

Ch. 3

- Frontal lobe=affects behavior
- Biological psychology
 - Organization of the nervous system
 - The neuron
 - Communication
 - Drugs
 - Brain structure and function
- The nervous system
 - Function—gather and process information
 - Produce responses to stimuli
 - Coordinate the workings of different cells
 - Uses nerve cells or “neurons” and “glia” (glial cells)
 - Sensory
 - Motor
 - Inter
 - Central and Peripheral nervous system
 - Central—brain and spinal cord
 - Peripheral—autonomic (involuntary action) and somatic (voluntary action)
 - Handles input (sensory nerves) and output (motor nerves)
 - Somatic nervous system—consists of nerves that are connected to sensory receptors
 - Sense the world
 - Act voluntarily
 - Autonomic system—regulates internal organs and glands
 - Involuntary (breathing, digestion, anything you can't control)
 - Sympathetic system—mobilizes bodily resources and increases the output of energy during emotion and stress
 - High energy usage
 - Prepares for fight or flight
 - Pupils open
 - Pulse quickens
 - Adrenaline released
 - Parasympathetic system—operates during relaxed states, conserves energy
 - Conserves energy
 - Prepares for rest
 - Pupils constrict
 - Pulse slows
 - Communication
- Neurons
 - Basic unit of the nervous system
 - Cells that receive and transmit information
 - Communicate via electrochemical signals
 - There are many different types of neurons
 - Excitatory or inhibitory
- Glia

- Support, nurture, and insulate neurons
 - Remove debris when neurons die
 - Formation and maintenance of neural connections
 - Modify neuronal functioning
- Otto Loewi
 - Father of neuroscience
 - Discovered frog hearts communicated chemically
- Structure of neurons
 - Dendrites—receive information from other neurons and transmit it toward the cell body
 - Cell body—the part of the neuron that keeps it alive and determines whether or not it will fire
 - Axon—a neuron's extending fiber that conducts impulses away from the cell body and transmits them to other neurons
 - May be relatively short (four thousands of an inch), or relatively long (a few feet)
 - Axons may be insulated by a layer of fatty material called the myelin sheath
 - Composed of glial cells
 - Segmented ("nodes of ranvier")
 - Myelination—reduces confusing signals from nearby neurons
 - Speeds things up
 - Occurs throughout your life
 - Symptoms of multiple sclerosis
 - How a neuron "fires"
 - One neuron stimulates another
 - Stimulation causes a change in electrical potential between the inside and the outside of the neuron
 - Negative on the inside; positive on the outside
 - Sudden, momentary inflow of Na⁺ ions followed by outflow of K⁺ ions creates an electrical impulse
 - Action potential—brief change in electrical voltage that occurs between the inside and the outside of an axon when a neuron is stimulated and which serves to produce an electrical impulse
 - All-or-none-either happens or it doesn't
 - Hyperpolization (refractory period)—must reset to fire again
 - AP steps
 - Resting potential (-70 mv) sodium-potassium pump keeps Na⁺ outside and K⁺ inside the cell
 - Depolarization—sodium gates open and Na⁺ enters
 - Threshold (-55 mv) reached with influx of Na⁺
 - Action Potential—peak (+40 mv)
 - Repolarization—sodium gates shut, potassium gates open (Na⁺ stops coming in and K⁺ leaves)
 - Refractory period—overreaction (-90)
 - Resting state—Na—K
 - Pump regains balance (-70)

- Impulse reaches the axon terminal—the end of an axon from which the axon releases its message
- The axon terminal has within it several synaptic vesicles containing a neurotransmitter
- Neurotransmitter—a chemical substance that is released by a transmitting neuron at the synapse and that alters the activity of a receiving neuron
- Synapse—the site where transmission of a nerve impulse from one nerve cell to another occurs; includes:
 - The axon terminal
 - The synaptic cleft (the space in between neurons)
 - Receptor sites—in the membrane of the receiving cell, which are specialized to receive specific messages
- What happens to the neurotransmitter after action potential
 - NT released from presynaptic membrane
 - NT crosses synaptic cleft
 - Binds to postsynaptic receptors
 - Excitatory
 - More action potentials
 - Na⁺ enters cell
 - Inhibitory
 - Fewer action potentials
 - K⁺ leaves cell
- Chemical messengers
 - Neurotransmitters
 - Serotonin
 - Affects neurons involved in sleep, appetite, sensory perception, temperature regulation, pain suppression, and mood
 - Dopamine
 - Affects neurons involved in voluntary movement, learning, memory, emotion, pleasure or reward, and possibly, response to novelty
 - Related to Parkinson's
 - Acetylcholine
 - Affects neurons involved in increased heart rate and the slowing of intestinal activity during stress, and neurons involved in learning, memory, dreaming, waking from sleep, and emotions
 - Gaba
 - The major inhibitory neurotransmitter in the brain
 - Glutamate