Chapter 5

Sensation

I. Sensing the World – Basic Principles

- Sensation – The process by which you detect physical energy from your environment and encode it as a neural signal.
- Thresholds
  - Psychophysics – Study the relationship between physical energy and psychological experiences.
  - Absolute thresholds – Weakest level of a stimulus that can be detected half of the time.

I. Sensing the World – Basic Principles

- Thresholds
  - Difference Thresholds – Minimum difference between any two stimuli that can be detected half of the time.
    - Just Noticeable Difference
    - Weber's Law – The stronger the stimulus, the more change necessary to notice a difference.
  - Signal Detection Theory – Assumes no actual threshold but that threshold changes with a variety of factors (ex: fatigue, attention, expectations, motivation and emotional stress)

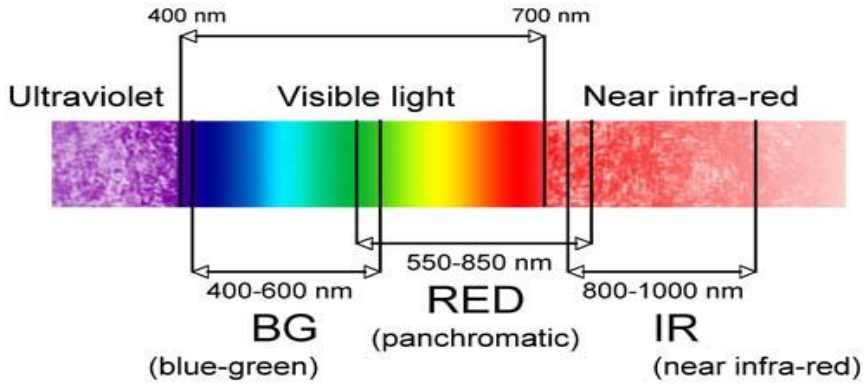
I. Sensing the World – Basic Principles

- Thresholds
  - Subliminal stimulation – Receipt of messages that are below ones absolute threshold for conscious awareness.
    - We can process information without being aware of it.
    - Subliminal sensation is not the same as subliminal persuasion.
- Sensory adaptation – When stimulation is unchanging, you become less sensitive to it. (Can you think of an example of this?)

"So, it's a little fuzzy and you're seeing spots?"

II. Vision

- Stimulus input: Light Energy
  - Wavelength – Distance from the peak of one light or sound wave to the peak of the next.
  - Hue – Dimension of color determined by wavelength.
  - Intensity – Our perception of brightness or loudness, determined by a wave's altitude (height)



