**SENSATION (**Immediate response in the brain caused by the excitation of a sensory organ.
**PERCEPTION** (your interpretation of stimuli, processing it)

**Psychophysics** - The study and measuring of the function of the senses.

**Detection** - the active, usually conscious, sensing of a stimulus.
**Absolute Threshold Theory** - Minimum detectable amount of physical energy for you to notice it (50% of the time)
**Absolute Sense Thresholds**

| | |
|---|---|
| Vision | Candle, 30 miles, clear dark night |
| Hearing | Tick of a watch, 20 feet , quiet conditions |
| Taste | 1 teaspoon of sugar, 2 gallons of water |
| Smell | 1 drop of perfume, diffused to air volume of 6 rooms |
| Touch | Wing of a bee, falling to your cheek, from 1 cm. |

**Signal-Detection Theory**: some factors will distort your detection (decision not just detection)
**Hit, Miss, False Alarm, and Correct Rejection**

**Discrimination -** Ability to discern the difference between stimuli.
**Just Noticeable Difference**: the minimum amount that needs to change for you to notice that there was a change. Weber's Fraction

**Sensory Organs -** have receptor cells that receive the sensory information.
**Receptor cells** - responsible for **transduction**: converting that physical energy into an electrochemical impulse that can be processed in the brain.

**Human Eye**
**Cornea** - transparent, dome-shaped window covering the front of the eye. **Gross Refraction** - the bending of light waves into the eye.
**Aqueous Humor** - thin, watery fluid that fills the space between the cornea and the iris. Nourishes the cornea and the lens.
**Pupil** - round opening in the center of the iris
**Iris** - colored part, embedded with tiny muscles that dilate (widen) and constrict (narrow) the pupil size.
**Lens** - located just behind the iris, focuses light onto the retina, responsible for **Accommodation** - the eye's way of changing its focusing distance, by changing the shape of the lens.
**Vitreous** - thick, transparent substance that fills the center of the eye, giving it form and shape.
**Retina** - multi-layered sensory tissue that lines the back of the eye. There are three layers to the retina. The **Ganglion** Cells. The **Interneuron** Layer (made up of Amacrine, Bipolar, and Horizontal cell), and the **Photoreceptors**.
**Fovea** - the very center portion of the retina, densely packed with cones
**Photoreceptors** - capture light rays and transduce. Rods, Cones

**From Eye to the Brain**
1. Axons of ganglions cells
2. Form optic nerve
3. Optic chaisma (base of brain)
4. Thalamus
5. Visual cortex of occipital lobe

**Hyperopia**: difficulty focusing on close objects (farsightedness)
**Myopia**: difficulty focusing on distant objects (nearsightedness)
**Astigmatism**: defects in cornea or lens that causes more than one focal points, causing blurriness
**Presbyopia**: farsightedness due to old age
**Brightness** - the amplitude of the wave
**Hue** - the color you see
**Saturation** - how vibrant the color is.

**Trichromatic Theory:** there are 3 types of cones that specialize in red, green, or blue.
**Opponent-Process Theory**: an "either-or" system. Opposing colors: Red/green, Yellow/blue, Black/white
**Color Weakness:** partial blindness (ie red-green color weakness - 8% of all men, 1% of women)
**Dark adaptation**: dramatic increase in retinal sensitivity to light that occurs after you enter the dark. (30-35 minutes for maximum adaptation.)
**Feature Detectors** Hubel and Wiesel, specialized cells in visual cortex for lines and edges, temporal lobe for faces

**Sound waves**
**Anatomy of the Ear**
**Pinna**: The external ear. Amplifies sound. Funnels energy to the middle ear.
**Auditory Canal:** carries the sound wave from the outside to the middle ear.
**Tympanic Membrane (eardrum):** Moves in response to sound waves. Converts sound energy to mechanical energy.
**Ossicles**: The hammer (malleus), anvil (incus), & stirrup (stapes). Tiny little bones that transmit & amplify motion of eardrum.
**Oval Window:** membrane that vibrates from the stapes to the cochlea.
**Cochlea**: A fluid-filled chamber. Hair cells are attached to the basilar membrane. Tranduces mechanical energy to neural impulses.
**Stereocilia**: bristles atop hair cells.
**Bone Conduction**: Sound is also transmitted to the cochlea through contact with skull bones. This is why your voice sounds odd in recordings.

