Chapter 1 -

i. Wilhelm Wundt - founding father of psychology
   - psychology's intellectual parents were the disciplines of philosophy and physiology
   - psychology is the study of the mind, behavior, and their neurological underpinnings

ii. First two major schools of thought in psychology:
   - **Structuralism** - based on the notion that the task of psychology is to analyze consciousness into its basic elements and investigate how these elements are related. structuralists wanted to identify and examine the fundamental components of conscious experience, such as sensation, feelings, and images
     - structuralists depended on **introspection** - observing your own conscious experience, bad b/c there is no independent objective evaluation of that claim
   - **Functionalism** - based on the belief that psych should investigate the function or purpose of consciousness rather than its structure. more interested in how people adapt their behavior to the demands of the real world around them
   - **Behaviorism** - founded by John Watson - thought that psychology should study only observable behavior. thought psychs should abandon study of consciousness and focus only on behaviors they could observe directly. thought studying unobservable actions was too subjective
     - strongly believes that **nurture** wins out over nature
   - **Gestalt psychology** - argued that psych should continue to study conscious experience rather than overt behavior
   - Sigmund Freud - believed in the existence of the unconscious, his **psychoanalytic theory** attempts to explain personality, motivation, and mental disorders by focusing on unconscious determinants of behavior
     - Id - primal urges / ego - component of personality charged with dealing with reality / superego - holds all of the ideals and values we internalize from our parents and culture
   - B.F. Skinner developed his own philosophy of **radical behaviorism** - organisms tend to repeat responses that lead to positive outcomes and vice versa, thought people are controlled by their environment, behavior is governed by external stimuli
   - **Humanism -** opposed to behaviorism and psychoanalytic theory lead to a new school of thought bc it failed to recognize the unique qualities of *human* behavior
     - humanism - emphasizes the unique qualities of humans, especially their freedom and their potential for growth
     - takes an optimistic view of human nature, don't think people are pawns of their animals heritage or environmental circumstances, animals and humans are fundamentally different
     - human behavior is governed primarily by an individuals sense of self (self-concept) which animals lack
   - **Applied psych** - branch of psych that uses psych principles and theories to overcome issues in practical, every day situations like education, business management, etc.
   - **Clinical psych** - concerned with the diagnosis and treatment of psych problems and disorders
   - **Cognitivism** - cognitive branch of psych is a branch that studies mental processes including how people think, perceive, remember, etc.
     - core focus is on internal, mental states, on how people acquire, process and store info
     - involves all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered and used
   - **Ethnocentrism** - tendency to view one's own group as superior to others and as the standard for judging the worth of foreign ways
   - Perception is not a passive process, what we see is what we want to see
     - **confirmation bias** - tendency to seek out info that is consistent with our expectations
     - **limited data problem** - tend to make inferences/conclusions on the basis of very little data or info
   - **Evolutionary psych** - examines behavioral processes in terms of their adaptive value for members of species over the course of many generations
   - **Positive psych** - uses theory and research to better understand the positive, adaptive, creative, and fulfilling aspects of human existence
   - **Biologism** - concerned with integration of mind, body & behavior
     - examined behavior in terms of physiological (brain) processes
     - ex* electrical stimulation of brain evokes emotional responses in animals

	perspective	iii. subject matter
Behavioral	Effects of enviro on the overt behavior of humans and animals	Only observable events (stimulus-response relationships) can be studied scientifically
Psychoanalytic	Unconscious determinants of behavior	Unconscious motives and experiences in early childhood govern personality and mental disorders
Humanistic	Unique aspects of human experience	Humans are free, rational beings with the potential for personal growth, and they are fundamentally different than animals
Cognitive	Thoughts; mental processes	Human behavior cannot be fully understood without examining how people acquire, store, and process info
Biological	Physiological basis of behavior in humans and animals	An organism's functioning can be explained in terms of the bodily structures and biochemical processes that underlie behavior

Evolutionary	Evolutionary basis of behavior in humans and animals	Behavior patterns have evolved to solve adaptive problems; natural selection favors behaviors that enhance reproductive success

Chapter 7 -

i. Memory:
   - encoding - (studying/learning/acquisition) involves forming a memory code, the process of interpreting + transforming info into the code used by the brain
   - storage - (retaining/consolidating) - maintaining encoded info in memory over time
   - retrieval - (decoding) - decoding is the process of translating stored info back into the code used for reporting/expressing it, recovering info from memory stores

ii. Levels of Processing - theory proposes that deeper levels of processing result in longer-lasting memory codes
   - in dealing with verbal info, people engage in 3 progressively deeper levels of processing
     - structural encoding - relatively shallow processing that emphasizes the physical structure of the stimulus
     - phonemic encoding - further analysis emphasizes what a word sounds like
     - semantic encoding - emphasizes the meaning of verbal input, involves thinking about the objects and actions the words represent

iii. semantic encoding can often be enhanced through **elaboration** (linking a stimulus to other info at the time of encoding)

iv. **dual-coding theory -** holds that memory is enhanced by forming semantic and visual codes, since either can lead to recall

v. **self-referent encoding** - involves deciding how or whether info is personally relevant, if info is personally relevant recall is enhanced

