ascending (afferent) pathways

3. dorsal column medial lemniscus system

3a. Gracile fasciculus 3b. Cuneate fasciculus

4. Spinocerebellar Tracts

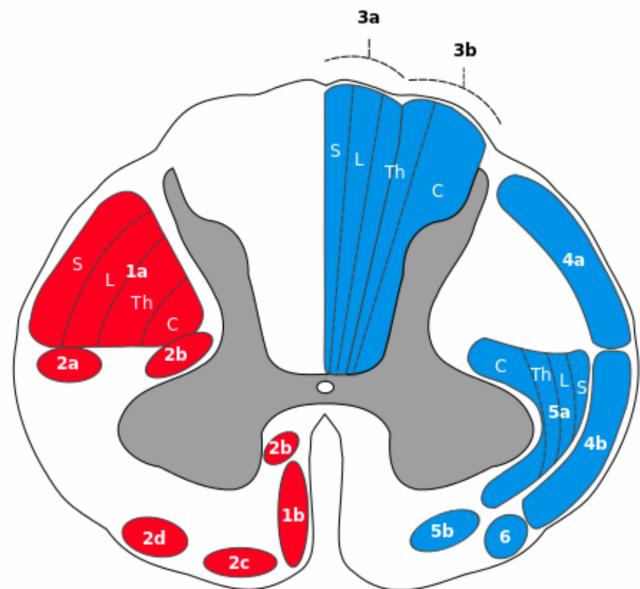
4a. posterior spinocerebellar tract 5b. anterior spinocerebellar tract

5. Anterolateral System

5a. lateral spinothalamic tract

5b. anterior spinothalamic tract

6. spino-olivary fibers



Cranial Nerves

① Olfactory Nerve

Function:

Type:

Exits:

Classification: **visceral sensory**

② Optic Nerve

Function: vision

Type: sensory

Exits:

Classification: **special sensory**

③ Oculomotor Nerve

Function: eye movement, pupillary constriction, open eyelids

Type: motor

Exits: interpeduncular fossa (midbrain)

Classification: **somatic motor** (oculomotor nucleus - midbrain), **visceral motor** (edinger-westphal nucleus - midbrain)

④ Trochlear Nerve → contains only LMNs

Function: eye movements

Type: motor

Exits: caudal to inferior colliculus (midbrain)

Classification: **somatic motor** (trochlear nucleus - midbrain)

⑤ Trigeminal Nerve

Function: somatic sensation from face, mouth, cornea; muscles of mastication

Type: sensory + motor

Exits: pons

Classification: **branchial motor** (trigeminal motor nucleus - pons), **general sensory** (trigeminal sensory nuclei)

⑥ Abducens Nerve → contains only LMNs

Function: eye movements

Type: motor

Exits: pontomedullary junction

Classification: **somatic motor** (abducens nucleus - pons)

⑦ Facial Nerve

Function: muscles of facial expression, taste from anterior tongue, autonomic control of tear/salivary glands

Type: motor and sensory

Exits: pontomedullary junction

general sensory (trigeminal sensory nuclei) visceral sensory (nucleus of the solitary tract)

Classification: Branchial Motor (Facial Nucleus - pons), visceral motor (super salivatory nucleus - pons)

⑧ Vestibulocochlear Nerve

Function: hearing and balance

Type: sensory

Exits: pontomedullary junction

Classification: special sensory (vestibular nuclei, cochlear nuclei - pons + medulla)

⑨ Glossopharyngeal

Function: sensation from pharynx, taste from posterior tongue, parotid salivary gland, blood pressure receptors

Type: mixed

Exits: post olfactory sulcus

visceral motor (inferior salivatory nucleus) visceral sensory (nucleus of the solitary tract)

Classification: branchial motor (nucleus ambiguus), general sensory (trigeminal sensory nuclei)

⑩ Vagus Nerve

Function: autonomic functions of gut, muscles of vocal cord, pharynx sensation, swallowing

Type: sensory + motor

Exits: post olfactory sulcus

Classification: branchial motor (nucleus ambiguus), general sensory (trigeminal sensory nuclei)

visceral sensory (nucleus of the solitary tract) visceral motor (dorsal motor nucleus of vagus)

⑪ Spinal Accessory Nerve

Function: innervate shoulders + neck muscles (trapezius)

Type: motor

Exits: post-olivary sulcus

Classification: branchial motor (spinal accessory nucleus - medulla)

⑫ Hypoglossal Nerve → contains only LMNs

Function: movements of tongue

Type: motor

Exits: pre-olivary sulcus

Classification: somatic motor (hypoglossal nuclei - medulla)

Functional Components

Somatic Motor (General Somatic Efferent - GSE)

project to skeletal muscles (muscles derived from somites)

- neurons are located in brainstem and ventral horn of the spinal cord
- Cranial Nerves: oculomotor, trochlear, abducens, hypoglossal

Branchial Motor (special visceral efferent - SVE)

- project to skeletal muscle not derived from somites (come from branchial arches in neck of the embryo)
 - branchial arch derived muscles are involved in mastication, swallowing, facial expression in mammals, and gills in fish
- neurons are LMNs that project to branchial arch-derived muscles
- Cranial Nerves: trigeminal, facial, glossopharyngeal, vagus, spinal accessory

Visceral Motor (general visceral efferent - GVE)

- Controls smooth muscle, cardiac muscles, and glands
 - these neurons project to visceral motor ganglia
- visceral motor neurons are found in the spinal cord + brainstem
 - sympathetic visceral motor neurons in the spinal cord at lumbosacral levels
 - parasympathetic visceral motor neurons are found in the spinal cord at sacral levels and in the brainstem

- Cranial Nerves: oculomotor, facial, glossopharyngeal, vagus

General Sensory (general somatic afferent) - GSA

- provides pain, fine touch, proprioception, and temperature from cutaneous and musculotendinous receptors
- sensory neurons in the dorsal horn of the spinal cord and in the brainstem
- Cranial Nerves: trigeminal, glossopharyngeal, vagus

Visceral Sensory (general visceral afferent - GVA, special visceral afferent - SVA)

- sensation from receptors in the visceral (organs of body such as heart, lungs, gut) → GVA
 - found in dorsal horn of the spinal cord and in the brainstem
 - Cranial Nerves: glossopharyngeal, vagus
- sensation from receptors in the tongue and nose (taste + smell) → SVA
 - Cranial Nerves: Facial, glossopharyngeal, vagus, olfactory

Special Sensory (special somatic afferent - SSA)

- responsible for vision + hearing
- Cranial Nerves: optic, vestibulocochlear