**CHAPTER 2 LECTURE NOTES**

* Franz Gall developed *the false* theory called **Phrenology** - where bumps on the head dictate personality and intelligence. But the theory did direct our attention to *brain region* and *function.*
* Psychologists that study these connections between biology and behavior are called **Biological Psychologists**.

Neural Communication

* Neural System made up of nerve cells or **neurons**.
  + Neurons composed of:
    - **Dendrites**: message *receiving* fibers
    - **Axons**: message *sending* fibers insulated by …
    - **Myelin Sheath**: fatty cells that help\speed up impulses.
* **Action Potential:**  brief electrical charge that travels down the axon as it becomes *Depolarized* due to the movement of positively charged ions entering the axon. After the transmission, the axon becomes *Polarized* as positive ions are pumped out during the *Refractory Period.*
* Intensity of a stimulus called **Threshold**. A stimulus must exceed the threshold in order for a transmission to occur. ***The neuron will either fire or it won't****.* Much like a gun, the neuron either fires or it doesn't, there are no half-fires. This is called the ***all-or-none-response****;* if a stimulus is really strong, only the *number* of neurons firing will increase, *not* their speed
* **Synapse (or Synaptic Cleft):** gap between terminal of the sending neuron and the receiving neuron
  + Once the action potential reaches the synapse, **neurotransmitters**, or *chemical messengers,* are released into the gap where it will bind onto specific receptor sites on the receiving neuron.
  + **Acetylcholine (ACh):** most common well know neurotransmitter; it causes muscles to contract in movement.
  + **Endorphins:** natural opiates produced in the body to control pain and induce pleasure. ***("Morphine within)***
  + **Agonists***:* molecules which *mimics* the shape of natural neurotransmitters (Morphine)
  + **Antagonists***:* molecules which *block* neurotransmitters from binding on receptor sites.
  + **Blood-brain barrier***:* in the brain *…* filters out unwanted chemicals in blood stream.

Neural and Hormonal Systems

***Nervous System*** composed of …

* **Central Nervous System (CNS)** - brain and spinal cord
* **Peripheral Nervous System (PNS)** - links CNS to body's muscles and glands by means of nerves which are bundles of *sensory (incoming info)* and *motor neurons (outgoing info).*

***Autonomic Nervous System*** (under PNS) composed of …

* **Sympathetic Nervous System** - arouses body for defense (increase heartbeat, dilating pupils, inhibit digestion etc.)
* **Parasympathetic Nervous System** - calms the body after stress.
* **Simple Reflex:** an automatic response to stimuli (like knee-jerk) involving messages from *Sensory to Interneuron (Spinal Cord) to Motor Neuron*.

### Endocrine System (hormone secreting system)…

* communicates by releasing **Hormones** (chemical messengers) into the bloodstream
* In times ofstress the ANS will signal **Adrenal Glands** (above kidney) to release *epinephrine* and *norepinephrine* hormones (also called *adrenaline* and *noradrenaline.)*
* **Pituitary gland**: “master gland” … under the influence ofhypothalamus in brain, pituitary releases hormones that regulate glands and growth.

*The Brain*

* Lesions - remove brain tissue
* Electroencephalogram (**EEG**) - measures brain electric activity
* Computed Tomograph **(CT or CAT Scan) -** taking x-ray photographs of brain
* Positron Emission Tomograph **(PET Scan)** - detects radioactive glucose consumption in brain
* Magnetic Resonance Imaging **(MRI)** - generates brain images from magnetic activity
* **Brainstem** - oldest portion in brain forms into the Medulla Oblongata
* **Medulla Oblongata** - regulates involuntary processes like heartbeat and breathing.
* **Reticular Formation** – within brainstem, controls arousal
* **Thalamus** - lies above brainstem and is shaped like two eggs.
  + Function: act as a *sensory switchboard* relaying incoming signals to appropriate brain regions.
  + does not relay sensory, signals dealing with *smell.*
* **Cerebellum** - mainly controls *balance ...* stores partial *memory* and *learning capacities.*
* **Limbic System** - includes:
  + **Amygdala** - influence emotions (fear, anger).
  + **Hippocampus** - process memory.
  + Removal of amygdala results in emotionless organisms upon arousal.
* **Hypothalamus** - maintains body homeostasis (temperature, hunger, growth) and governs pituitary.
* **Glial Cells** - guide and support nerve cells in the brain
* The brain is divided into 4 regions:
  + **Frontal Lobe** - behind forehead, has Motor Cortex (located at the back of frontal lobe, the cortex controls voluntary movement)
  + **Parietal Lobe** - top to back of head, has Sensory Cortex (located in the beginning of parietal lobe, the cortex processes \bodily senses)
  + **Occipital Lobe** - back of head, regulates vision.
  + **Temporal Lobe** - above ears, regulates hearing
* ¾ of the brain is uncommitted to motor or sensory functions. Theses brain regions are called **Association Areas** - areas involved in thinking, remembering, and speaking. *The larger the association area, the more intelligent the species, for they are able to anticipate future events.*
* The case with Phineas Gage showed researchers that damages in the frontal lobe could result in personality changes because their normal 'restraints" or inhibitions are erased. With Phineas, this was due to a tamping rod that entered at his left cheek and exited out the top of his head, separating his internal motives and external judgment.

### Stages of Language

* **Visual Cortex** - occipital lobe (back of head): sees the visual stimulation (words)
* **Angular Gyrus** – mid-side of parietal lobe: converts words into auditory code
* **Wernicke's Area** - between temporal and parietal lobe (side of head): derives meaning from auditory code
* **Broca's Area** - mid-bottom of frontal lobe: controls motor cortex
* **Motor Cortex** - back of frontal lobe: activates speech muscles to pronounce word.
  + Damage to:

(1) cannot see

(2) cannot read

(3) cannot understand,

(4) and (5) cannot speak.

### Split Brain

* **Corpus Callosum:** joins the two hemispheres and is separated to cure epileptic seizures.
  + **Spilt-brain patients**: people with separated corpus callosums
  + unable to say what they see in their left visual field because *speech is in left hemisphere* and the hemispheres regulate opposite sides of the body.
  + when split-brainers are asked to say what they saw, the left hemisphere will say what is seen in the right visual field
  + when asked to point, get, or write what they saw, the right hemisphere will dictate what is seen In the left visual field.
  + **Sign language** is nevertheless language and is controlled by left hemisphere, if deaf people suffer a stroke in left hemisphere, signing will be disrupted.
  + **Left Hemisphere**: mathematics, language, logical, reasoning, meaning
  + **Right Hemisphere:** perceptual and spatial tasks, musical, artistic, emotion, face recognition, copying information.