vi. Storage: Maintaining Info in Memory:
   - **sensory memory** - preserves info in its original sensory form for a brief time, usually only a fraction of a second
   - **STM** - a limited-capacity store that can maintain unrehearsed info for up to about 20 seconds
     - maintenance rehearsal - repeating either verbally or mentally
     - used to be thought that 7 +/- 2 was limit of STM
     - now more likely to be 4 +/- 1
   - **Working memory** - limited capacity storage system that temporarily maintains and stores info by providing an interface b/w perception, memory, and action. consists of 4 components:
     - **phonological loop** - used when you recite numbers to remember a phone number
     - **visuospatial sketchpad** - permits people to temporarily hold and manipulate visual images
     - **central executive system** - controls deployment of attention, switching focus, and dividing attention as needed
     - **episodic buffer** - temporary, limited capacity store that allows various components of working memory to integrate info that serves as an interface b/w working memory and long-term memory
     - **Working Memory Capacity** - one's ability to hold and manipulate info in conscious attention
   - **LTM** - unlimited capacity store that can hold info over lengthy periods of time
     - **flashbulb memories** - unusually vivid and detailed recollections of momentous events (remembering extremely detailed about where you were during 9/11) - people have exceptional confidence in their accuracy of these memories even if they are often altered
   - **clustering** - tendency to remember similar or related items in groups
   - **conceptual hierarchy** - multilevel classification system based on common properties among items
   - **schema** - an organized cluster of knowledge about a particular object or event abstracted from previous experience with the object or event
     - people are more likely to remember things that are consistent with their schemas than things that are not
     - people sometimes exhibit better recall of things that violate their schema based expectations
   - **semantic network** - consists of nodes representing concepts, joined together by pathways that link related concepts
     - **spreading activation** - when people think about a word, their thoughts naturally go to related words
   - **encoding specificity principle -** memory for info would be better when the conditions during encoding and retrieval were similar (being drunk, etc)
   - **misinformation effect** - when participants' recall of an event they witnessed is altered by introducing misleading post-event information
   - Source and Reality Monitoring:
     - **reality monitoring** - refers to the process of deciding whether memories are based on external sources (one's perception of actual events) or internal sources (one's thoughts and imaginations) - "did i pack the umbrella or only think about packing it?"
     - **source monitoring** - involves making attributions about the origins of memories
       - **source monitoring error** - occurs when a memory derived from one source is misattributed to another source
       - **destination memory** - remembering who you told something
   - **recall measure (of retention)** - requires subjects to reproduce info on their own without any cues (being asked to write memorized words on a blank sheet w/o any cues)
   - **recognition measure (of retention)** - requires subjects to select previously learned info from an array of options (multiple choice/matching questions)
   - third measure of measuring forgetting is **relearning** - requires a subject to memorize info a second time to determine how much time or how many practice trials are saved by having learned it before
   - Why We Forget
     - ineffective encoding - if you're distracted while reading a textbook you may just be saying words to yourself instead of thinking thoroughly about them, this is an example of phonemic encoding instead of semantic encoding
     - **pseudo-forgetting** - you assume you know what a penny looks like, but most have actually failed to encode the info, see them often but do not really look at them closely
     - **decay** - proposes that forgetting occurs because memory traces fade with time
       - researchers have not been able to prove that decay causes LTM forgetting. info that is not rehearsed disappears as time passes (forgetting a language)

- **interference** - proposes that people forget info because of competition from other material
  - **retroactive interference** - occurs when new info impairs the retention of **previously learned** info
  - **proactive interference** - occurs when previously learned info interferes with the retention of ***new info***
- **encoding specificity principle** - the value of a retrieval cue depends on how well it corresponds to the memory code (if the sound of a word - its phonemic quality - was emphasized during encoding, an effective retrieval cue should emphasize the sound of the word)
- **transfer-appropriate processing** - occurs when the initial processing of info is similar to the type of processing required by the subsequent measure of retention
- **retrograde amnesia** - involves the loss of memories for events that occurred prior to the onset of amnesia (get hit in the head and forget previous years of your life)
- **anterograde amnesia** - loss of memories for events that occur after the onset of amnesia
- **consolidation** - hypothetical process involving the gradual conversion of information into durable memory codes stored in LTM

- Systems and Types of Memory
  - **implicit memory** - (unintentional remembering) is apparent when retention is exhibited on a task that does not require intentional remembering (person w/ anterograde amnesia remembers words from a list without even remembering being shown the list)
  - **explicit memory** - involves intentional recollection of previous experiences
    - scientists think differences b/w implicit and explicit exist b/c they are handled by independent memory systems (declarative and procedural memory)
  - **declarative memory (system)** - handles factual info (recollections of words, definitions, names, dates, etc.
  - **non-declarative / procedural memory (system)** - houses memory for actions, skills, operations, and conditioned responses
    - recall of factual info (declarative memory) depends on conscious and effortful processes whereas memory for conditioned reflexes (non-declarative/procedural) requires little effort or attention (typing or shooting a basketball)
  - **declarative** memory is divided into **episodic** and **semantic memory**
    - **episodic** - a record of things you've done, seen, and heard. includes info about *when* you did these things, saw them, or heard them (remembering seeing OF in concert)
    - **semantic** - contains general knowledge that is not tied to the time when the info was learned (Christmas is Dec. 25th)
  - **prospective memory** - remembering to do things in the future
  - **retrospective memory** - remembering events from the past or previously learned info

Chapter 2 -

- **operational definition** - establish precisely what is meant by each variable in the context
- the scientific approach is worth the effort because of its clarity and precision
- **extraneous variables** - variables other than the independent variable that seem likely to influence the dependent variable in a specific way
- **confounding variable** - occurs when two variables are linked together in a way that makes it difficult to sort out their specific effects
- **naturalistic observation** - engages in careful observation of behavior without intervening directly
  - **reactivity** - when a subject's behavior is altered by the presence of an observer
- **case study** - an in-depth investigation of an individual subject
- **descriptive/correlational research** - (surveys, naturalistic observation, case studies) broaden the scope of phenomena that psychologists are able to study
  - consequently, correlational research cannot demonstrate conclusively that two variables are casually related
- Descriptive Statistics: used to organize and summarize data
  - **negatively skewed distribution** - in which most scores pile up at the **high** end of the scale
  - **positively skewed** - when most scores pile up at the **low** end
  - **variability** - refers to how much the scores in a data set vary from each other and from the mean
    - **standard deviation** - an index of the amount of variability in a set
    - **normal distribution** - a symmetrical, bell-shaped curve that represents the pattern in which many human characteristics are dispersed in the population
      - precise way to measure how people stack up in comparison to each other
      - about 68% of scores fall within +/- 1 standard deviation, about 95% fall within +/- 2
      - **percentile** - if you score at the 60th percentile, 60% of people scored the same or below you
    - **correlation coefficient** - a numerical index of the degree of relationship b/w two variables. indicates the direction (positive or negative) of the relationship, and how strongly they are related
      - positive correlation - co-vary in the same direction
      - negative correlation - co-vary in the opposite direction
      - Strength of the Correlation:
        - coefficient can be between 0 and +1.00 (if positive) or between 0 and -1.00 (if negative)
        - coefficient near 0 indicates no relationship, the closer to 1 or -1, the stronger the relationship
        - ability to predict one variable based on knowledge of the other variable increases with the strength of the correlation
- Inferential Statistics: are used to interpret data and draw conclusions
  - **statistical significance** - said to exist when the probability that the observed findings are due to chance is very low (very low usually defined as fewer than 5 chances in 100)
  - **meta-analysis** - combo of the statistical results of many studies of the same question
  - **sampling bias** - exists when a sample is not representative of the population from which it was drawn
  - **social desirability bias** - a tendency to give socially approved answers about oneself
  - **a response set** - tendency to respond to questions in a particular way that is unrelated to the content of the question

