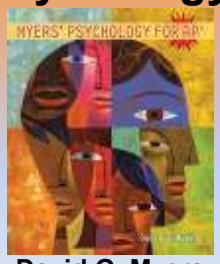
Myers' Psychology for AP*



David G. Myers
PowerPoint Presentation Slides
by Kent Korek
Germantown High School

Unit 4: Sensation and Perception

Unit Overview

Click on the any of the above hyperlinks to go to that section in the presentation.

Sensing the World: Some Basic Principles

Introduction

- Sensation
- Perception
  - –Are one continuous process

Introduction

- Bottom-up processing
- Top-down processing

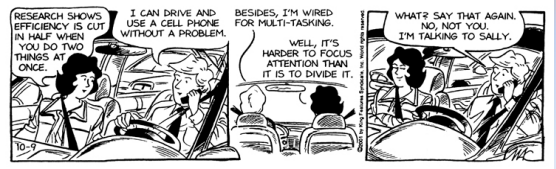
Selective Attention

- Selective Attention
  - Cocktail party effect

Selective Attention

Selective Attention and Accidents

- Cell phone use and car accidents



Selective Attention

Selective Inattention

- Inattentional blindness

Selective Attention
Selective Inattention

- Change blindness
  - Change deafness
  - Choice blindness
  - Choice-choice blindness
- Pop-out

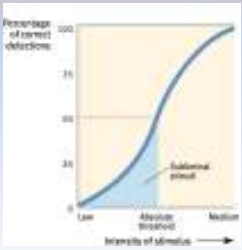



Thresholds

- Psychophysics

Thresholds
Absolute Thresholds

- Absolute threshold
  - 50 % of the time




Thresholds
Signal Detection

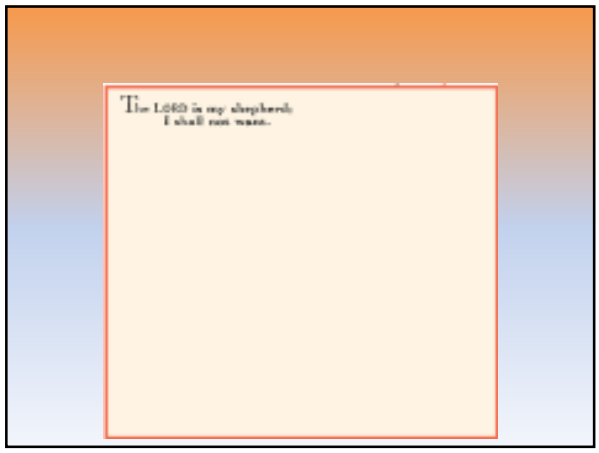
- Signal-detection theory
  - –Ratio of "hits" to "false alarms"

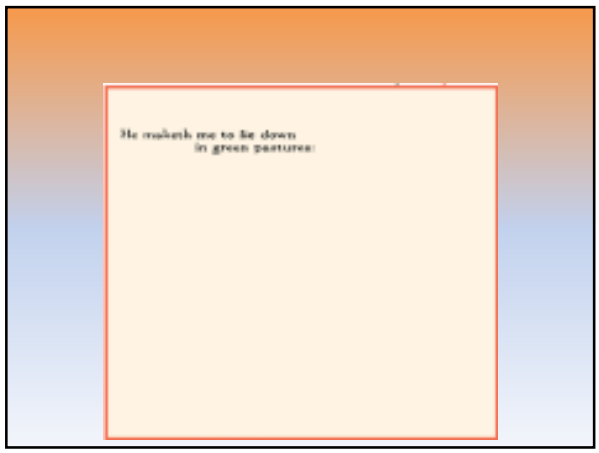
Thresholds
Subliminal Stimulation

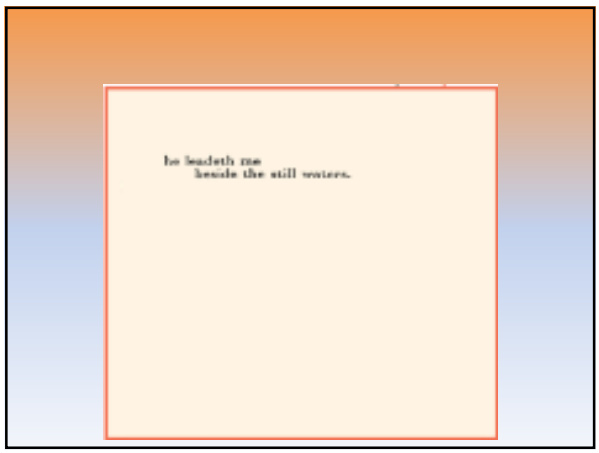
- Subliminal (below threshold)
- Priming
  - –Masking stimulus
- Subliminal persuasion

Thresholds
Difference Thresholds

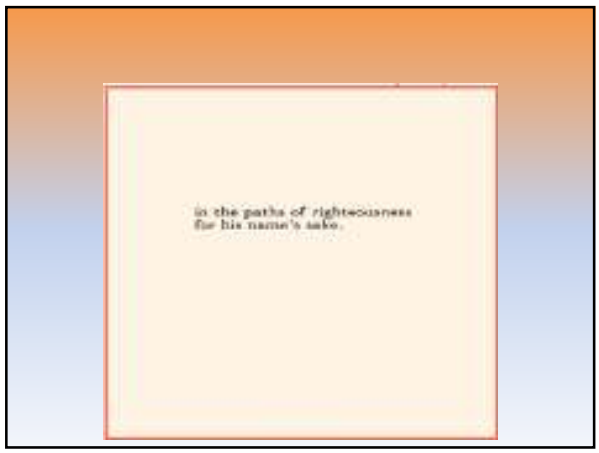
- Difference threshold
  - –Just noticeable difference (jnd)
- Weber's Law


The LORD is my shepherd;
I shall not want.


He maketh me to lie down
in green pastures:


he leadeth me
beside the still waters.


He restoreth my soul:
he leadeth me


in the paths of righteousness
for his name's sake.


Yea, though I walk through the valley
of the shadow of death,

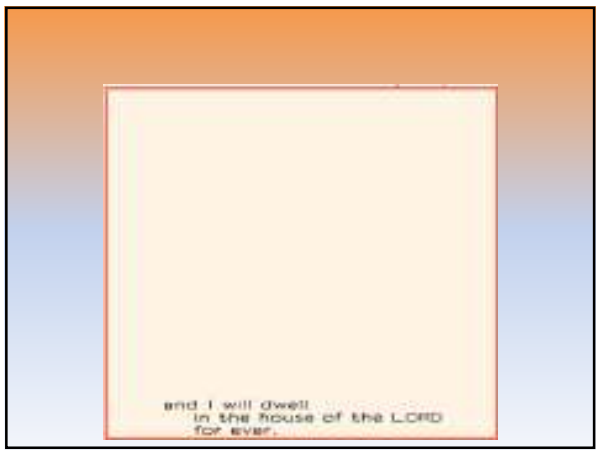

I will fear no evil:
for thou art with me:


thy rod and thy staff
they comfort me.


Thou preparest a table before me
in the presence of mine enemies:


thou anointest my head with oil,
my cup runneth over.


Surely goodness and mercy
shall follow me
all the days of my life:


and I will dwell
in the house of the LORD
for ever.