**Ear to Brain**
- Auditory receptors on the basilar membrane
- Join to form the auditory nerve
- Medulla oblongata
- Thalamus
- Auditory cortex of the temporal lobe

**Place Theory (Helmholtz)**
Different frequencies resonate on different locations of the basilar membrane.
Different sounds are created by where on the basilar membranes the hair cells are activated.
**Frequency Theory**
Firing rates of hair cells create pitch sensation, 1 action potential is equal to 1 Hz
Explains frequencies below 4000 Hz, but not above (refractory period) – volley principle

**Duplicity Theory** = synthesis of the place and frequency
**Auditory Localization**

**Taste** (Sweet, sour, salty, bitter, and umami)
Buds: clusters of receptor cells located between papillae
- Tongue to Medulla
- Pons
- Thalamus
- Somatosensory Cortex, temporal lobe, and limbic system

**Olfaction** (fruit, flower, spicy, etc…)
- Consists of over 5 million rods embedded in the olfactory epithelium
- Nasal cavity to the Olfactory epithelium. Contains Receptor cells
- Penetrate skull and form olfactory nerves. Terminate at olfactory bulbs
- Bypass thalamus
- Goes to olfactory cortex in temporal lobe and limbic system

**Somesthetic Sense** (Sensations produced by the skin, muscles, joints, viscera, and organs of balance.)
**Skin Sense -** Light touch**,** Pressure, Pain, Cold, Warmth. Each has a specialized receptor mechanism.
**Pain** - Important for survival, Gate Theory:

**Kinesthetic Sense** - Knowledge of the position and motion of body parts. Receptors in muscles, joints,…
V**estibular Sense** - Semicircular canals & the vestibular sacs. Senses acceleration, not uniform motion

**PERCEPTUAL CONSTANCIES**

**Size constancy:** perceived size of the object remains the same even though its size changes in your retina. Mostly empirical – Turnball's pygmies and the "Buffalo" insects
**Shape Constancy:** shape remains the same as retinal image changes
**Brightness Constancy:** apparent brightness/color remains the same as retinal image changes.
**Proximal Image:** as registered by the retina (aka retinal image)
**Distal Image:** as the object exists in the real world

**GESTALT PRINCIPLES**

**Figure Ground:** grouping of sensations as an object that stands out against a background.
**Nearness:** grouping objects that are close together (aka proximity)
**Similarity:** group objects that are similar to one another.
**Continuation/Continuity:** prefer simple and continuous patterns
**Closure:** tendency to complete (close) objects
**Contiguity:** linking of things that occur close in time/space

**DEPTH PERCEPTION** (The ability to see 3-D space and accurately judge differences.)
**Depth Cues** – binocular (2 eyes) or monocular (1 eye)
**Muscular Cues** – accommodation (lens) and convergence (position of the eyes to keep an object in their center.)
**Retinal Disparity** – the discrepancy b/w each eye's view. When the two images are fused into one-overall image, stereoscopic vision (3-D) occurs.

**PICTORAL CUES**

**Linear Perspective:** parallel lines appear to converge as they get further away and near to the horizon.
**Relative Size:** objects that are smaller appear further away.
**Location in Picture Plane:** objects that are closer to the horizon line appear to be more distant.
**Light and Shadow:** lights and shadows can give a 2-D picture, 3-D characteristics.
**Aerial Perspective:** smog, fog, dust, and haze add to the apparent distance of an object.
**Relative Motion / Motion Parallax:** objects that are closer appear to rush by and objects that are further away mover slower.

**Moon Illusion:** the moon appears larger when it is lower in the sky, closer to the horizon.
**Ponzo Illusion:** converging lines illusion
**Muller-Lyer:** arrowhead illusion
**Perceptual Learning:** changes in perception due to experience
**Perceptual Habits:** well-established patterns of perception
**Ames Room:** illusion room
**Context matters:** info surrounding the stimulus
**Adaptation level:** mental average used to judge amounts
**Inattentional Blindness:** failure to perceive something in plain view
**Habituation:** decrease in perceptual response of repeated stimulus…you get used to it
**Orientation Response:** body change readying you to perceive
**Perceptual Set/Expectancy:** readiness to perceive in a particular manner
**Top-down vs. bottom-up perception: with** your brain's interpretation; vs. just using your perception
**Perceptual reconstruction:** mental model as it occurred
**Eyewitness Testimony:** faulty due to perceptual construction

**Attention:** tracking or focusing on a message
**Selective Attention:** ability to track one message and ignore others
**Cocktail Party Phenomena:** using selective attention in group setting