- **double-blind procedure** - research strategy in which neither subjects nor experimenters know which subjects are in the experimental or control groups

cerebellum - physical coordination and balance, first to be affected by alcohol
medulla - vital (*autonomic*) functions [breathing, heart rate, blood pressure]
pons - sleep & arousal
thalamus - station for sensory info
hypothalamus - basic biological drives (fighting, fleeing, mating)

Lobes:
frontal - muscle movement
occipital - visual
temporal - auditory
parietal - sense of touch

Chapter 3 - Biological Bases of Behavior

- cells in the nervous system fall into 2 major categories: glia & neurons
- **Neurons** - individual cells in the nervous system that receive, integrate, and transmit info
    - majority communicate only with other neurons, small minority receive signals from outside the nervous the system
        - **Soma (cell body)** - contains the nucleus and much of the chemical machinery common to most cells. rest of the neuron devoted exclusively to handling info
        - **Dendrites** - part of neuron specialized to *receive* info
            - info flows from the dendrites into the cell bodies (soma), then travels away from the soma along the **axon** - long thin fiber that transmits signals away from the soma to other neurons or to muscles or glands
        - **Myelin sheath** - insulating material, derived from glial cells, that encases some axons
            - speeds up transmission of signals that move along axons
            - if an axon's myelin sheath deteriorates, its signals may not be transmitted effectively
            - loss of muscle control from multiple sclerosis is due to degeneration of myelin sheaths
        - The axon ends in a cluster of **terminal buttons** - small knobs that secrete chemicals called **neurotransmitters** - serve as messengers that may activate neighboring neurons
        - points at which neurons interconnect are called **synapses** - a junction where info is transmitted from one neuron to another
            - info is received at the dendrites, passed through the soma and along the axon, and is transmitted to the dendrites of other cells at meeting points called synapses
- **Glia** - cells found throughout the nervous system that provide various types of support for neurons
    - smaller than neurons, outnumber neurons 10 to 1, account for over 50% of brains volume
    - supply nourishment to neurons, remove neuron's waste products, and provide insulation around axons
- **The Neural Impulse**
    - complex electrochemical reaction.
    - positively charged sodium + potassium ions, and negatively charged chloride ions flow back and forth across the membrane
    - difference in flow rates leads to a higher concentration of negatively charged ions in the cell
    - resulting voltage means that the neuron at rest is a store of potential energy
    - **Resting potential of a neuron -** is its stable, negative charge when the cell is inactive (charge is about -70 millivolts)
    - when neuron is stimulated, channels in its cell membrane one, briefly allowing positively charged sodium ions to rush in, making the neuron's charge less negative, or even positive, creating action potential
    - **Action potential** - brief shift in a neuron's electrical charge that travels along an axon
        - after firing of an action potential, the channels in the cell membrane close up. some time is needed before they open again and cannot fire until it can
        - **absolute refractory period** - minimum length of the time after an action potential during which another action potential cannot begin (1 or 2 milliseconds)

        - followed by a **relative refractory period** - during this time a neuron can fire, but its threshold for firing is elevated, so more intense stimulation is required to initiate action potential
    - **All-or-None Law**
        - neuron either fires or it doesn't, weaker stimuli do not produce smaller action potentials
        - action potential is an all or nothing event, neurons can convey info about the strength of a stimulus, they do so by varying the rate at which they fire action potentials
        - stronger stimulus will cause a cell to fire a more rapid volley of neural impulses
- **The Synapse: Where Neurons Meet**
    - sending signals: chemicals as couriers
        - two neurons don't actually touch, they're separated by the **synaptic cleft** - microscopic gap b/w the terminal button of one neuron and the cell membrane of another neuron
        - the neuron that sends a signal across the gap is called the **presynaptic neuron**, one that receives signal is **postsynaptic neuron**
        - arrival of action potential at an axon's terminal button triggers release of **neurotransmitters** - chemicals that transmit info from one neuron to another
        - most NTs stored in small sacs called **synaptic vesicles**
        - NTs released when a vesicle fuses with the membrane of the presynaptic cell, and its contents spill into the synaptic cleft
        - after their release, NTs diffuse across the synaptic cleft to the membrane of the receiving cell. there they may bind with special molecules in the postsynaptic cell membrane at various receptor sites
    - receiving signals: postsynaptic potentials
        - when a NT and a receptor molecule combine, reactions in a cell membrane cause a **postsynaptic potential (PSP)** - a voltage change at a receptor site on a postsynaptic cell membrane
            - PSPs do not follow the all-or-none law as action potentials do. PSPs are *graded*, they vary in size and the increase or decrease the probability of a neural impulse in the receiving cell in proportion to the amount of voltage change
        - 2 types of messages can be sent b/w cells:
            - **Excitatory PSP** - positive voltage shift that increases the likelihood that the postsynaptic neurons will fire action potentials
            - **Inhibitory PSP** - negative voltage shift that decreases the likelihood that the postsynaptic neuron will fire action potentials
        - **Reuptake** - process in which NTs are sponged up from the synaptic cleft by the presynaptic membrane, allows synapses to recycle their materials
        - a neuron must do a great deal more than relay messages it receives, it must integrate signals arriving at many synapses before it decides whether to fire a neural impulse
        - if many inhibitory and excitatory PSPs occur at the same time, the state of the neuron is a weighted balance
        - elimination of old synapses plays a larger role in the sculpting of neural networks than the creation of new synapses. Nervous system creates more synapses than necessary and gradually eliminates less-active synapses (**synaptic pruning**)
- **Neurotransmitters**
    - **agonist** - chemical that mimics the action of a neurotransmitter
    - **antagonist** - chemical that opposes the action of a neurotransmitter
    - **monoamines** - dopamine, norepinephrine, serotonin
    - **endorphins** - "runner's high" b/c of high endorphin level
    - **GABA and Glutamate** - GABA is strictly inhibitory effects at all synapses, responsible for much of the inhibition in the central nervous system
        - **Glutamate** - most prevalent neurotransmitter, strictly excitatory, in over 90% of synapses in the human brain. required for relaying sensory info and for learning
        - acts on synapses which are modifiable, capable of increasing and decreasing in strength, and assumed to be involved in memory storage. key role in **long-term potentiation** - a long-lasting enhancement in signal transmission b/w 2 neurons that results from stimulating them synchronously
        - **GABA** - next most prevalent to Glutamate (**READ MORE ABOUT GABA! CLASS**