The LORD is my shepherd;
I shall not want.
He maketh me to lie down
in green pastures:
he leadeth me
beside the still waters.
He restoreth my soul:
he leadeth me
in the paths of righteousness
for his name's sake.
Yea, though I walk through the valley
of the shadow of death,
I will fear no evil:
for thou art with me;
thy rod and thy staff
they comfort me.
Thou preparest a table before me
in the presence of mine enemies:
thou anointest my head with oil,
my cup runneth over.
Surely goodness and mercy
shall follow me
all the days of my life:
and I will dwell
in the house of the LORD
for ever.

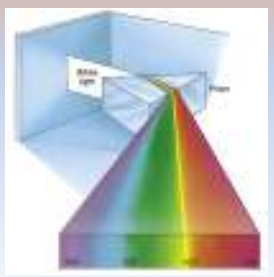
Sensory Adaptation

- Sensory Adaptation
  - Informative changes
  - Reality versus usefulness

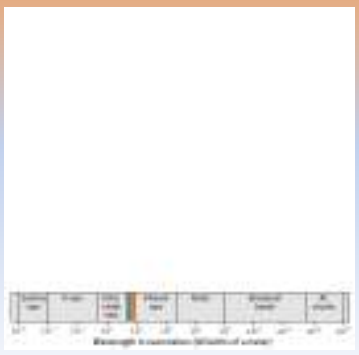
Vision

The Stimulus Input: Light Energy

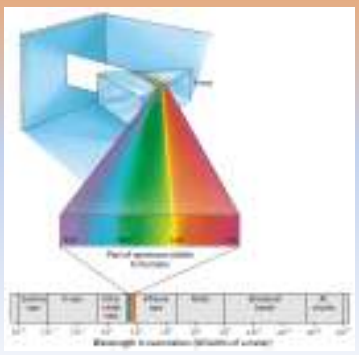
- Transduction (transform)
- Wavelength
- Hue (color)
  - –Wavelength
- Intensity
  - –Wave amplitude



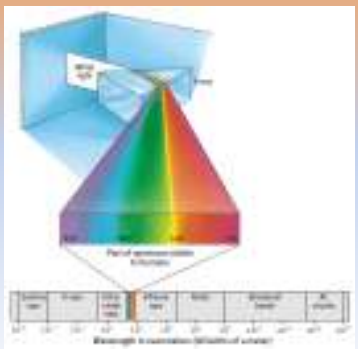
Electromagnetic Energy Spectrum



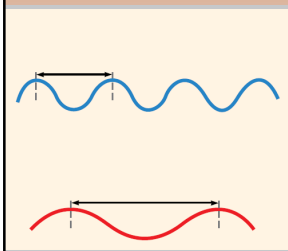
Electromagnetic Energy Spectrum

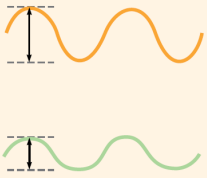


Electromagnetic Energy Spectrum

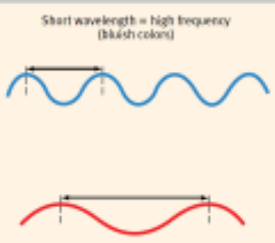


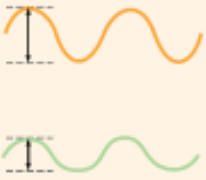
The Physical Property of Waves



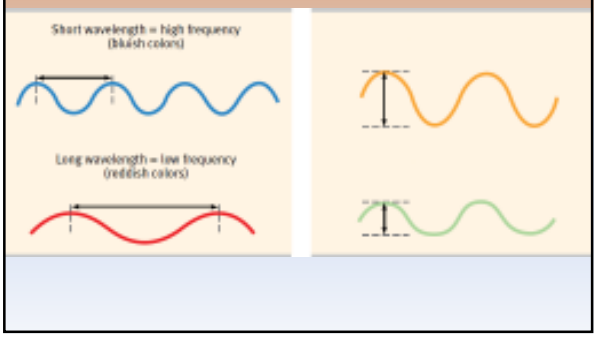


The Physical Property of Waves

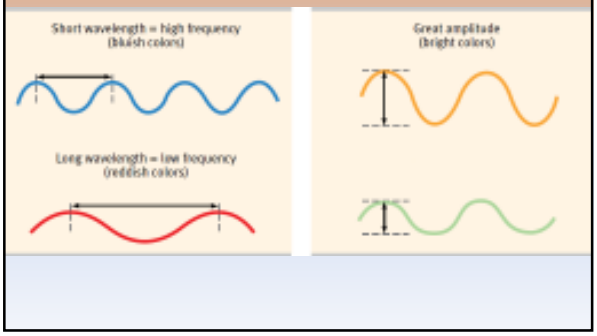




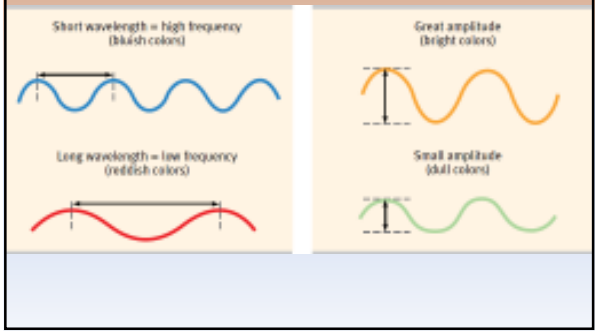
The Physical Property of Waves



The Physical Property of Waves



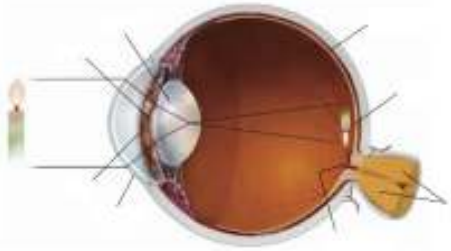
The Physical Property of Waves



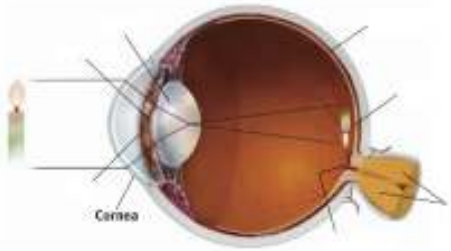
The Eye

- Cornea
- Pupil
- Iris
- Lens
  - –accommodation
- Retina

The Structure of the Eye

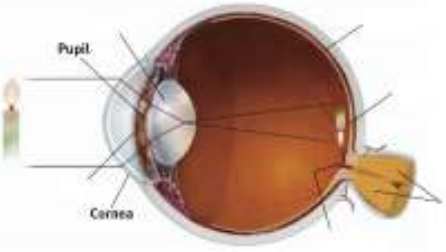


The Structure of the Eye



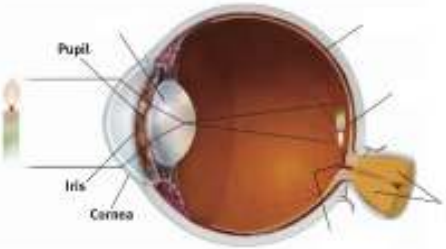
Cornea = outer covering of the eye.