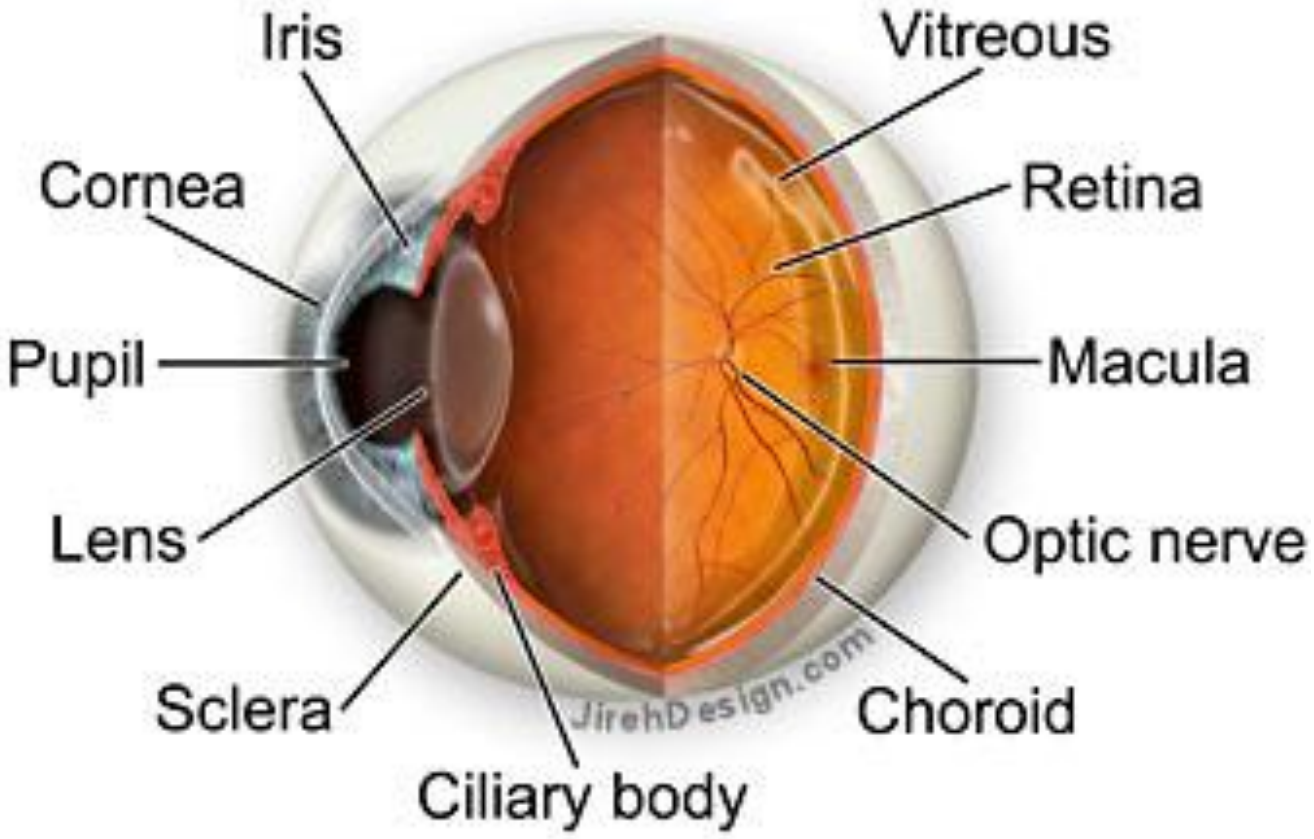
II. Vision

- The eye
  - Pupil – Where light enters the eye.
  - Iris – Ring of muscle that controls the size of the pupil opening.
  - Lens – Structure behind the pupil that changes shape to focus images on the retina.
  - Retina – Light sensitive surface in the back of the eye containing rods and cones that transduces light energy.
    - Rods – Detect black, white, gray and movement; Necessary for peripheral and twilight vision.
    - Cones – Detect color and fine detail in daylight or bright light conditions.

II. Vision

- The eye
  - Optic nerve – Carries neural impulses from the eye to the thalamus of the brain.
  - Fovea – Central focal point in the retina around which the eye's cones cluster.
  - Blind spot – Region of the retina where the optic nerve leaves the eye.
  - Acuity – Ability to detect detail, sharpness of vision.
  - Nearsighted – Too much curvature of the cornea and/or lens focuses images in front of the retina so nearby objects are seen more clearly.
  - Farsighted – Too little curvature of the cornea and/or lens focuses images behind the retina so distant objects are seen more clearly.

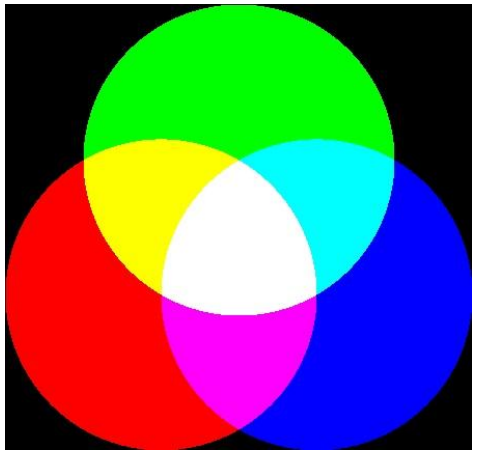
Normal Eye Anatomy



II. Vision

- Visual information processing
  - Feature detection – Nerve cells in the brain that respond to specific features of the stimulus such as shape, angle or movement.
  - Parallel processing – Simultaneously analyzing different elements of sensory information (ex: color, brightness, shape)

