

## The Brain (Part II)

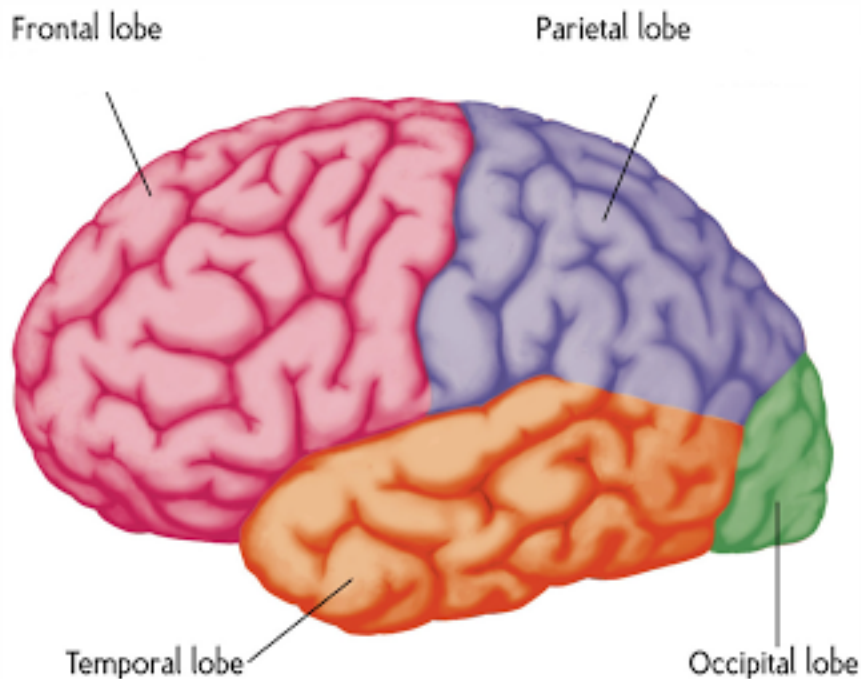
The Corpus Callosum: Function (Fig. 3.11)

- Precise connections between the 2 hemispheres of the brain
- Coordination between the right side and left side of the body (e.g. hands, feet)
- Allow for some specialized functions to be restricted to only one side (e.g. language on the left)

The 4 Lobes of the Cerebral Cortex (Fig. ~3.10)

*Cortex = outside of the brain*

- Frontal lobe is in the front
- Occipital lobe is in the very back
- Temporal lobe is on the side
- Parietal lobe



[https://sites.google.com/a/cms.k12.nc.us/ap-psych-2a/\\_/rsrc/1433185217681/rishi-kathrotia---cerebral-cortex/cerebral-cortex.png?height=300&width=400](https://sites.google.com/a/cms.k12.nc.us/ap-psych-2a/_/rsrc/1433185217681/rishi-kathrotia---cerebral-cortex/cerebral-cortex.png?height=300&width=400)

### Sensory-motor Divisions (Fig. 3.9)

of the brain is about **doing** things and everything on **receiving** things

- Doing vs. Perceiving
- Motor vs. Sensory

### Sensory processing

--> Lateralization: right vs. left

--> Convergence: from simple sensory features to more complex ones

- Convergence, primary areas --> Association Areas --> .??. --> Motor areas (Fig. 3.10)

### Primary Sensory Map

- Different parts of the body are represented by different groups of neurons. The number of neurons 'in charge' of a body part is **not proportional** to the size of the part.
- Neurons love to be stimulated. If a neuron is not stimulated, it dies.
- Neurons of two neighbor body parts talk to each other

### Limbic System (Fig. 3.13)

- (neo)cortex: evolutionary 'new'
- Limbic cortex: evolutionary 'old'
- Motivation and Emotion

### The Basal Ganglia (Fig. 3.14)

- Basal Ganglia
  - Caudate --> striatum
  - Putamen --> striatum
  - Globus pallidus
- Control of parkinson's

### Neuroanatomy

- Diencephalon
  - = Thalamus + Hypothalamus
  - Thalamus (3.10)
    - 2 lobes linked by the
    - Major sensory structure made of specialized nuclei (L.G.N., M.G.N.)
      - Ears --> Medial Geniculate Nucleus --> hear

termedia

- Eyes (retina) --> optic chiasm --> Lateral Geniculate Nucleus
  - Also has some motor outputs:
    - Cerebellum (memory for fine learned movements) --> ventrolateral nucleus --> primary motor cortex
- Hypothalamus (3.15)
  - Controls the autonomic (heart, lungs...) and Endocrine (hormones) systems.
  - Species specific behaviors (four F's: fighting, fleeing)
  - Pituitary gland
  - **Posterior** pituitary gland: oxytocin (child birth), vasopressin (anti-diuretic hormone, urine output). Both substances are involved in 'attachment behaviors'.
    - Hypothalamus --> Posterior Pituitary --> Hormones in Blood
  - **Anterior** pituitary gland (prolactin, production of milk). Controls the production of other hormones (e.g. sex hormones, growth hormones): 'Master' gland.
    - Hypothalamus --> Hormone releasing Factor molecules --(capillaries)--> Anterior pituitary --(Neurosecretory cells)--> hormone in blood

#### Midbrain (= mesencephalon)

- Tectum
  - Sensory reflexes (e.g. eye movements)
  - Pineal gland (sleep/wake cycle, jetlag)
  - Colliculi:
    - Superior colliculus (vision)
    - Inferior colliculus (audition)
- Tegmentum
  - Reticular formation
    - Sleep, attention, movement, reflexes
    - Many nuclei
  - Periaqueductal gray matter ('P.A.G.')
    - Pain processing
    - Species typical basic behaviors (mating, aggression)
  - Red Nucleus and Substantia Nigra
    - Motor info,