The Structure of the Eye



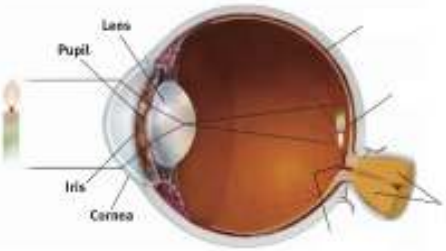
Pupil = the adjustable opening in the center of the eye through which light enters.

The Structure of the Eye



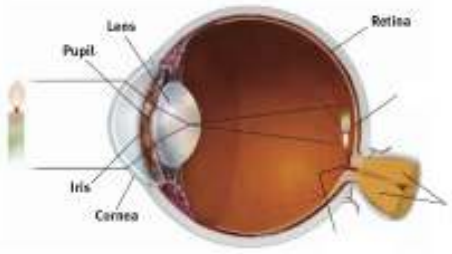
Iris = a ring of muscle tissue that forms the colored portion of the eye around the pupil and controls the size of the pupil opening.
• The iris dilates/constricts in response to changing light intensity

The Structure of the Eye



Lens = the transparent structure behind the pupil that changes shape to help focus images on the retina.

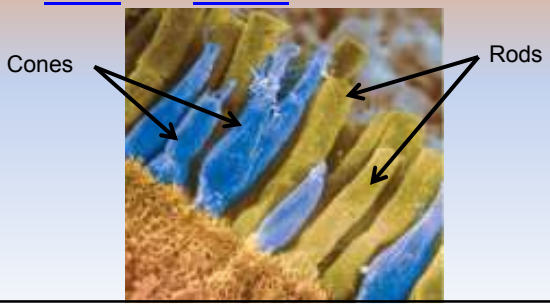
The Structure of the Eye



Retina = the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information.

The Eye
The Retina

- Rods and Cones



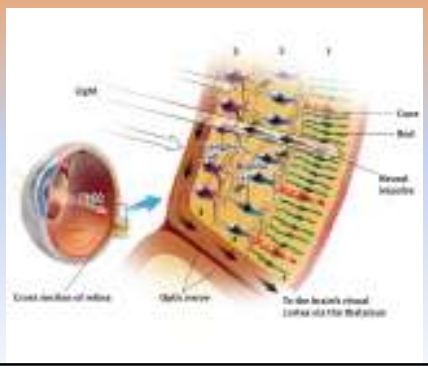
Rods versus Cones

Receptors in the Human Eye: Rod-Shaped Rods and Cone-Shaped Cones

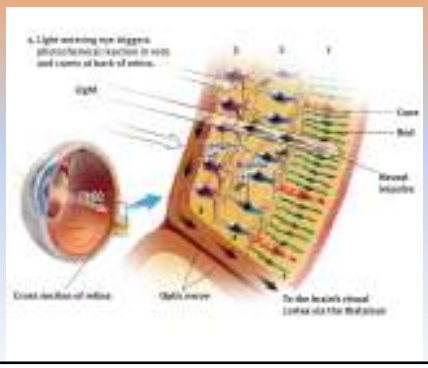
	Cones	Rods
Number	6 million	120 million
Location in retina	Center	Periphery
Sensitivity in dim light	Low	High
Color sensitivity	High	Low
Detail sensitivity	High	Low

The Retina's Reaction to Light

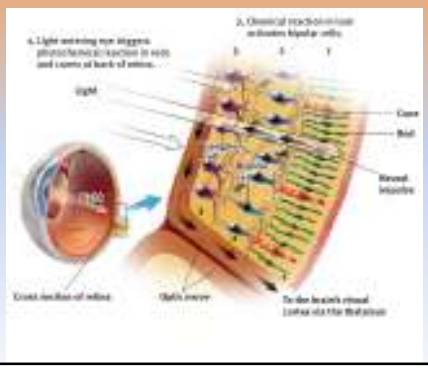
The Retina's Reaction to Light



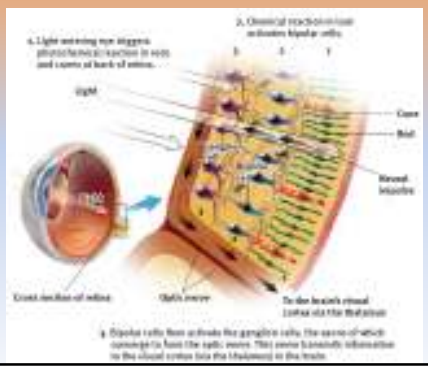
The Retina's Reaction to Light



The Retina's Reaction to Light



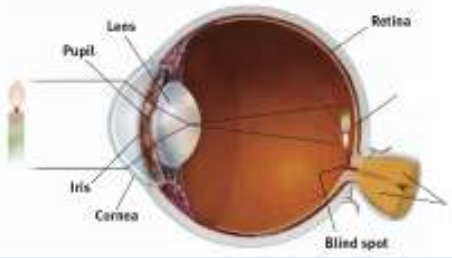
The Retina's Reaction to Light



The Eye
The Retina

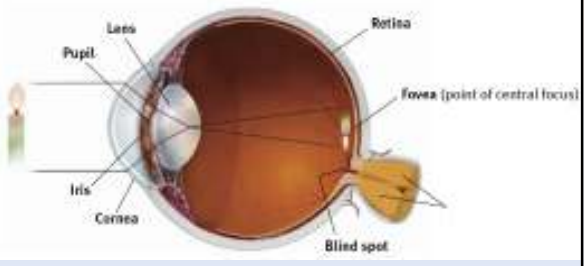
- Optic nerve
- Blind spot
- Fovea

The Structure of the Eye



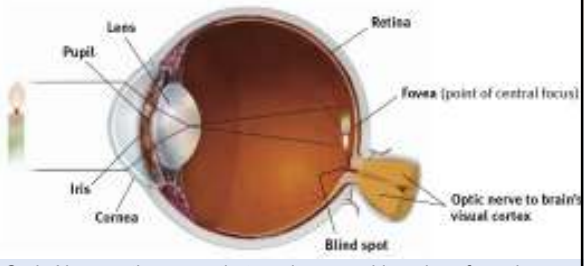
Blind Spot = the point at which the optic nerve leaves the eye, creating a "blind" spot because no receptor cells are located there.

The Structure of the Eye



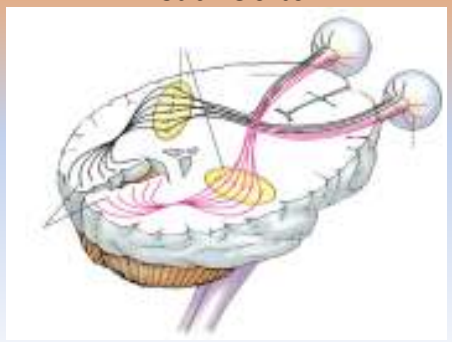
Fovea = the central focal point in the retina, around which the eye's cones cluster.

The Structure of the Eye

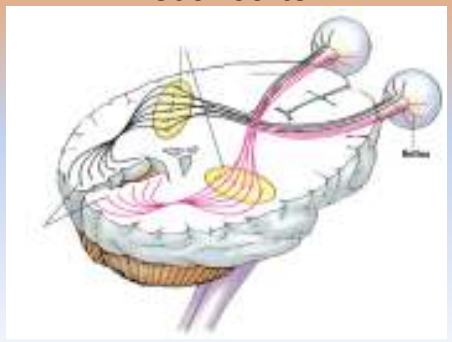


Optic Nerve = the nerve that carries neural impulses from the eye to the brain.