II. Vision



- Color vision
  - Color is our mental construction
  - Tri-chromatic theory – Theory that retina contains 3 different color receptors (red, green, blue) which, when stimulated in combination, produce the perception of color.
  - Opponent process theory – Theory that opposing retinal processes (red-green, blue-yellow, black, white) enable color vision. (What does that look like?)
  - Color constancy – Knowing the color of an object doesn't change even if it seems to.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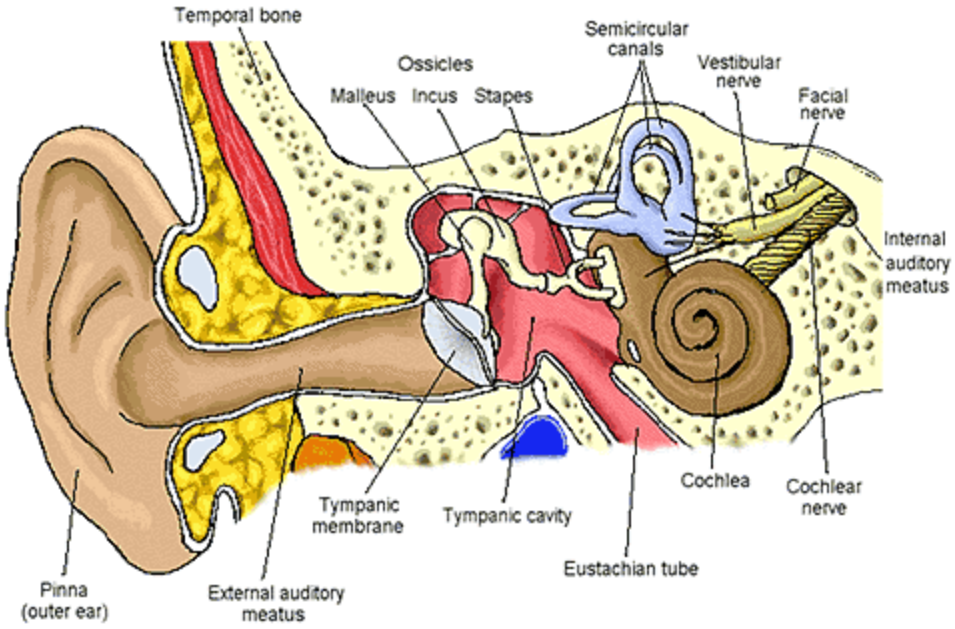
III. Hearing

- Audition – The sense of hearing.

- Stimulus Input: Sound Waves
  - Frequency – Number of complete wavelengths that pass a point in a given time.
  - Pitch – A tone's highness or lowness that depends on frequency.
  - What is the difference between noise and music?

III. Hearing

- The Ear
  - Sequence: Auditory canal, eardrum, middle ear, inner ear (cochlea), basilar membrane, nerve fibers, auditory nerve, temporal lobe's auditory cortex



III. Hearing

- The Ear
  - Cochlea – A snail shaped fluid filled tube in the inner ear, with hair cells on the basilar membrane that trigger nerve impulses.
  - Auditory nerve – Transmits sound messages to the temporal lobe.

III. Hearing

- The Ear
  - How do we perceive pitch?
    - Place Theory – The position on the basilar membrane at which waves reach their peak; accounts well for high pitched sounds.
    - Frequency Theory – The rate of the neural impulses traveling up the auditory nerve matches the frequency of the tone, enabling you to sense pitch; explains low pitch.
  - How do we locate sound?
    - Stereophonic hearing (3D)
    - Differences in intensity between left and right ear

III. Hearing

- Hearing Loss
  - Conduction deafness – Hearing loss caused by damage to the mechanical system that conducts sound waves to the cochlea. (A hearing aid may restore hearing.)
  - Nerve (sensorineural) deafness – Hearing loss caused by damage to the cochlea's receptor cells or to the auditory nerve. (Only way to restore hearing is a cochlear implant.)
    - How a cochlear implant works
    - Cochlear implant activation

IV. The Other Senses

- Touch – This is actually a mix of four distinct skin senses (Pressure, warmth, cold and pain)
  - Most sensitive to unexpected stimulation
  - Pain
    - Body's way of telling you something has gone wrong
    - What if you couldn't feel pain?
    - Gate-control theory – Idea that the spinal cord contains a neurological "gate" that blocks pain signals or allows them to pass to the brain.
    - Pain control therapies: Drugs, surgery, acupuncture, massage, exercise, hypnosis, relaxation training

IV. The Other Senses

- Taste – Involves four basic elements (sweet, sour, bitter and salty)
  - Chemical sense
  - Taste buds reproduce themselves every week or two and decrease with age.
  - Sensory interaction – Principle that one sense may influence another (smell and taste)
  - Are you a supertaster?

When you are having a bad day, just remember that it could always be worse. You could have this job….

IV. The Other Senses

- Smell
  - Chemical sense
  - Olfactory nerve – Transmits the scent message to the brain (bypasses the thalamus).
- Body position and movement
  - Kinesthesis – System for sensing the position and movement of individual body parts.
  - Vestibular sense – Body sense of equilibrium located in the semi-circular canals of the inner ear.