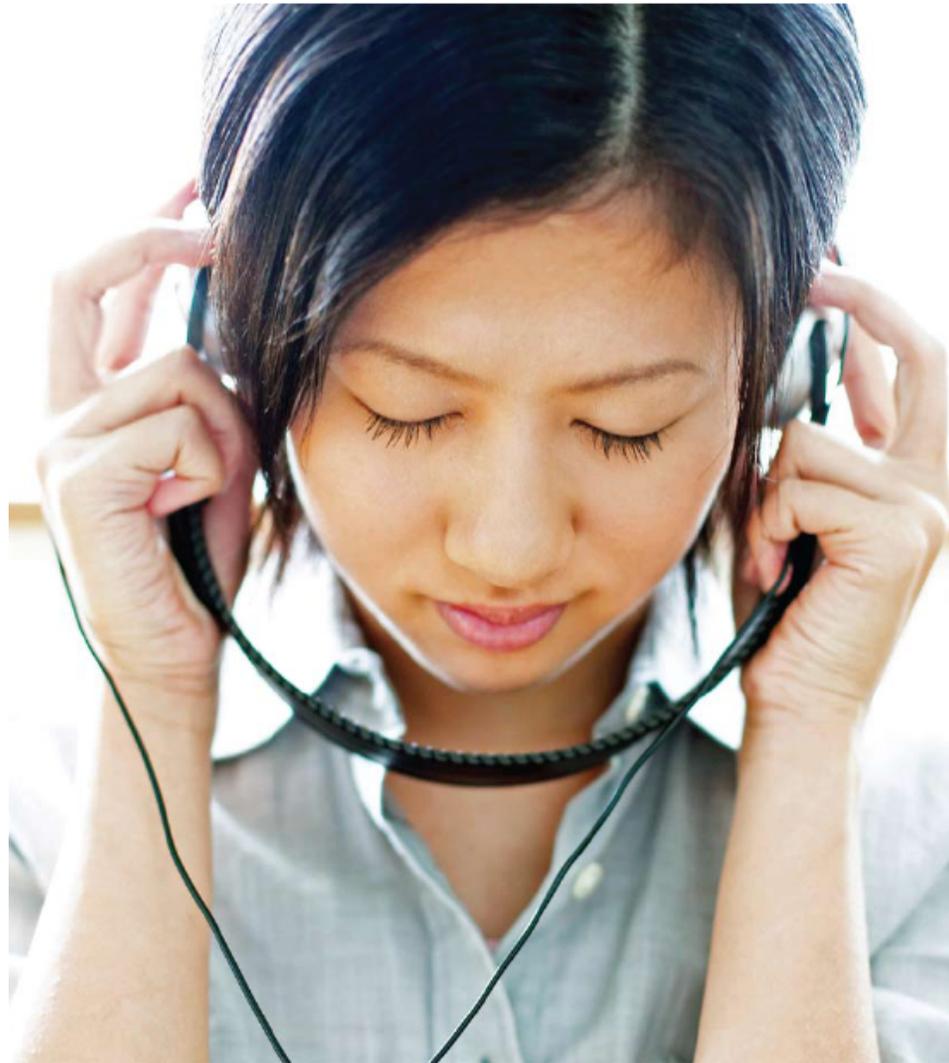


Unit 4: Sensation and Perception



Unit Overview

- [Sensing the World: Some Basic Principles](#)
- [Vision](#)
- [Hearing](#)
- [Other Senses](#)
- [Perceptual Organization](#)
- [Perceptual Interpretation](#)
- [Is there Extrasensory Perception?](#)