NOTES)

Neurotransmitter	Function & Characteristics
Acetylcholine (ACh)	**Activates motor neurons controlling skeletal muscles. Contributes to the regulation of attention, arousal, and memory. Some Ach receptors stimulated by nicotine Only transmitter b/w motor neurons and voluntary muscles (every move you make depend on ACh)**
Dopamine (DA) - Monoamine	**Contributes to control of voluntary movement, pleasurable emotions. Decreased levels associated with Parkinson's disease. Over-activity at DA synapses associated with schizophrenia. Cocaine and amphetamines elevate activity at DA synapses Motivation and Reward!**
Norepinephrine (NE) – Monoamine	**Contributes to modulation of mood and arousal. Cocaine and amphetamines elevate activity at NE synapses**
Serotonin – Monoamine	**Involved in regulation of sleep and wakefulness, eating, aggression. Abnormal levels may contribute to depression and OCD. Prozac and similar antidepressant drugs affect serotonin circuits**
GABA	**Serves as widely distributed inhibitory transmitter. Valium and similar antianxiety drugs work at GABA synapses**
Endorphins	**Resemble opiate drugs in structure and effects. Contribute to pain relief and perhaps to some pleasure emotions**

- Organization of the Nervous System
  - **Peripheral Nervous System**
    - made up of all those nerves that lie outside the brain and spinal cord. **Nerves** are bundles of neuron fibers (axons) that are routed together in the PNS
    - subdivided into the **Somatic Nervous System** and the **Autonomic Nervous System**
    - **Somatic Nervous System** - made up of nerves that connect to voluntary skeletal muscles and to sensory receptors - carry info from receptors in the skin, muscles, and joints to the **Central Nervous System** and carry commands from the CNS to the muscles
      - functions require 2 kinds of nerve fibers:
      - **Afferent nerve fibers** - axons that carry info inward to the CNS from the periphery of the body
      - **Efferent nerve fibers** - axons that carry info outward from the CNS to the periphery of the body
      - somatic nerves are 2-way streets with incoming (afferent) and outgoing (efferent) lanes
  - **Autonomic Nervous System -** made up of nerds that connect to the heart, blood vessels, smooth muscles, and glands
    - controls automatic, involuntary, visceral functions such as heart rate, digestion, and perspiration
    - divided into two branches:
      - **Sympathetic division** - branch of the autonomic nervous system that mobilizes the body's resources for emergencies. creates the fight-or-flight response. slows digestive processes and diverts blood to lessen bleeding during an emergency. releases hormones to ready body for exertion
      - **Parasympathetic division -** branch of autonomic nervous system that generally conserves bodily resources, allows us to save and store energy (slows heart rate, reduce blood pressure)
  - **Central Nervous System** - consists of the brain and the spinal cord. protected by enclosing sheaths called the **meninges**
    - **Cerebrospinal fluid** - nourishes the brain and provides a protective cushion. hollow cavities in brain filled with fluid known as **ventricles**

