

## Ch. 4

- Two sides of the coin
- **Sensation is the detection of physical energy by our sense organs, which send that information to the brain**
  - The external stimulus is converted by a sense receptor (specialized cell) into neural activity via **transduction**—the process by which the nervous system converts an external stimulus, like light or sound, into electrical signals within neurons
  - Activation is highest when stimulus is first detected, then sensory adaptation occurs
- **Perception is the brain's interpretation of raw sensory data**
- When the way we perceive a stimulus does not match reality, that's an **illusion**
- **Psychophysics**—study of how we perceive sensory stimuli based on their physical characteristics
  - **Absolute threshold**—is the lowest level of a stimulus we can detect 50% of the time
    - A single candle 30 miles away
    - 50 odorant molecules
  - The **just noticeable difference** is the smallest amount of stimulus change we can detect
  - **Weber's law**—the stronger the stimulus, the greater change needed to detect
- **Signal detection theory**—theory regarding how stimuli are detected under different conditions
- When our senses cross
  - **Synesthesia**—a rare condition in which people experience cross-modal sensations, like hearing sounds when they see colors—sometimes called “colored hearing”—or even tasting colors
- When senses meet the brain
  - After being transduced, our brains then organize the sensory data into meaningful concepts
  - Our brains piece together:
    - What's in our sensory field
    - What was there a moment ago
    - What we remember from our past
  - The multitasking brain
    - We attend to multiple senses at once, called **parallel processing**
    - **Bottom-up** (take a stimulus' parts and try to construct the parts together) vs. **top-down processing** (guessing the stimulus from the parts)
- **Perceptual Hypotheses**
  - **Perpetual sets** occur when our expectations influence our perceptions
  - **Perceptual constancy** allows us to perceive stimuli consistency across conditions
    - We don't see the size, shape, or color of an object changing despite the objective fact that they do
    - Color perception in particular derives from context
- **The Role of Attention**
  - **Selective attention** allows us to choose which sensory inputs to focus on and which to ignore/minimize
    - The other “channels” are still being processed at some level, though
      - Cocktail party effect
  - We're poor at detecting stimuli in plain sight if our attention is focused elsewhere

- **Binding Problem**
  - One of the great mysteries of psychology is just *how* our brains combine all the various stimuli around us into a coherent whole
  - The look, feel, smell, and taste of an apple all rely on different areas of the brain to process, but, we just see an apple!
- **Subliminal information processing**
  - We process many sensory inputs unconsciously and many of our actions occurs with little to no forethought or deliberation
  - If we can detect stimuli without knowing it, does that change our behavior?
- **Subliminal perception**
  - The processing of sensory information that occurs below the level of conscious awareness
  - Can have a brief, short-term impact on behaviors and attitudes
  - Effect disappears when subjects are aware of or suspect subliminal influences
- **Subliminal Persuasion**
  - Fairly unlikely to produce large-scale or enduring attitudes or decisional changes
  - Subliminal self-help tapes have been shown to be ineffective
    - Illusory placebo effect
  - Reversed subliminal messages also ineffective
- **Extrasensory perception (ESP)**
  - The perception of events outside the known channels of sensation
  - According to *parapsychologists*, there are three major types
    - **Precognition**—predicting events before they occur
    - **Telepathy**—reading other people’s minds
    - **Clairvoyance**—detecting the presence of objects or people that are hidden from view
- **Evidence for ESP**
  - Early studies by JS Rhine using Zener cards reported positive results
  - But, methodological problems plagued the study and no one else could replicate his results
- **Why people believe**
  - Despite the lack of scientific evidence, over 40% of American adults believe in ESP
  - Illusory correlations and not understanding chance occurrences
- **The visual system**
  - The human visible spectrum is a narrow band of light that we respond to
  - Other animals may have a more restricted or greater spectrum
  - We perceive **brightness** (intensity) and **hue** (color)
  - **Mixing lights produces white (additive)**—green, blue, red
  - **Mixing pigments produces black (subtractive)**—yellow, cyan, magenta
- **Structure of the eye**
  - **Sclera**—white portion of the eye
  - **Iris**—colored portion and controls how much light enters the eye
  - **Pupil**—hole where light enters the eye
  - **Cornea**—transparent cells that focus light on the back of the eye
  - **Lens**—bends light by changing its curvature

- o Glasses change the way light enters the eye to help correct *myopia* or *hyperopia*
  - o Retina—thin membrane at the back of the eye
    - Fovea—center part of retina, responsible for acuity
  - o Light hits two types of sense receptors on the retina—rods (light) and cones (color)
    - Dark adaptation
  - o Optic nerve exits the back of the eye and is composed of the axons of the *ganglion cells*
    - Causes a blind spot
  - o Most of the axons go to the thalamus and then the visual cortex, but some go to midbrain
- Visual perception
  - o Different cortical cells respond maximally to different types of stimuli
  - o Feature detector cells allow us to detect lines and edges
- Gestalt principles (6)
  - o Rules that govern how we perceive objects as wholes within their overall context
  - o Proximity—objects physically close to each other tend to be perceived as unified wholes
  - o Similarity—all things being equal, we see similar objects as comprising a whole, much more so than dissimilar objects
  - o Continuity—we still perceive objects as wholes, even if other objects block part of them.
  - o Closure—when partial visual information is present, our brains fill in what's missing.
  - o Symmetry—we perceive objects that are symmetrically arranged as wholes more often than those that aren't
  - o Figure-ground—perceptually, we make an instantaneous decision to focus attention on what we believe to be the central figure, and largely ignore what we believe to be the background.
- Visual Perception
  - o To determine motion, the brain compares visual frames of what is to what was
    - Phi phenomenon
- Color perception
  - o Different theories of color perception explain different aspects of our ability to detect color
  - o Trichromatic theory says color vision is based on our sensitivity to three primary colors
    - Consistent with three types of cones in eyes
    - Explains color blindness
  - o Opponent process theory
    - Color vision as a function of complementary, opposing colors
      - Red and green
      - Blue and yellow
      - Black and white
- Depth perception
  - o Monocular depth cues rely on one eye
    - Apparent size/Object size—a nearby object produces a larger image than a distant one
    - Linear perspective—as parallel lines get further away, they appear to get closer together