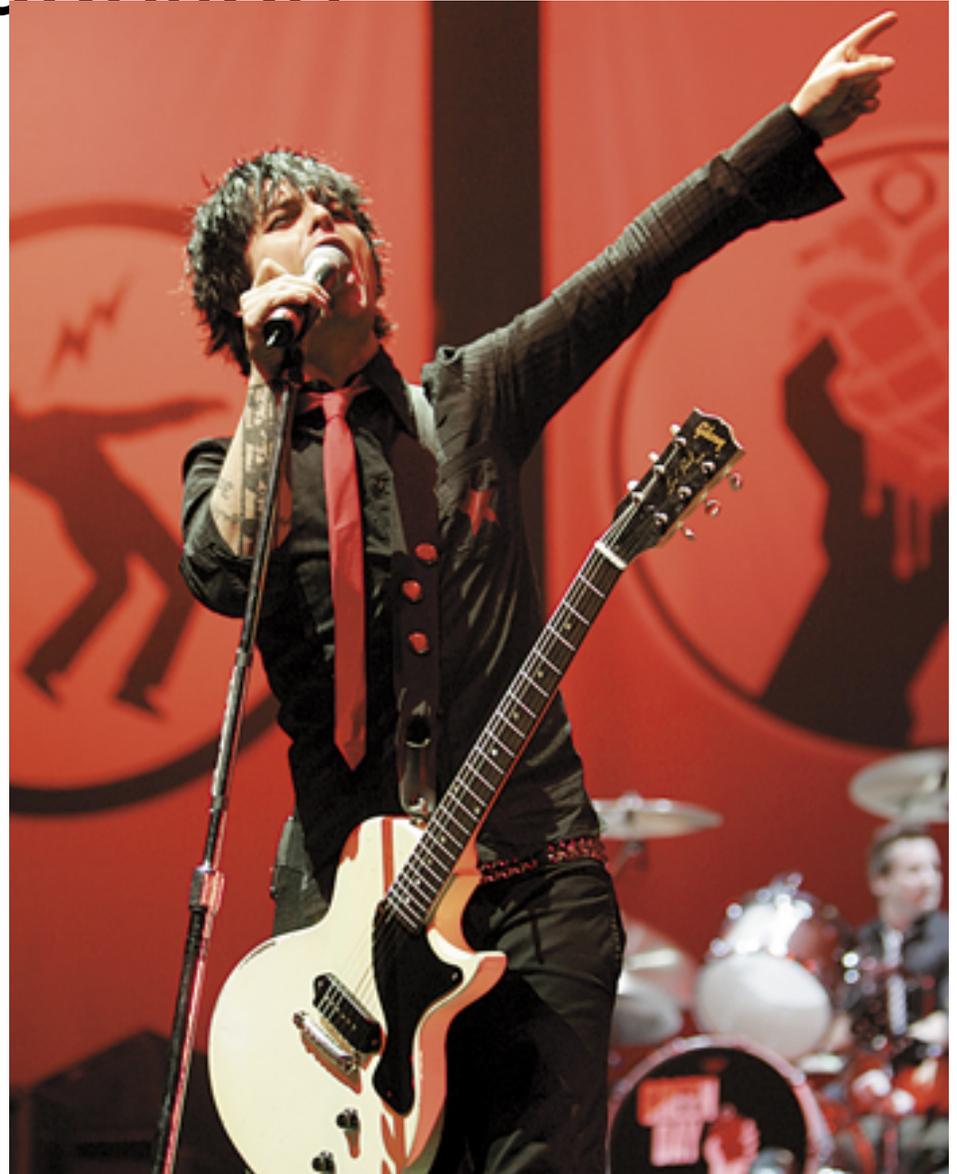
Click on the any of the above hyperlinks to go to that section in the presentation.