        - spinal cord connects brain to rest of body through the PNS, which is an extension of the brain
    - Looking inside the Brain
        - **Electroencephalograph (EEG) -** device that monitors the electrical activity of the brain over time by means of the recording electrodes attached to surface of scalp. often used in diagnosis of brain damage and neurological disorders. translates electrical activity into brain wave, contributed to understanding of brain-behavior relationship
        - **Leisoning** - involves destroying a piece of the brain using a high-frequency electric current in order to study relationship b/w brain and behavior
        - **Electrical Stimulation of the Brain (ESB)** - involves sending a weak electric current into a brain structure to stimulate/activate it, has been used to determine functions of parts of the brain
        - **Transcranial Magnetic Stimulation (TMS)** - new technique that permits scientists to temporarily enhance or depress activity in a specific area of the brain. basically creates "temporary virtual lesions" helps determine functions of parts of brain. **cannot** be used to study areas deep within the brain
        - **Computerized Tomography (CT scan) -** computer-enhanced x-ray of brain structure, creates a vivid image of a horizontal slice of the brain
        - **Positron Emission Tomography (PET scan)** - CT scans can only portray brain structure, while PET scans can examine brain *function*, mapping brain activity over time. radioactively tagged chemicals are introduced and serve as markers of blood flow or metabolic activity
        - **MRI** - uses magnetic fields, radio waves, and computerized enhancement to map out brain structure. provide better images of brain structure than CT scans, created HQ 3D images of brain
            - **fMRI (functional MRI)** - variation on MRI that monitors blood flow and oxygen consumption to identify areas of high activity, can map actual activity in the brain over time (like PET scans). used to study locked-in patients brains
- Brain and Behavior - separated into: hindbrain, midbrain & forebrain
    - **Hindbrain** - includes cerebellum and two structures found in lower part of brainstem: medulla & the pons
        - **Medulla** - attaches to spinal cord, in charge of unconscious but vital functions (circulating blood, breathing, sneezing, coughing, salivating) **Pons** - includes bridge of fibers that connects brainstem w/ cerebellum. has cell bodies involved w/ sleep & arousal
        - **Cerebellum (little brain)** - large folded structure adjacent to back surface of brainstem. critical to coordination and balance. one of first structures alcohol affects
    - **Midbrain** - segment of brainstem that lies b/w the hindbrain and forebrain
        - contains area concerned with integrating sensory processes (vision + hearing) important system of dopamine-releasing neurons that projects into various higher brain centers originates in midbrain. this dopamine system involved in voluntary movements, degeneration of this structure causes Parkinson's
        - **Reticular formation** - runs through both hindbrain and midbrain. lies at central core of brainstem, contributes to modulation of muscle reflexes, breathing, and pain perception, as well as regulation of sleep & arousal
    - **Forebrain** - largest and most complex region of the brain, includes variety of structures including: thalamus, hypothal., limbic system & cerebrum
        - **Thalamus** - all sensory info must pass through (except smell) to get to cerebral cortex.made of clusters of cell bodies (somas) each soma is concerned with relaying sensory info to a particular part of the cortex
        - **Hypothalamus** - structure found near base of forebrain involved in regulation of basic biological needs (hypo = under, under thalamus)
            - vital link b/w endocrine system and brain
            - plays major role in regulation of basic biological drives (when hypothal. is leisured, all hunger is lost) (regulates fighting, fleeing, feeding, and mating)
            - controls the autonomic nervous system
        - **Limbic system** - (seat of emotion) - loosely connected network of structures located

roughly along border b/w cerebral cortex and deeper subcortical areas
    - not well defined with clear boundaries, involved in regulation of emotion, memory, and motivation
    - contains **hippocampus** (formulation of long-term memories) and **amygdala** (central role in learning of fear and other basic emotional responses
    - limbic system seems to be filled with "pleasure centers" rats pressing lever thousands of times an hour to send electric signal to limbic system
  - **Cerebrum** - seat of complex thought, largest & most complex part of brain. includes areas responsible for most complex mental activities (learning, remembering, thinking, consciousness itself)
  - **Cerebral Cortex** - convoluted outer layer of the cerebrum. cerebrum divided into 2 halves called cerebral hemispheres. separated by **longitudinal fissure**. **Corpus callosum** - structure that connects two cerebral hemispheres
- Each Hemisphere divided into 4 lobes:
  - **Occipital** - back of head, includes part where most visual signals are sent, visual processing is begun (primary visual cortex)
  - **Parietal** - forward of occipital lobe, includes area that registers touch (**primary somatosensory cortex**) when ESBs are sent to parietal lobe, people feel like someone is touching them somewhere
  - **Temporal** - lies below parietal, contains area devoted to audio processing near top called **primary auditory cortex**. damage can impair understanding of speech and language
  - **Frontal lobe** - largest lobe, controls areas that control muscle movement (**primary motor cortex**)
    - portion of frontal lobe to front of the motor cortex is called the **prefrontal cortex** - somewhat of a mystery, thought to monitor, organize, integrate and direct though processes
- Plasticity of the Brain
  - **Brain plasticity** - brain's ability to change structure and function. experience is an important stimulant of brain plasticity
    - ex* in blind people, areas in occipital lobe dedicated to visual processing are "recruited" to help with verbal processing
    - **Neurogenesis** - formation of new neurons. originally thought this didn't occur in adults, but research shows it does
  - Right/Left Brain - Cerebral Laterality -
    - **Left Brain** - processes language, thought of as "dominant" hemisphere. also thought to handle reasoning, remembering, planning, and problem solving ("higher" mental processes)
    - **Split-brain surgery** - corpus callosum is cut to reduce severity of seizures. each hemisphere's primary connections are to the opposite side of body. visual and auditory signals are sent to both sides of brain, but more closely connected to opposite hemispheres
    - **Right Brain** - found to be superior to left hemisphere in visual-spatial tasks (discriminating colors, arranging blocks, recognizing faces)
  - **Perceptual asymmetries** - left-right imbalances b/w the cerebral hemispheres in the speed of visual or auditory processing
    - left hemisphere - better involving verbal processing (language, speech, reading, writing)
    - right hemisphere - better involving non-verbal processing (spatial, musical, visual recognition, tasks involving perception of other's emotions)
  - **Endocrine system: another way to communicate** - consists of glands that release hormones into the bloodstream; hormones help to control bodily functions
    - hormones diffuse through bloodstream and bind to special receptors on target cells. travel slower than neurotransmitters and effect on many target cells throughout the body (less specific)
    - **Pituitary gland** - releases variety of hormones that fan out around body, stimulating actions in the other endocrine glands (master gland). also, adrenal