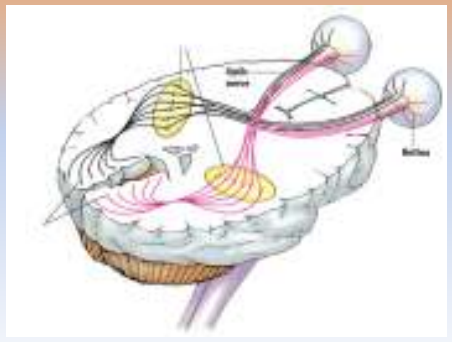
Visual Information Processing
Visual Cortex



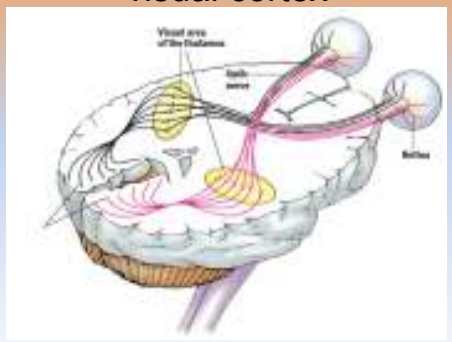
Pathways from the eyes to the visual cortex



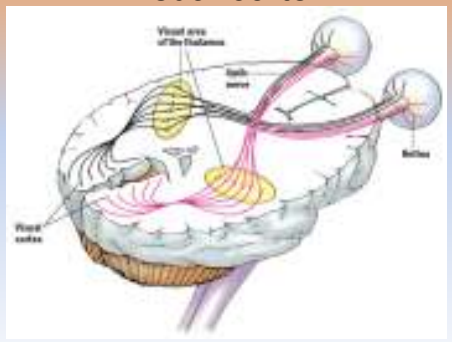
Pathways from the eyes to the visual cortex



Pathways from the eyes to the visual cortex

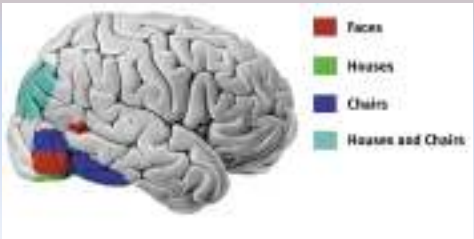


Pathways from the eyes to the visual cortex



Visual Information Processing
Feature Detection

- Feature detectors



Visual Information Processing
Parallel Processing

- Parallel processing
  - –Blind sight

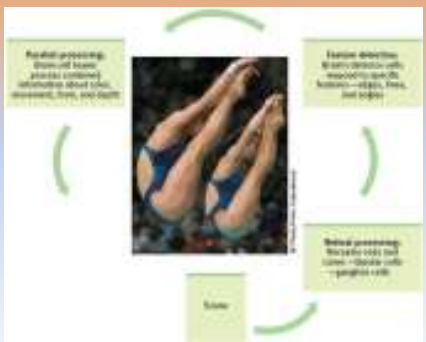
Visual information processing

Visual information processing

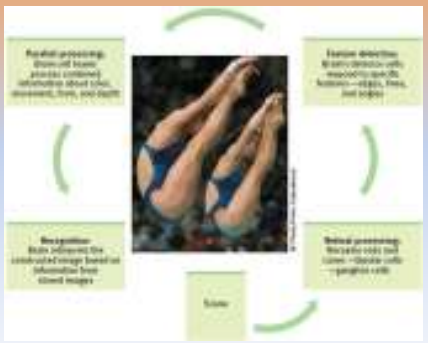
Visual information processing

Visual information processing

Visual information processing

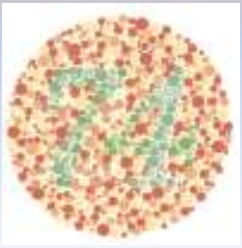


Visual information processing



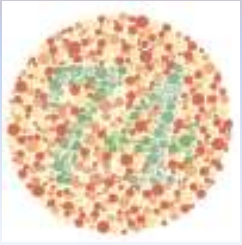
Color Vision

- Young-Helmholtz trichromatic (three color) theory
  - Red – Green - Blue
  - Monochromatic vision
  - Dichromatic vision



Color Vision

- Opponent-process theory
  - Three sets of colors
    - Red-green
    - Blue-yellow
    - Black-white
  - Afterimage



After image

This slide is intentionally left blank.

Hearing

The Stimulus Input: Sound Waves

- Audition
- Amplitude
  - –loudness
- Frequency
  - –Pitch

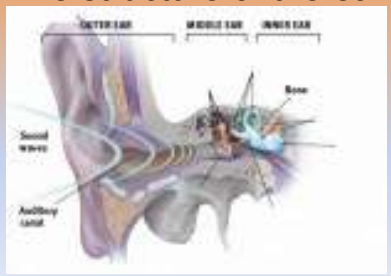
The Ear

- Outer ear
  - –Auditory canal
  - –Ear drum

The structure of the ear

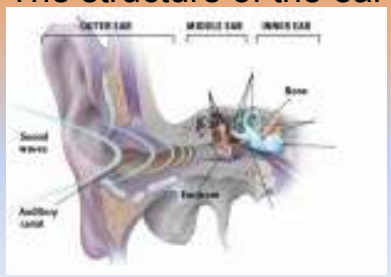
The ear is divided into the outer, middle and inner ear.

The structure of the ear



The sound waves travel down the auditory canal to the eardrum.

The structure of the ear



Eardrum = tight membrane that vibrates when struck by sound waves.

The structure of the ear

Eardrum

The Ear

- Middle ear
  - –Hammer, anvil, stirrup

The structure of the ear

Bones of the middle ear = the hammer, anvil, stirrup which vibrate with the eardrum.

The structure of the ear

Hammer

The structure of the ear

Anvil

The structure of the ear

Stirrup

The structure of the ear

Oval window = where the stirrup connects to the cochlea.

The structure of the ear

Cochlea = a coiled, bony, fluid-filled tube in the inner ear through which sound waves trigger nerve impulses.