Sensing the World: Some Basic Principles



Introduction

- Sensation
- Perception
 - Are one continuous process



Sensation & Perception

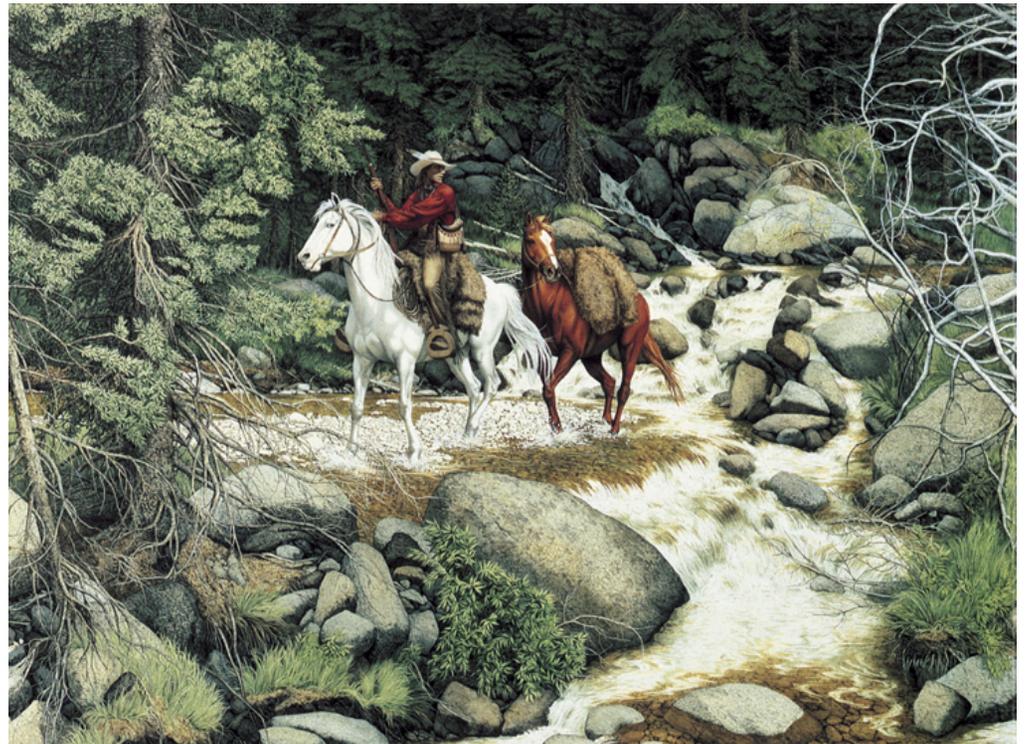
How do we construct our representations of the external world?

To represent the world, we must detect physical energy (a stimulus) from the environment and convert it into neural signals. This is a process called **sensation**.

When we select, organize, and interpret our sensations, the process is called **perception**.

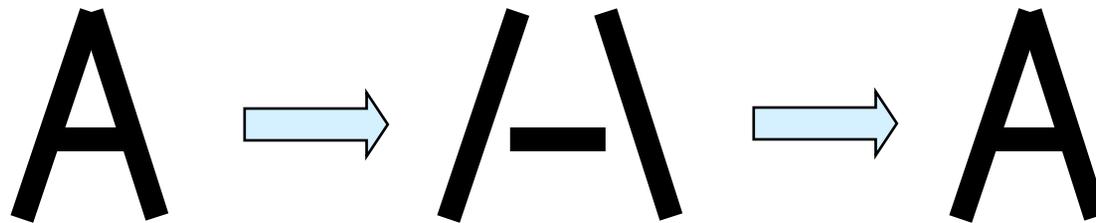
Introduction

- Bottom-up processing
- Top-down processing



Bottom-up Processing

Analysis of the stimulus begins with the sense receptors and works up to the level of the brain and mind.



Letter “A” is really a black blotch broken down into features by the brain that we perceive as an “A.”