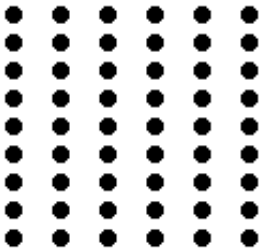
gland releases "stress hormones" preparing body to cope with emergency
    - **Oxytocin** - hormone released by pituitary gland, regulates reproductive behaviors - triggers birth contractions, also makes people more trusting when ingesting oxytocin spray
- **Heredity and Behavior: is it all in the genes?**
    - **behavioral genetics** - interdisciplinary field that studies the influence of genetic factors on behavioral traits
    - **chromosomes** - strands of DNA molecules that carry genetic info (besides sex cells, every body cell contains 46 chromosomes operating in 23 pairs, with one chromosome of each pair being contributed by each parent)
    - **genes** - DNA segments that serve as the key functional units in hereditary transmission
    - **homozygous condition** - two genes in a specific pair are the same
    - **heterozygous condition** - two genes in a specific pair are different
        - when parents contribute genes for different types of traits (ex* earlobes) one gene in the pair (dominant gene) will override the recessive gene
    - **genotype** - person's genetic makeup, **phenotype** - refers to the ways in which a person's genotype is manifested in observable characteristics and can change over time unlike genotypes. **Polygenic traits** - characteristics that are influenced by more than one pair of genes
- **Family studies** - researchers assess hereditary influence by examining blood relatives to see how much they resemble one another on a specific trait
    - **twin studies** - researches assess hereditary influence by comparing the resemblance of identical twins and fraternal twins with respect to a trait
    - **identical (mono-zygotic twins)** - emerge from one zygote that splits for unknown reasons - genetic relatedness is 100 %
    - **fraternal (dizygotic)** - result when two eggs are fertilized simultaneously by different sperm cells forming two separate zygotes - genetic relatedness 50%
- **Genetic Mapping** - process of determining location and chemical sequence of specific genes on specific chromosomes
    - **epigenetics** - study of heritable changes in gene expression that do not involve modification to the DNA sequence
- **Darwin's Insights:**
    - **fitness** - reproductive success of an individual organism relative to the average reproductive success in the population
    - **genetic drift** - random fluctuation in gene frequencies over generations as a result of chance alone
    - **mutation** - spontaneous, heritable change in a piece of DNA that occurs in an individual organism
    - **Gene flow** - occurs when gene frequencies in a population shift b/c some individuals leave the population or join it
    - **inclusive fitness** - sum of an individuals own reproductive success plus the effects the organism has on the reproductive success of related others

Chapter 4 - Sensation and Perception

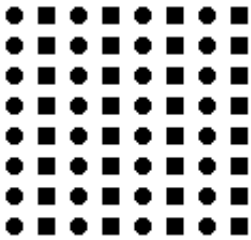
- **sensation** - stimulation of sense organs (absorption of energy such as light or sounds waves by the sensory organs, **perception** - selection, organization, and interpretation of sensory input (translating sensory input into something meaningful, such as your best friend's face)
    - **Psychophysics -** study of how physical stimuli are translated into psychological experience
    - **Threshold** - dividing point b/w energy levels that do and do not have a detectable effect
    - **Absolute threshold -** minimum amount of stimulation that an organism can detect (50% of the time)
    - **Just noticeable difference (JND)** - smallest difference in the amount of stimulation that a sense can detect (can notice difference b/w 300 lb. weight and 310 lb. weight but not a 309 lb. weight)
    - easier to detect difference in length of a 1 inch line vs difference in length of a 40 inch line
    - **Weber's Law** - size of a JND is a constant proportion of the size of the initial stimulus

(describes what type of increase is needed for someone to notice a difference in a parameter) (You see two stars in the sky. Which one is brighter? How much brightness does one star have to be compared to the other so that you will notice a difference in brightness?)
    - **Fechner's Law -** magnitude of a sensory experience is proportional to the number of JNDs that the stimulus causing the experience is above the absolute threshold (3 bulbs in a dark room, turn one on and there is a big difference, turn the second on, there is 2x as much light but the perceived difference is not as large) equal increases in stimulus intensity (amount of light) produce progressively smaller differences in the magnitude of sensation (perceived brightness)
    - **Signal detection theory -** performance of noticing a stimulus depends on amount of background noise, can also be affected by how hard you are trying to notice them, other factors can affect performance as well (fatigue, etc.)
    - **Sensory adaption** - gradual decline in sensitivity due to prolonged stimulation (stop smelling something in room after being there for a while)
- **Sight**
    - **cornea -** transparent window at front of eye
    - **lens -** directly **behind** cornea, focuses light rays falling onto the retina
        - **accommodation** - when your eye adjusts for seeing things near and far away
    - **pupil** - opening in center of the iris (colored part of eye) that helps regulate the amount of light passing into the rear chamber of the eye
    - **saccades -** quick eye movements, we do not keep our eyes fixed when we look at things
    - **retina** - neural tissue lining back surface of eye, absorbs light, processes images, and sends visual images to brain
        - axons that run from the retina to the brain converge at the **optic disk** (hole in retina where the **optic nerve** fibers exit the eye
    - only ~10% of light arriving at cornea reaches the receptor cells in the retina (rods and cones)
        - 100-125 million rods vs. 5-6.4 million cones
        - **cones** - specialized visual receptors that play a key role in daylight vision and color vision. play major role in perception of color. concentrated most heavily towards center of the retina and quickly fall off in density towards the periphery
        - **fovea** - tiny spot in center of the retina that contains only cones; visual acuity is greatest at this spot
        - **rods -** specialized visual receptors play a key role in night vision and peripheral vision, more sensitive to dim light than cones
            - greatly outnumber cones in the periphery. to see a faintly illuminated object in the dark, it's best to look slightly above or below. moves image to rod-dominated area just outside the fovea
        - **dark adaption** - eye becomes more sensitive to light in the dark (phone light in movie theater)
        - **light adaption** - eye becomes less sensitive to light in high illumination (phone light on sunny day)
    - **receptive field of a visual cell** - retinal area that, when stimulated, affects the firing of that cell
        - **lateral antagonism** - occurs when neural activity in a cell opposes activity in surrounding cells. makes viewing something bright in a dark room a more clear image
    - **Vision and the brain**
        - **optic chasm** - point at which the optic nerves from the inside half of each eye cross over and then project to the opposite half of the brain
        - **parallel processing** - involves simultaneously extracting different kinds of info from the same input (parts of the brain handles perception of color, while another part handles brightness, both from the same image)
        - **feature detectors:**
            - **visual agnosia** - inability to recognize objects
            - **prosopagnosia** - inability to recognize faces
            - **McCollough effect** - black and white gratings have a colorful after-image effect depending on the orientation of the gratings
- **Color**