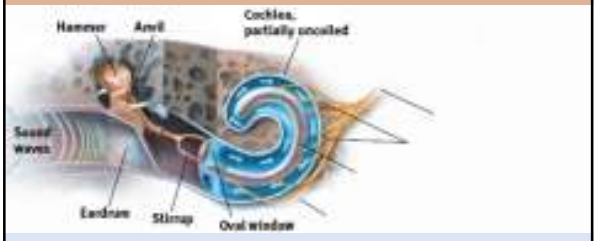
The Ear

- Inner ear
  - Oval window
  - Cochlea
    - Basilar membrane
  - Auditory nerve
  - Auditory cortex

The structure of the ear

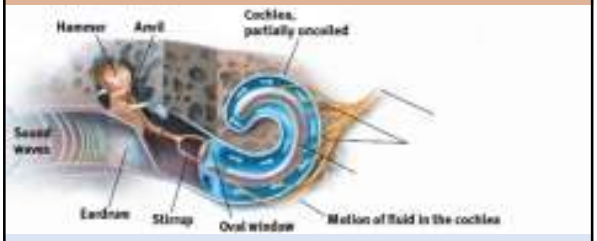
Oval Window

The structure of the ear



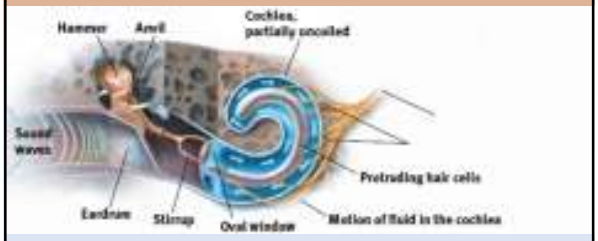
Cochlea

The structure of the ear



Fluid in the cochlea

The structure of the ear

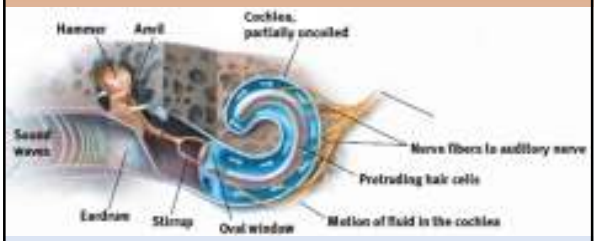


Hair cells in the cochlea

The structure of the ear

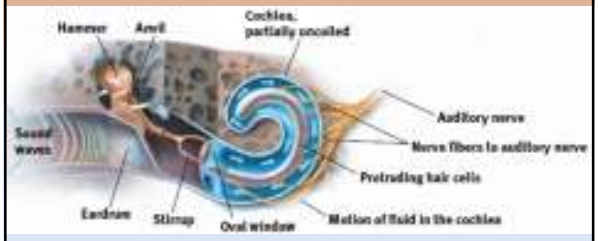
Auditory nerve = nerve which sends the auditory message to the brain via the thalamus.

The structure of the ear



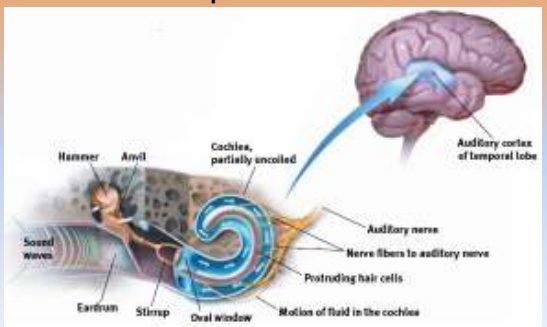
Nerve fibers

The structure of the ear



Auditory nerve

Neural impulse to the brain

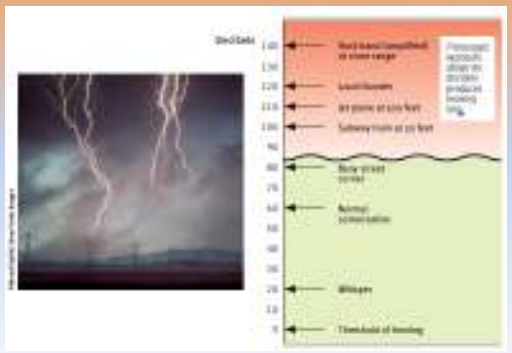


The Ear

Perceiving Loudness

- Basilar membrane's hair cells
  - –Compressed sound

Cochlea and loud sounds



The Ear
Perceiving Pitch

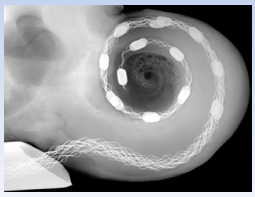
- Place theory
  - –High pitched sounds
- Frequency theory
  - –Low pitched sounds
  - –Volley principle

The Ear
Locating Sounds

- Stereophonic hearing
- Localization of sounds
  - –Intensity
  - –Speed of the sound

Hearing Loss and Deaf Culture

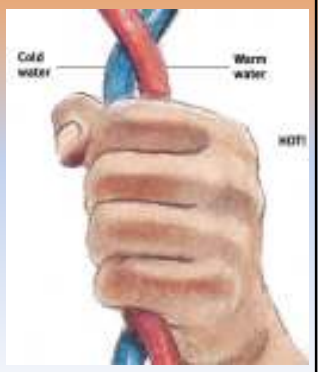
- Hearing loss
  - –Conduction hearing loss
  - –Sensorineural hearing loss
  - –Cochlea implant
- Signing



Other Senses

Touch

- Types of touch
  - –Pressure
  - –Warmth
  - –Cold
  - –Pain
- Sensation of hot



Touch

- Rubber hand illusion

Touch

- Kinesthesis
- Vestibular sense
  - Semicircular canals

Semicircular Canals

Pain

Understanding Pain

- Biological Influences
  - Noiceptors
    - Sensory receptors that detect hurtful temperatures, pressures, or chemicals
  - Gate-control theory
  - Endorphins
  - Phantom limb sensation
  - Tinnitus

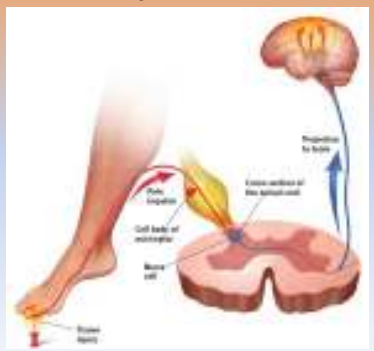
The pain circuit

The pain circuit

The pain circuit

The pain circuit

The pain circuit



Pain

Understanding Pain

- Psychological Influences
  - –Rubber-hand illusion
  - –Memories of pain

Pain
Understanding Pain

- Social-Cultural Influences

Biopsychosocial approach to pain

Biopsychosocial approach to pain

Biopsychosocial approach to pain

Biopsychosocial approach to pain

Pain
Controlling Pain

- Physical methods
- Psychological methods

Taste

- Sweet, sour, salty and bitter
  - –Umami
- Taste buds
  - –Chemical sense
- Age and taste

THE SURVIVAL FUNCTIONS OF BASIC TASTES

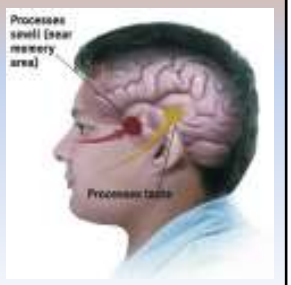
Taste	Indicates
Sweet	Energy source
Salty	Sodium essential to physiological processes
Sour	Potentially toxic acid
Bitter	Potential poisons
Umami	Proteins to grow and repair tissue

Taste
Sensory Interaction

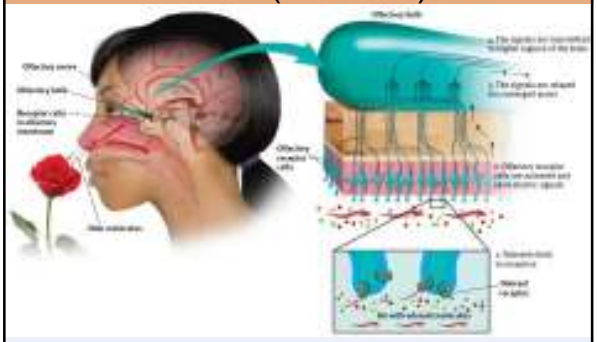
- Sensory interaction
- Interaction of smell and taste
  - –McGurk Effect
- Interaction of other senses