Top-Down Processing

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

THE CAT

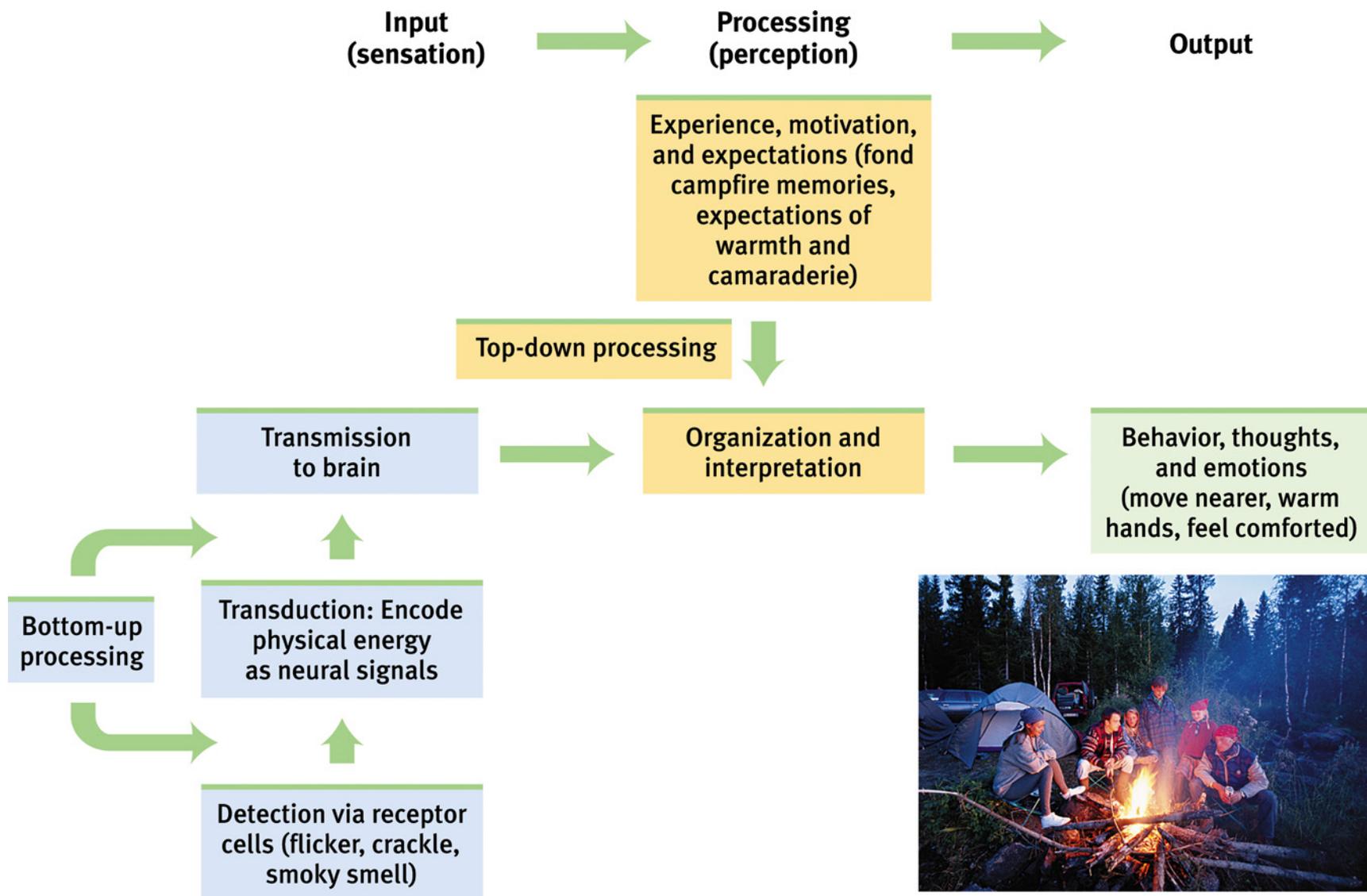


Figure 5.1 Sensation and perception: One continuous process
 Myers: Psychology, Eighth Edition
 Copyright © 2007 by Worth Publishers