#### Brain Stem = Diencephalon + Midbrain + Hindbrain (Fig. 3.17)

#### Hindbrain

- **Metencephalon = cerebellum + pons**
- **Myelencephalon = Medulla (oblongata)**

- Cerebellum
  - Dense and specialized structure (little brain)
  - Made of : cerebellar cortex, deep nuclei and
  - Coordination of complex movements (walking, jumping)
  - Smooth precise movements
- Pons
  - Relay between the cortex and the cerebellum (through the peduncles)
  - Many nuclei
- Medulla

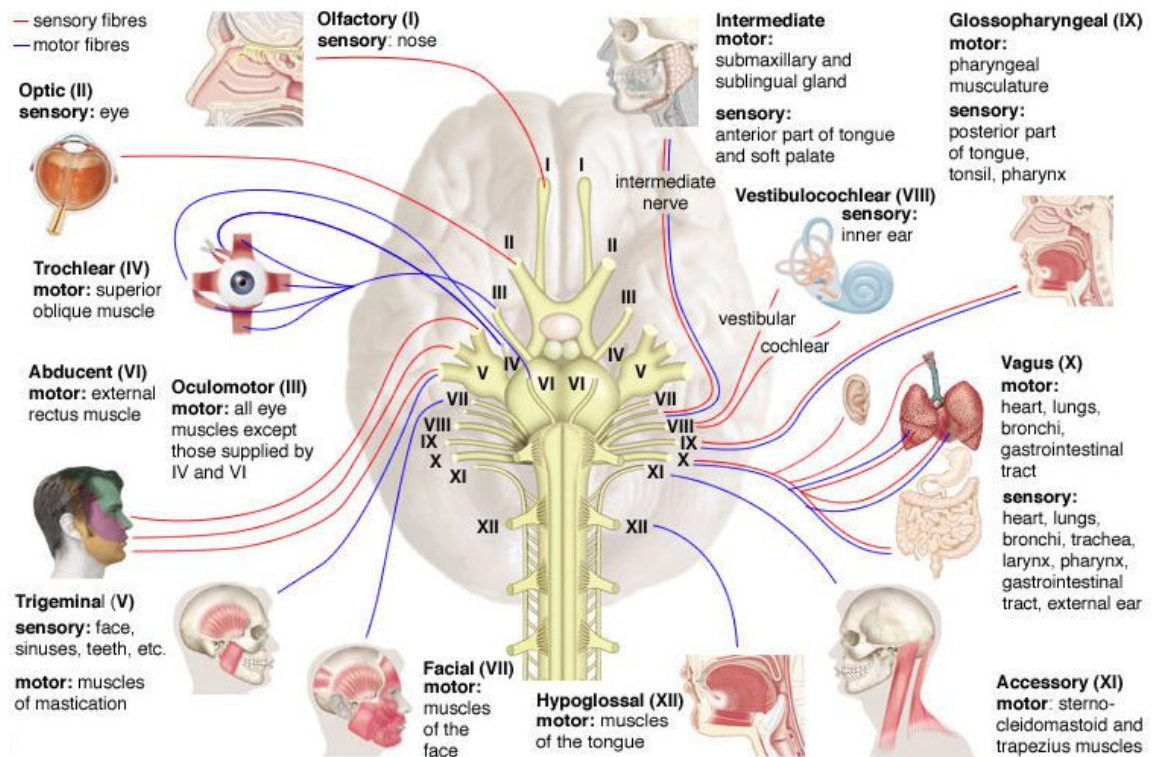
### Spinal Cord

- Sensory-motor flow
  - Sensory information enters dorsally (into the back), and motor information exits ventrally (belly side)
- Flow of information (Fig. 3.20)
  - Afferent (towards) vs. Efferent (away from)
- Controls glands and muscles (low-level reflexes)
- Collects somatosensory information
- Ventral and dorsal roots
- Gray matter (inside), white matter (outside). Brain: opposite
- 4 Levels: Cervical, thoracic, lumbar, sacral (Fig. 3.18)
  - Cauda equina -- Caudal block -- epidural
- Brain interactions (Fig. 3.19)
  - Brain and spinal cord are in constant 2-way interaction through specialized groups of neurons
  - Ascending
  - Descending

### Peripheral nervous System

- 12 Cranial Nerves (Fig. 3.21)
  - Olfactory (smell)
  - Optic (vision)
  - Oculomotor (eye movements)
  - Trochlear (eye movements)
  - Abducens (eye movements)
  - Trigeminal (Jaw muscles)
  - Facial (face muscles)
  - Auditory (hearing, balance)
  - Glossopharyngeal (taste, muscles of throat and larynx)
  - Vagus (internal organs)
  - Spinal Accessory (Neck muscles)
  - Hypoglossal (tongue movements)
- Blue means motor

- Red means sensory
- Most nerves follow blood vessels



- - <https://media1.britannica.com/eb-media/44/54244-004-892C5169.jpg>

- Somatic Nervous System
  - Sensory communication and local control of body skeletal muscles
  - Spinal nerves
  - Cranial nerves (12)
- Autonomic Nervous System
  - Sympathetic: energy expense (arousal). Sympathetic ganglion chain.
    - Sympathetic ganglion chain: coördinate energy expenditure across spinal levels
    - Thoracic + Lumbar
  - Parasympathetic: Energy saving (rest).
    - Cranial + Sacral
  - Preganglionic vs. Postganglionic
    - Pre = before the spinal cord
    - Post = towards the organs