Smell

- Olfaction
  - –Chemical sense
  - –Odor molecules
  - –Olfactory bulb
  - –Olfactory nerve



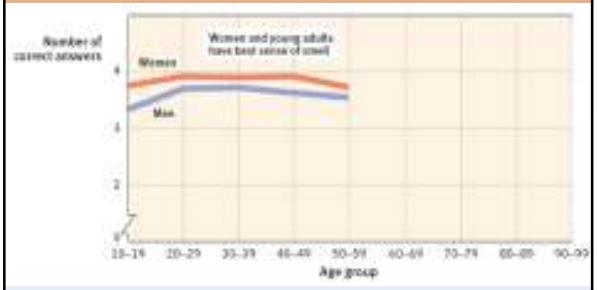
Smell (olfaction)



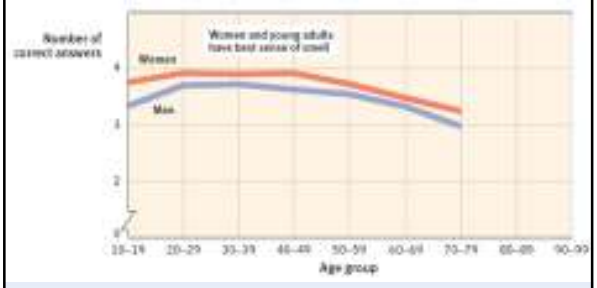
Smell and age

Smell and age

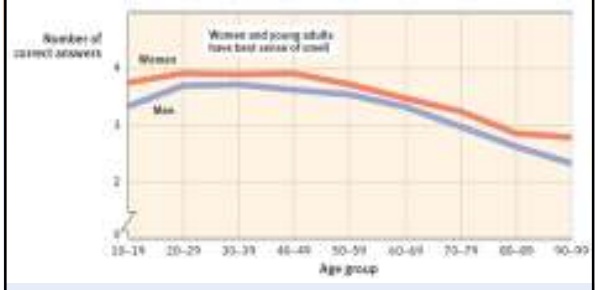
Smell and age



Smell and age



Smell and age



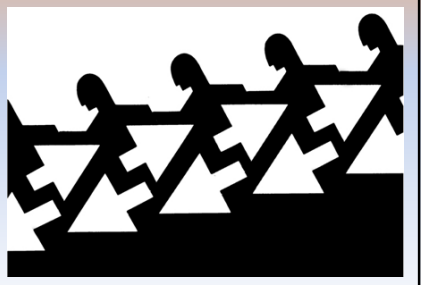
Perceptual Organization

Introduction

- Gestalt (form or whole)

Form Perception
Figure and Ground

- Figure-ground



Form Perception
Grouping

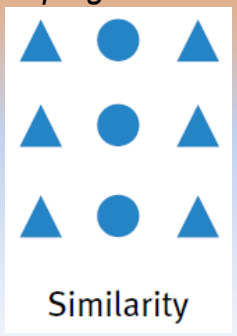
- Grouping
  - –Proximity
  - –Similarity
  - –Continuity
  - –Connectedness
  - –Closure

Form Perception
Grouping

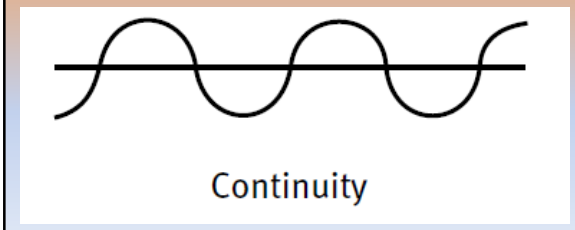
- Grouping
  - –Proximity
  - –Similarity
  - –Continuity
  - –Connectedness
  - –Closure

Form Perception
Grouping - Proximity

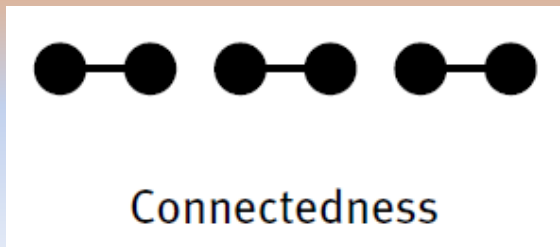
Form Perception
Grouping - Similarity



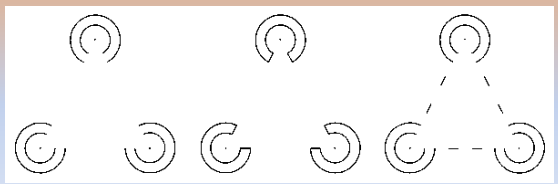
Form Perception
Grouping - Continuity



Form Perception
Grouping - Connectedness



Form Perception
Grouping - Closure



Depth Perception

- Depth perception
  - Visual-cliff

Depth Perception
Binocular Cues

- Binocular cues
  - Retinal disparity

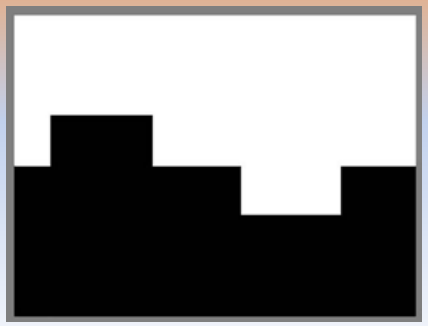
Depth Perception
Mononocular Cues

- Monocular cues
  - Horizontal-vertical illusion

Depth Perception
Mononocular Cues

- Monocular cues
  - Relative height
  - Relative size
  - Interposition
  - Linear perspective
  - Relative motion
  - Light and shadow

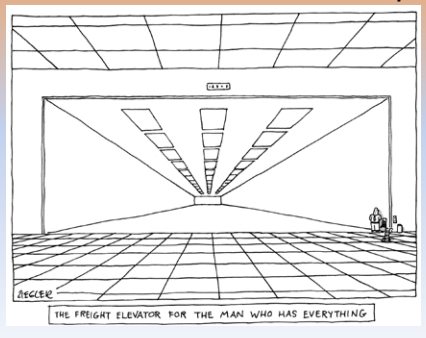
Depth Perception
Mononocular Cues – Relative Height



Depth Perception
Mononocular Cues – Relative Size

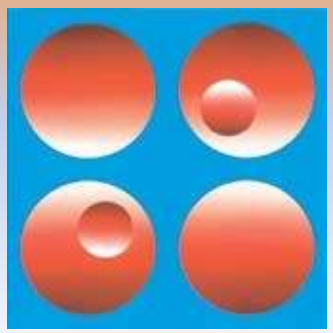
Depth Perception
Mononocular Cues - Interposition