Selective Attention

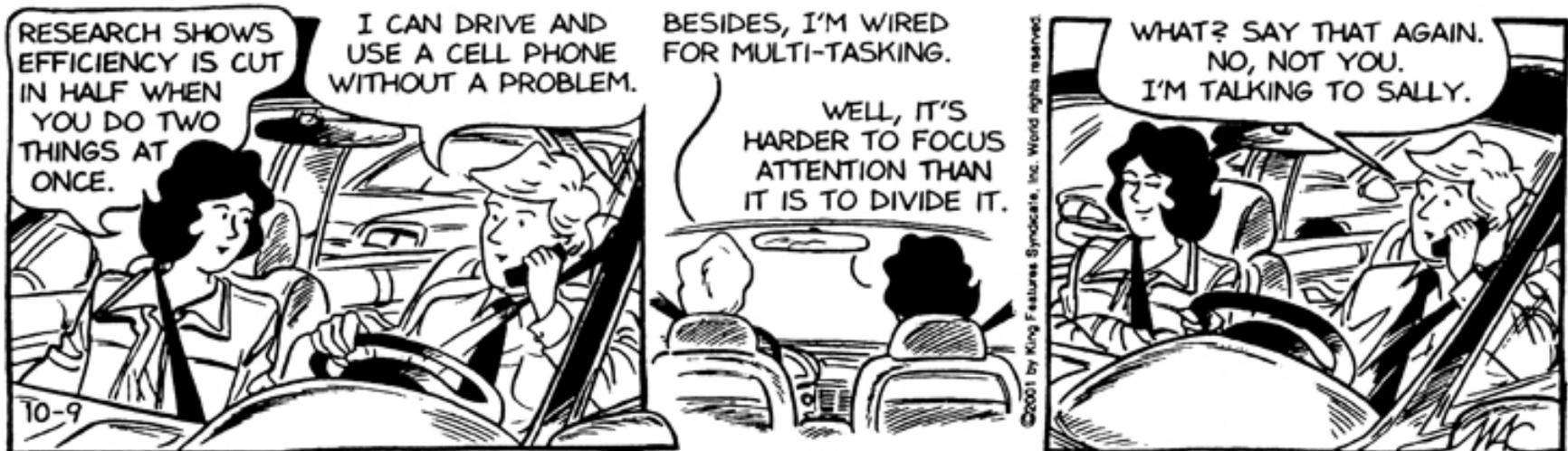
- Selective Attention
 - Cocktail party effect



Selective Attention

Selective Attention and Accidents

- Cell phone use and car accidents



Selective Attention

Selective Inattention

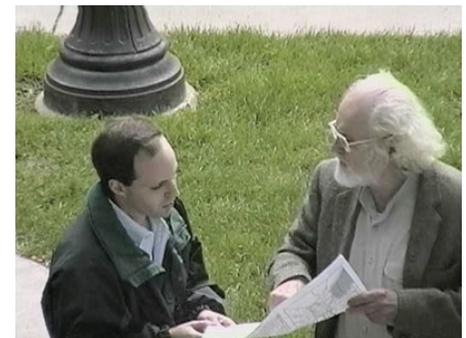
- Inattention blindness



Selective Attention

Selective Inattention

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



Exploring the Senses

1. What stimuli cross our threshold for conscious awareness?
2. Could we be influenced by stimuli too weak (subliminal) to be perceived?
3. Why are we unaware of unchanging stimuli, like a band-aid on our skin?

