

CHAPTER 49 : Nervous Systems

49.2 The vertebrate brain is regionally specialized

I. Arousal and Sleep

- brainstem/cerebrum control alertness
- brain is active in sleep
- sleep: consolidating learning & memory
- reticular formation - diffuse network of neurons in the core of brainstem
 - determines which info reaches cerebrum
 - more received info = more alert/awake
- sleep/wake cycles in all birds & mammals
- Melatonin made in pineal gland
 - important role in sleepiness
- dolphins sleep while swimming (one eye open)

II. Biological Clock Regulation

- bio. clock - molecular mechanism directing periodic gene expression & cellular activity
 - usually linked to light/dark
- suprachiasmatic nucleus (SCN)
 - group of neurons in hypothalamus
 - coordinate circadian rhythms
 - determines rhythm of whole animal

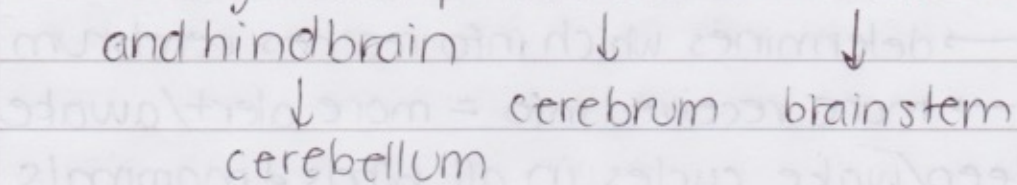
III. Emotions

- depend on many brain structures
 - amygdala, hippocampus, thalamus (& more)
 - grouped as limbic system (border the brainstem)
- laughing/crying also involve other areas
- emotion attaches to basic survival functions

- emotional experience stored as memory
- amygdala - clusters of neurons near base of the cerebrum that has an important role in storing emotional memory
- autonomic arousal: increased heart rate and sweating after experiencing unpleasant event repeatedly

IV. Organization of the Human Brain

- embryo develops forebrain, midbrain and hindbrain



Cerebrum

- skeletal muscle contraction, learning, emotion, memory, perception
- cerebral hemispheres - right and left
- cerebral cortex - vital for perception, voluntary movement, learning
 - also divided into right and left
 - left side of brain controls right & vice versa
- corpus callosum - thick band of axons
 - enables left ↔ right communication

Cerebellum

- coordinates movement & balance; motor skills
- monitors motor commands
- hand-eye coordination
- receives info about sensory stuff
 - & about position of joints, lengths of muscles, & auditory/visual stuff

Diencephalon

- gives rise to thalamus, hypothalamus, and epithalamus
- thalamus - main input center for sensory info going to cerebrum
 - info sent to appropriate place for processing
- hypothalamus - smaller; contains body's thermostat & central biological clock
 - control of pituitary gland
 - hunger, thirst, mating/sexual behavior, fight-or-flight response
 - hormones as well
- epithalamus: pineal gland, source of melatonin

Brainstem

- consists of midbrain, pons, medulla oblongata
- midbrain gets & integrates sensory info
 - sends it to forebrain
 - coordinates visual reflexes
- pons and medulla
 - transfer info between PNS, mid- & forebrain
 - coordinate large-scale body movement
- medulla
 - breathing, heart/blood vessel activity, swallowing, vomiting, digestion