Depth Perception
Mononocular Cues – Linear Perspective



Depth Perception
Mononocular Cues – Relative Motion

Depth Perception
Mononocular Cues – Light and Shadow

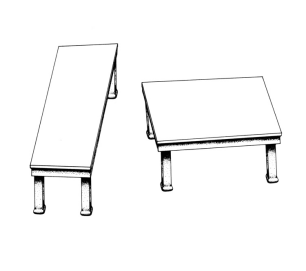


Motion Perception

- Stroboscopic movement
- Phi phenomenon

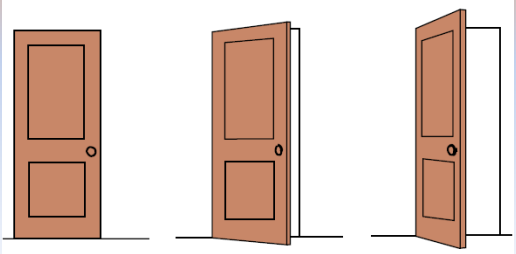
Perceptual Constancy

- Perceptual Constancy



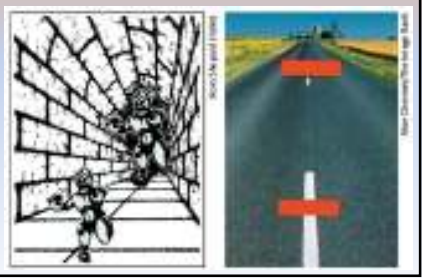
Perceptual Constancy
Shape and Size Constancies

- Shape constancy



Perceptual Constancy
Shape and Size Constancies

- Size constancy
- Moon illusion
- Ponzo illusion



Ames Room

Ames Room

Perceptual Constancy
Lightness Constancy

- Lightness constancy
  - Brightness constancy
  - Relative luminance

Perceptual Constancy
Color Constancy

- Color constancy
  - Surrounding context
  - Surrounding objects

Perceptual Interpretation

Sensory Deprivation and Restored Vision

- Experiments on sensory deprivation
  - Critical period

Perceptual Adaptation

- Perceptual adaptation
  - –Displacement goggles

Perceptual Set

- Perceptual set
  - –Mental predisposition
  - –Schemas

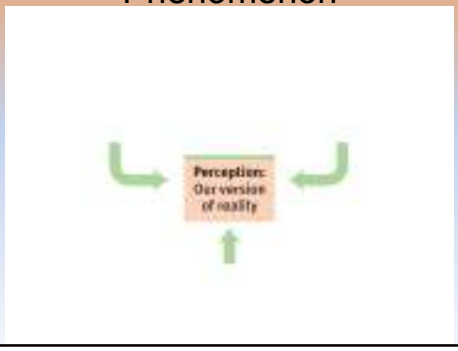
Perceptual Set
Context Effects

- Context effects

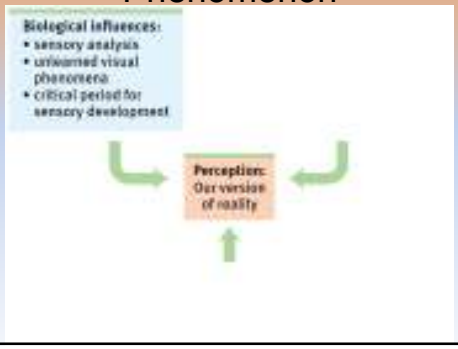
Perceptual Set
Emotion and Motivation

- Motivation on perception
- Emotions on perception

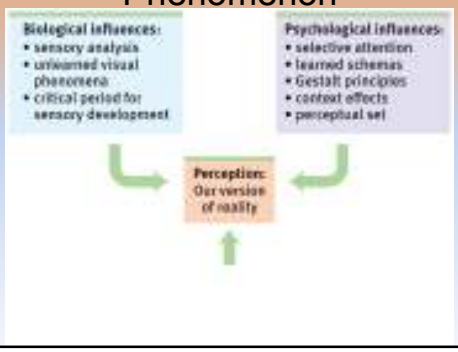
Perception is a Biopsychosocial Phenomenon



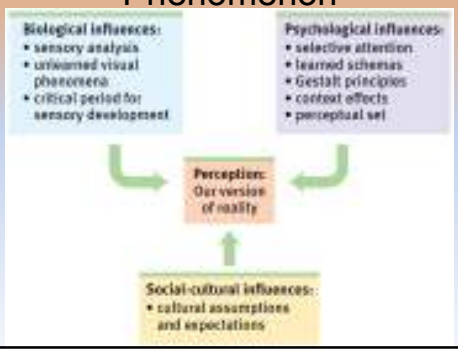
Perception is a Biopsychosocial Phenomenon



Perception is a Biopsychosocial Phenomenon



Perception is a Biopsychosocial Phenomenon

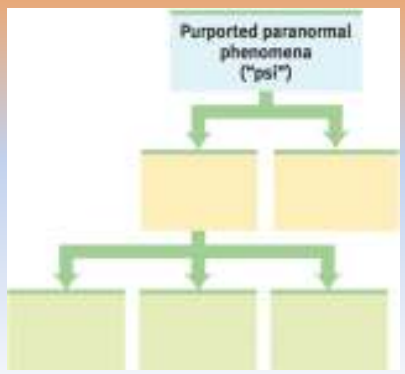


Is There Extrasensory Perception?

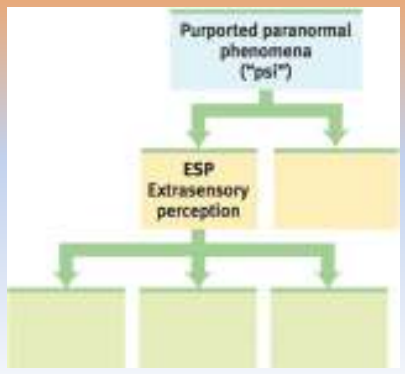
Claims of ESP

- Parapsychology
- Extrasensory Perception
  - Telepathy
  - Clairvoyance
  - Precognition
- Psychokinesis (PK)

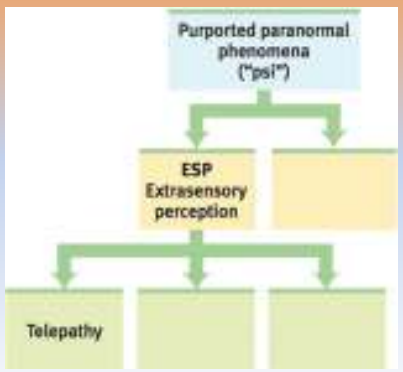
Parapsychology



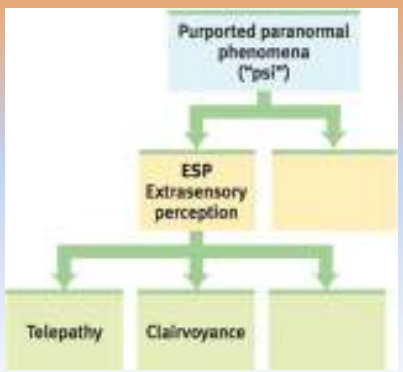
Parapsychology



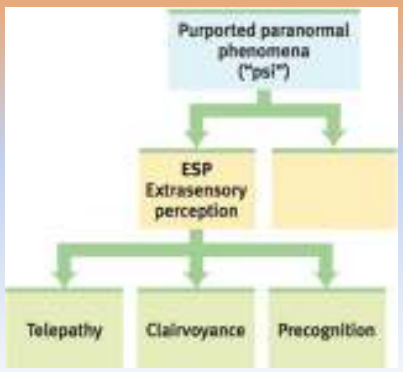
Parapsychology



Parapsychology



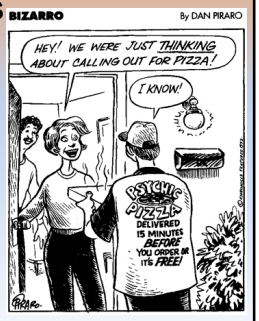
Parapsychology



Parapsychology

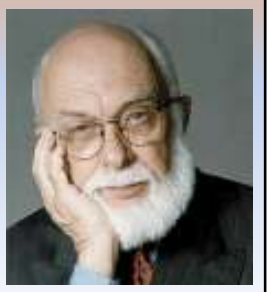
Premonitions or Pretensions?