Thresholds

- Psychophysics



Psychophysics

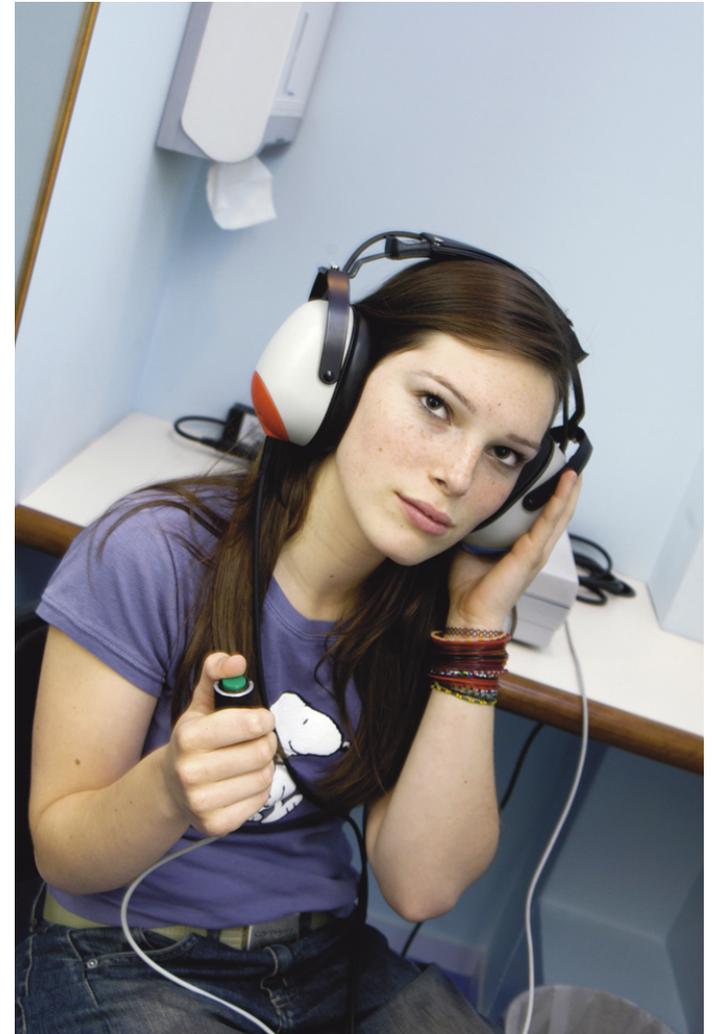
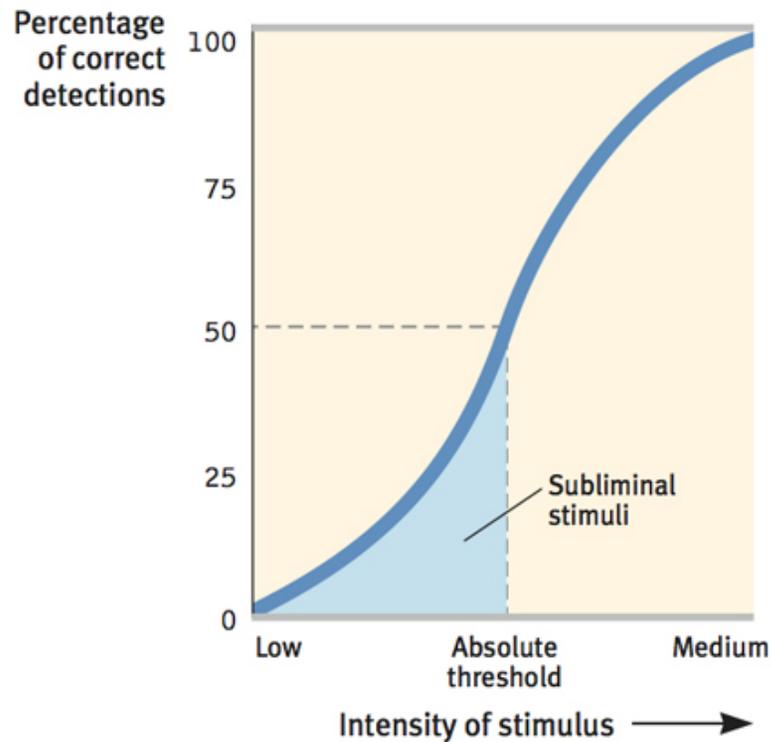
A study of the relationship between physical characteristics of stimuli and our psychological experience with them.

