Notes from Chapter 3 of the 4th edition of Bruce Goldstein's Cognitive Psychology textbook
https://www.cengage.com/c/cognitive-psychology-connecting-mind-research-and-everyday-experience-4e-goldstein/9781285763880

Perception: experiences resulting from stimulation to the senses; the gateway to all other cognition we'll discuss

- Perceptions can change based on added information (e.g., rules based on past experiences – *when objects overlap, the one underneath usually continues behind the one on top*)
- Perception can involve a process: sometimes automatic, sometimes not
- Perception occurs in conjunction with action

- How do you know where shadows exist? That a face is a face? We know these things, but it is difficult to design a perceiving "machine" (i.e., training computers)
    - Inverse projection problem
        - Retinal image on the eye could have been created by a number of objects
        - The image on the retina is ambiguous
    - Objects could be hidden or blurred: people draw on their knowledge of the environment to infer what's happening
    - Objects are viewed from different angles; humans have the ability to recognize an object from different viewpoints: *viewpoint invariance*
- How do we obtain information from the environment?
    - Bottom-up processing: 'bottom' or beginning of the cognitive system, when environmental energy stimulates the visual receptors (i.e., usually bottom-up in relation to the initial processing of the stimuli)
    - Top-down processing: processing that originates in the brain, at the top of the perceptual system (typically viewed as other signals that modulate bottom-up)
        - Knowledge helps us characterize blurred 'blobs'
        - Hearing words in a sentence: where one word ends and the next one begins (speech segmentation); people familiar with different languages can hear different stimuli in such segments
        - Experiencing pain: can be influenced by what a person expects, how the person directs his or her attention, and the type of distracting stimuli that are present; decrease in pain from a substance that has no pharmacological effect is the placebo effect
            - Sometimes with children, they're crying when they have a booboo not because it hurt immediately, but when they realized it hurt (and/or in reaction to the rxn of their parents)
    - Questions to ask:
        - How does the perceptual system identify different types of information?
        - How do perceivers use this information?
- How do we perceive objects?
    - Helmholtz: image on retina is ambiguous; it solves this ambiguity with *the likelihood principle*, i.e., we perceive the object mostly likely to have caused the pattern of stimuli we have received

        - What most likely occurs: *unconscious inference* process, i.e., when our perceptions are the result of unconscious assumptions or inferences that we make about the environment (process seems "automatic" but is actually complicated)
    - Gestalt psychologists: perceptions can't be explained by adding up small sensations (of say, different features, to perceive an object)
        - E.g., Apparent movement: although movement perceived, nothing moved (one light flashes, dark screen, the second light flashes on the other side of the screen – you perceive that the light has moved)
            - So, this cannot be explained by 'add-up' sensations, because there is nothing in the dark space between the flashing lights
            - The whole is different than the sum of its parts – Gestalt principles of organization: how elements are grouped together
                - Good continuation: points that when connected result in straight or smoothly curving lines are seen as belonging together, following the smoothest path. Objects that are overlapped by others are perceived as continuing behind the overlapping object
                - Pragnanz (Good Figure or Simplicity): every stimulus pattern is seen in such a way that the resulting structure is as simple as possible
                - Similarity: similar things are grouped together
            - A person's experience can influence perception, but experience plays less a role than perceptual principles
- How do we account for regularities in the environment?
    - Physical regularities: regularly occurring physical properties of the environment
        - People can perceive horizontals and verticals more easily than other orientations ("the oblique effect")
        - Light-from-above assumption: usually assume light is coming from above, because the sun, most light, etc. do
    - Semantic regularities: characteristics associated with fxns carried out in different types of scenes
        - What a given scene usually contains: a scene schema (visualizations contain information based on our knowledge of different kinds of scenes)
    - Bayesian inference: probability of an outcome is determined by the 'prior probability' or prior, i.e., our initial belief about the probability and the extent to which evidence is consistent with the outcome (likelihood)
- Thus four approaches: Helmhotz's unconscious inference, Gestalt laws of organization, regularities in environment, and Bayesian inference
    - Only Gestalt differs from the others; the other 3 suggest we use data in the environment- which we develop ideas about based on past experience – to determine what's out there
- Neurons and the environment
    - More neurons respond best to horizontals and verticals than respond best to oblique orientations (explaining oblique effect)
    - Experience-dependent plasticity: structure of the brain is changed by experience

        - Gauthier: FFA responds to faces AND greebles when people are trained to recognize families of greebles, so sensory processing regions are changed with experience
- Interaction between perceiving & taking action
    - Movement helps us perceive objects in the environment more correctly by giving us additional information (e.g., knowing how much force is needed to pick up a cup of coffee)
    - Physiology:
        - Brain ablation: the study of the effect of removing parts of the brain in animals
            - Monkeys who had their temporal lobe removed had a harder time discriminating objects (identities), while monkeys who had their parietal lobe removed had a harder time determining where landmarks were located
            - Pathway from striate cortex to temporal lobe: *what* pathway
            - Pathway from striate cortex to parietal lobe: *where* pathway
        - Neuropsychology: the study of behavior of people with brain damage
            - D.F.: suffered damage to temporal lobe
            - She had difficulty rotating a card in her hand to match different orientations of a slot
                - Once she started moving the card toward the slot, she was able to rotate it to match the orientation of the slot
                - Did poorly in a static orientation matching task, but did well once action was involved
                - One mechanism for judging orientation, another for coordinating vision and action
            - Pathway from visual cortex to temporal lobe: *perception* pathway
            - Pathway from visual cortex to parietal lobe: *action* pathway