- **additive color fixing -** putting more light in the mixture than exists in any one light by itself - starts black and turns to white (**computer designers**)
- **subtractive color mixing** - works by removing some wavelengths of light, leaving less light than was originally there - starts w/ white and turns to black the more color added (**paint mixing**)
    - mixing light is additive, while mixing paints or pigments is subtractive
- **trichromatic theory of color vision** - holds that the human eye has 3 types of receptors with differing sensitivities to different light wavelengths (red, green, and blue)
- **complementary (opposite) colors** - pairs of colors that produce grey tones when mixed
    - color of an afterimage will be the complement of the color you originally stared at
- **opponent process theory** - holds that color perception depends on receptors that make antagonistic responses to 3 pairs of colors
- **reversible figure** - drawing that is compatible with 2 interpretations that can shift back and forth
    - **perceptual set** - readiness to perceive a stimulus in a particular way
- **feature analysis** - process of detecting specific elements in visual input and assembling them into a more complex form
    - **bottom-up processing** - progression from individual elements to a whole
    - **top-down processing** - progression from the whole to the elements
    - **subjective contours** - perception of contours where none actually exist
    - **phi phenomenon** - illusion of movement created by presenting visual stimuli in rapid succession
- **Gestalt principles**
    - **proximity** - things close to one another seem to belong together **-** seen as columns instead of rows because of their proximity to each other



- **closure** - may "complete" figures that actually have gaps in them
- **similarity -** viewed as alternating columns b/c of similarity, not proximity. tend to group similar stimuli



- **simplicity** - shape is complex when looked at as a whole, so we most likely see it as made up of 3 simple shapes

- **continuity** - people tend to connect points that result in straight or gently curved lines that create "smooth" paths

  - **distal stimuli** - actual objects that exist
  - **proximal stimuli** - the way that we perceive the actual object (looks different from different angles) subject, NOT objective
    - **perceptual hypothesis** - we make educated guesses about what form could be responsible for a pattern of sensory stimulation. square sitting on a table might look trapezoidal from our angle but we guess correctly that it's a square anyways
  - **binocular depth cues** - clues about distance based on the differing views of the two eyes
    - principal binocular depth cue is **retinal disparity** - objects project images to slightly different locations on the right and left retinas, so the right and left eyes see slightly different view of an object (retinal disparity increases as objects get closer)
    - **convergence** - sensing the eyes converging towards each other as they focus on closer objects
  - **monocular depth cues** - clues on distances based on the image in either eye alone
    - **motion parallax** - nearby objects pass through field of vision more quickly when driving past than more distant objects, allowing us to determine distance by speed
    - **pictorial depth cues** - clues about distance that can be given in a flat picture
      - linear perspective - lines converge in the distance
      - texture gradients - can provide info about depth
      - interposition - if an object come b/w you and another object, it must be closer
    - **perceptual constancy** - tendency to experience a stable perception in the face of continually changing sensory input (person walking towards you does not look like they are actually growing, you understand they are the same size)

- **Sound**
  - wavelengths of sound measured in frequency **-** measured in cycles/second (hertz (Hz)
  - **external ear** (depends on vibration of air molecules), **middle ear** (depends on vibration of movable bones), **inner ear** (depends on waves in a fluid)
  - **Pinna** - sound collecting cone in the external ear
  - **Ossicles** - three smallest bones in body (anvil, stirrup, hammer) form a 3 stage level system that converts large movements w/ little force into small movements with greater force
  - **Cochlea** - makes up most of inner ear, fluid-filled, coiled tunnel that contains the receptors for hearing
    - **basilar membrane** - runs the length of the spiraled cochlea, holds the auditory receptors (aka hair cells, convert physical stimulation into neural impulses)
  - **Place theory** - holds that perception of pitch corresponds to the vibration of different portions, or places, along the basilar membrane (assumes that hair cells at various locations respond independently and that different hair cells are vibrated by different sound frequencies)
  - **Frequency theory** - holds that perception of pitch corresponds to the rate, or frequency, at which the basilar membrane vibrates

        - both theories are correct, and work together
    - **auditory localization** - locating source of a sound in space
- **Gustatory system** - sensory system for **taste**
    - sweet, sour, bitter, salty, umami
- **Olfactory system** - smell
    - only sensory system in which incoming info is **not** routed through the thalamus before it projects to the cortex
- **Sense of touch**
    - **gate-control theory** - explains about a pain-modulating system in which a neural gate present in the spinal cord can open and close thereby modulating the perception of pain. suggested that psychological factors play a role in the perception of pain
    - **kinesthetic system** - awareness of the position and movement of the parts of the body by means of sensory organs in the muscles and joints
    - **vestibular system** - responds to gravity and keeps your informed of your body's location in space, deals with balance (vestibule - deals with inner ear, involved in balance)

Chapter 5: Variations in Consciousness

- **ascending reticular activating system -** consists of the afferent fibers running through the reticular formation that influence physiological arousal
    - if reticular formation is activated, somebody will wake up. but if it is damaged or turned off people will continually sleep or be in a coma
- **REM sleep behavior disorder (RBD)** - potentially troublesome dream enactments during REM period
- 3 Theories of Dreaming:
    - **Freud** - dreams as wish fulfillment
    - **Cartwright** - problem-solving view
    - **Hobson & McCarley** - activation-synthesis model - story is created in mind to make sense of internal signals firing