Physical World	Psychological World
Light	Brightness
Sound	Volume
Pressure	Weight
Sugar	Sweet

Thresholds

Absolute Thresholds

- Absolute threshold
–50 % of the time



An absolute threshold is the minimal amount of sensory stimulation needed for a sensation to occur

Absolute Thresholds

Vision



Candle flame seen at 30 miles on a clear night

Hearing



Tick of a watch under quiet conditions at 20 feet

Touch



A bee's wing falling on your cheek from 1 centimeter (0.4 inch) above

Smell



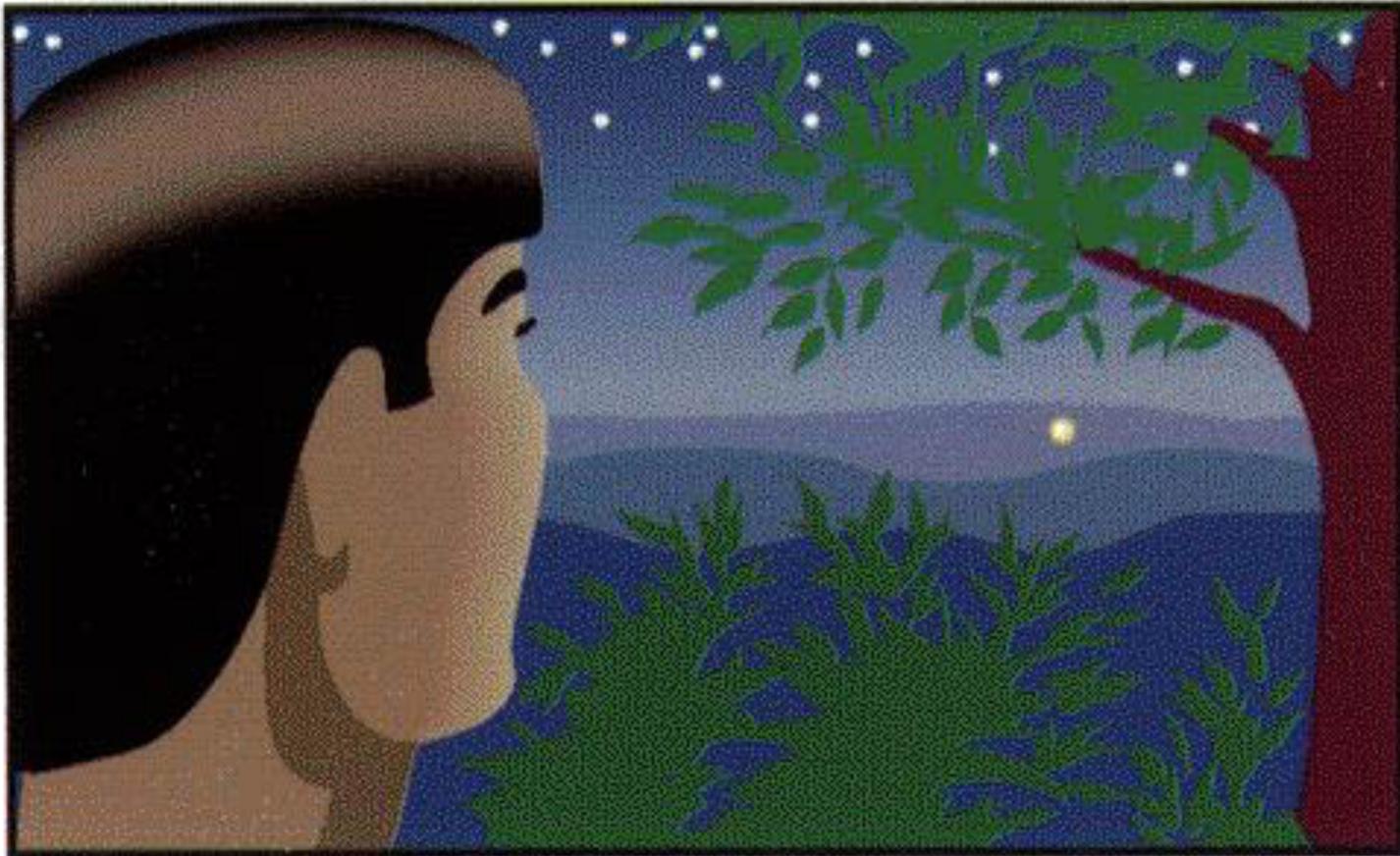
1 drop of perfume diffused into a three-room apartment