- Psychic predictions
  - –Nostradamus



Putting ESP to Experimental Test

- ESP Experiments



The End

Definition Slides

Sensation

= the process by which our sensory receptors and nervous system receive and represent stimulus energies from our environment.

Perception

= the process of organizing and interpreting sensory information, enabling us to recognize meaningful objects and events.

Bottom-up processing

= analysis that begins with the sensory receptors and works up to the brain's integration of sensory information.

Top-down processing

= information processing guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations.

Selective attention

= the focusing of conscious awareness on a particular stimulus.

Inattentional blindness

= failing to see visible objects when our attention is directed elsewhere.

Change blindness

= failing to notice changes in the environment

Psychophysics

= the study of relationships between the physical characteristics of stimuli, such as their intensity, and our psychological experience of them.

Absolute threshold

= the minimum stimulation necessary to detect a particular stimulus 50% of the time.

Signal detection theory

= a theory predicting how and when we detect the presence of a faint stimulus (signal) amid background stimulation (noise). Assumes there is no absolute threshold and that detection depends partly on a person's experience, expectations, motivation, and altertness.

Subliminal

= below one's absolute threshold for conscious awareness.

Priming

= the activation, often unconsciously, of certain associations, thus predisposing one's perception, memory, or response.

Difference threshold

= the minimum difference between two stimuli required for detection. We experience the difference threshold as a just noticeable difference (jnd).

Weber's law

= the principle that, to be perceived as different, two stimuli must differ by a constant percentage (rather than a constant amount).

Sensory adaptation

= diminished sensitivity as a consequence of constant stimulation.

Transduction

= conversion of one form of energy into another. In sensation, the transforming of stimulus energies, such as sights, sounds, and smells into neural impulses our brains can interpret.

Wavelength

= the distance from the peak of one light or sound wave to the peak of the next. Electromagnetic wavelengths vary from the short blips of comic rays to the long pulses of radio transmission.

Hue

= the dimension of color that is determined by the wavelength of light; what we know as the color names *blue*, *green*, and so forth.

Intensity

= the amount of energy in a light or sound wave, which we perceive as brightness or loudness, as determined by the wave's amplitude.

Pupil

= the adjustable opening in the center of the eye through which lights enters.

Iris

= a ring of muscle tissue that forms the colored portion of the eye around the pupil and controls the size of the pupil opening.

Lens

= the transparent structure behind the pupil that changes shape to help focus the images on the retina.

Retina

= the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information.

Accommodation

= the process by which the eye's lens changes shape to focus near or far objects on the retina.

Rods

= retinal receptors that detect black, white, and gray; necessary for peripheral and twilight vision, when cones don't respond.

Cones

= retinal receptor cells that are concentrated near the center of the retina and that function in daylight or in well-lit conditions. The cones detect fine detail and give rise to color sensations.

Optic Nerve

= the nerve that carries neural impulses from the eye to the brain.

Blind Spot

= the point at which the optic nerve leaves the eye, creating a “blind” spot because no receptor cells are located there.

Fovea

= the central focal point in the retina, around which the eye's cones cluster.

Feature detectors

= nerve cells in the brain that respond to specific features of the stimulus, such as shape, angle, or movement.

Parallel processing

= the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions, including vision. Contrasts with the step-by-step (serial) processing of most computers and of conscious problem solving.

Young-Helmholtz trichromatic (three-color) theory

= the theory that the retina contains three different color receptors – one most sensitive to red, one to green, one to blue – which, when stimulated in combination can produce the perception of any color.

Opponent-process theory

= the theory that opposing retinal processes (red-green, yellow-blue, white-black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green.

Audition

= the sense or act of hearing.

Frequency

= the number of complete wavelengths that pass a point in a given time (i.e. per second).

Pitch

= a tone's experienced highness or lowness; depends on frequency.

Middle Ear

= the chamber between the eardrum and cochlea containing three tiny bones (hammer, anvil, and stirrup) that concentrate the vibrations of the eardrum on the cochlea's oval window.

Cochlea

= a coiled, bony, fluid-filled tube in the inner ear through which sound waves trigger nerve impulses.

Inner ear

= the innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs.

Place theory

= in hearing, the theory that links the pitch we hear with the place where the cochlea's membrane is stimulated.

Frequency theory

= in hearing, the theory that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense its pitch.

Conduction hearing loss

= hearing loss caused by damage to the mechanical system that conducts sound waves to the cochlea.

- Problems with the eardrum or three bones of the middle ear.

Sensorineural hearing loss

= hearing loss caused by damage to the cochlea's receptor cells or to the auditory nerves; also called nerve deafness.

Cochlea implant

= a device for converting sounds into electrical signals and stimulating the auditory nerve through electrodes threaded into the cochlea.

Kinethesis

= the system for sensing the position and movement of individual body parts.

Vestibular sense

= the sense of body movement and position, including the sense of balance.

Gate-control theory

= the theory that the spinal cord contains a neurological “gate” that blocks pain signals or allows them to pass on to the brain. The “gate” is opened by the activity of pain signals traveling up small nerve fibers and is closed by activity in larger fibers or by information coming from the brain.

Sensory interaction

= the principle that one sense may influence another, as when the smell of food influences its taste.

Gestalt

= an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes.

Figure-ground

= the organization of the visual field into objects (the figures) that stand out from their surroundings (the ground).

Grouping

= the perceptual tendency to organize stimuli into coherent groups.

Depth perception

= the ability to see objects in three dimensions although the images that strike the retina are two-dimensional; allows us to judge distance.

Visual cliff

= a laboratory device for testing depth perception in infants and young animals.

Binocular cues

= depth cues, such as retinal disparity, that depend on the use of two eyes.

Retinal disparity

= a binocular cue for perceiving depth. By comparing images from the retinas in the two eyes, the brain computes distance – the greater the disparity (difference) between the two images, the closer the object.

Monocular cues

= depth cues, such as interposition and linear perspective, available to either eye alone.

Phi phenomenon

= an illusion of movement created when two or more adjacent lights blink on and off in quick succession.

Perceptual constancy

= perceiving objects as unchanging (having consistent shapes, size, lightness, and color) even as illumination and retinal images change.

Color constancy

= perceiving familiar objects as having consistent color, even if changing illumination alters the wavelengths reflected by the object.

Perceptual adaptation

= in vision, the ability to adjust to an artificially displaced or even inverted visual field.

Perceptual set

= a mental disposition to perceive one thing and not another.

Extrasensory perception (ESP)

= the controversial claim that perception can occur apart from sensory input; includes telepathy, clairvoyance, and precognition.

Parapsychology

= the study of paranormal phenomena, including ESP and psychokinesis.