Chapter 6: Learning

- **Classical conditioning** - learning process that occurs when two stimuli are repeatedly paired; a response that is at first elicited by the second stimulus is eventually elicited by the first stimulus alone
    - **Unconditioned stimulus (UCS)** - stimulus that evokes an unconditioned response without previous conditioning (meat(UCS) automatically makes a dog salivate even without previous conditioning
    - **Unconditioned response (UCR)** - an unlearned reaction to a UCS that occurs without previous conditioning - salivating
        - **Conditioned stimulus (CS)** - previously neutral stimulus that has, through conditioning, acquired the capacity to evoke a conditioned response. (audible tone that now causes salivation)
        - **Conditioned Response (CR) -** learned reaction to a conditioned stimulus that occurs b/c of previous conditioning - salivation from the tone
- **Evaluative conditioning** - refers to changes in the liking of a stimulus that result from pairing that stimulus with other positive or negative stimuli
- **Extinction** - gradual weakening and disappearance of a conditioned response tendency
    - **spontaneous recovery** - reappearance of an extinguished response after a period of non-exposure to conditioned stimulus
    - **renewal effect** - if a response is extinguished in a different environment than it was acquired, the extinguished response will reappear if the animal is returned to the original environment where acquisition took place. Extinction doesn't lead to unlearning, just suppression of a conditioned response
- **Stimulus generalization** - occurs when an organism that has learned a response to a specific stimulus responds in the same way to new stimuli that are similar to the original stimulus
- **stimulus discrimination** - occurs when an organism that has learned a response to a specific stimulus does not respond in the same way to new stimuli that are similar to the original stimulus
- **Higher-order conditioning -** situation in which a stimulus that was previously neutral (e.g., a light) is paired with a conditioned stimulus (e.g., a tone that has been conditioning with food to produce

salivating) to produce the same conditioned response as the conditioned stimulus… (person might be shown a blue flash of light that is immediately followed by a puff of air shot into his eyes. The conditioned response is blinking your eyes. Eventually, you will learn to blink your eyes when you see the blue flash, which is the "unconditioned stimulus" that is connected to the air puff, or "conditioned stimulus.")

- **Operant conditioning** - form of learning in which responses come to be controlled by their consequences
    - **instrumental learning** - another name for operant conditioning
    - **Law of Effect** - if a response in the presence of a stimulus leads to satisfying effects, the association between the stimulus and the response is strengthened (time for cats to escape puzzle and get to food waiting for them decreases each time as they reach their desired reward (food))
- **Reinforcement** - occurs when an event following a response increases an organism's tendency to make a response
- **Operant chamber (aka Skinner Box)** - small enclosure in which an animal can make a specific response that is recorded while the consequences of the response are systematically controlled
    - **reinforcement contingencies -** consequences that increases, maintains, or reduces the probability that the behavior will be repeated (positive & negative reinforcement, punishment, etc.)
    - **cumulative recorder** - creates a graphic record of responding and reinforcement in a Skinner box as a function of time (animal's rate of level pressing or disk pecking in the Skinner box is continuously monitored by a cumulative recorder
- **Basic processes in operant conditioning**
    - **shaping** - consists of the reinforcement of closer and closer approximations of a desired response
    - **extinction** - gradual weakening and disappearance of a response tendency b/c the response is no longer followed by a reinforcer
        - **resistance to extinction** - when an organism continues to make a response after delivery of the reinforce has been terminated
    - **discriminative stimuli** - cues that influence operant behavior by indicating the probably consequences (reinforcement or non-reinforcement) of a response
        - ex* birds learn that hunting for worms is likely to be reinforced after rain. After receiving signals that suggest reinforcement is likely (smiles, eye contact, etc), people will be more likely to ask someone on a date
- **Schedules of reinforcement**
    - **Schedule of reinforcement** - determines which occurrences of a specific response result in the presentation of a reinforcer
        - **continuous reinforcement** - occurs when every instance of a designated response is reinforced (experimenters often use this type to shape and establish a new response before moving on to more realistic schedules)
        - **intermittent, or partial reinforcement -** occurs when a designated response is reinforced only some of the time (this type makes a response MORE RESISTANT to extinction than continuous reinforcement)
    - **Ratio schedules** - require the organism to make the designated response a certain number of times to gain each reinforcer
        - **Fixed-ratio schedule (FR)** - reinforcer is given after a fixed number of non-reinforced responses (ex* rat is reinforced for every 10th lever press)
        - **Variable-ratio schedule (VR)** - reinforcer is given after a variable number of non-reinforced responses (ex* rat is reinforced for every 10th level press *on average*)
    - **Interval schedules** - require a time period to pass b/w the presentation of reinforcers
        - **Fixed-interval schedule (FI)** - reinforce is given for the first response that occurs after a fixed time interval has elapsed (ex* rat is reinforced on first attempt after 2 minute interval)
        - **Variable-interval schedule (VI)** - reinforce is given for the first response after a variable time interval has elapsed – interval length varies around a predetermined average
    - **Negative reinforcement** - when a response is strengthened b/c it is followed by the removal

of an aversive (unpleasant) stimulus
    - **Escape learning** - organism acquires a response that decreases or ends some aversive stimulation (ex* leaving a party that you're getting made fun of at)
    - **Avoidance learning** - organism acquires a response that prevents some aversive stimulation from occurring (ex* stopping going to parties altogether to prevent getting made fun of)
- **Recognizing biological constraints on conditioning**:
    - **instinctive drift** - occurs when an animal's innate response tendencies interfere with conditioning processes
    - **preparedness** - involves a species-specific predisposition to be conditioned in certain ways and not others - evolutionary forces gradually programmed humans to be acquire conditioned fears of these objects easily and rapidly (snakes, spiders, heights, darkness)
    - **Latent learning and cognitive maps** - **latent learning =** learning that is not apparent from behavior when it first occurs (ex* group of rats that did not receive a food reward after a daily trial of going through a maze did not improve after first 10 days. on 11th day were given a food reinforcement and showed tremendous improvement the following days. rats had been learning about the maze all along, but had no motivation to demonstrate this learning until reward was introduced) **cognitive map** = mental representation of the spatial layout of maze
- **Mirror neurons** - neurons activated by performing an action or by seeing another monkey or person perform the same action