Taste



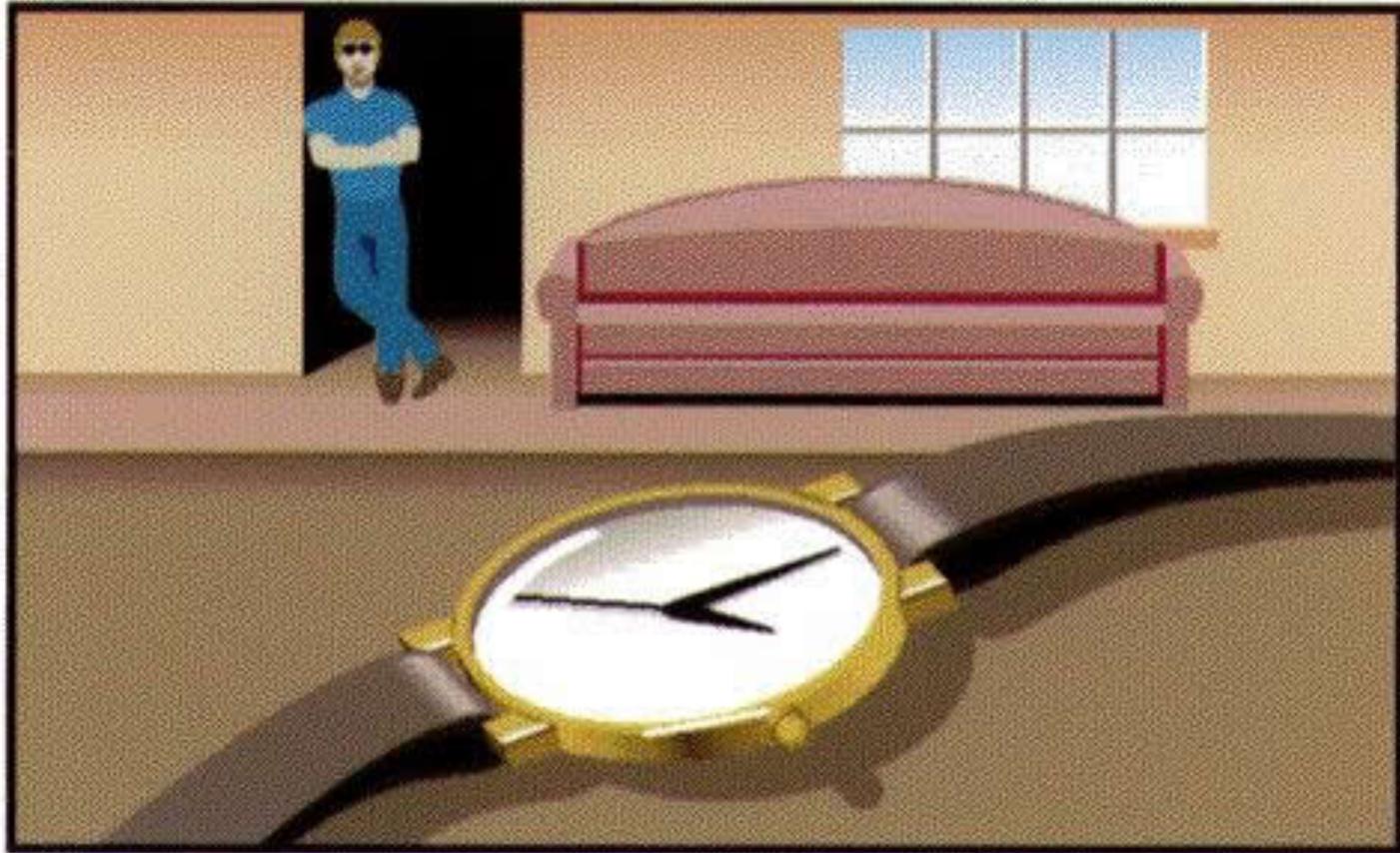
1 teaspoon of sugar in 2 gallons of water

Absolute Threshold: Vision



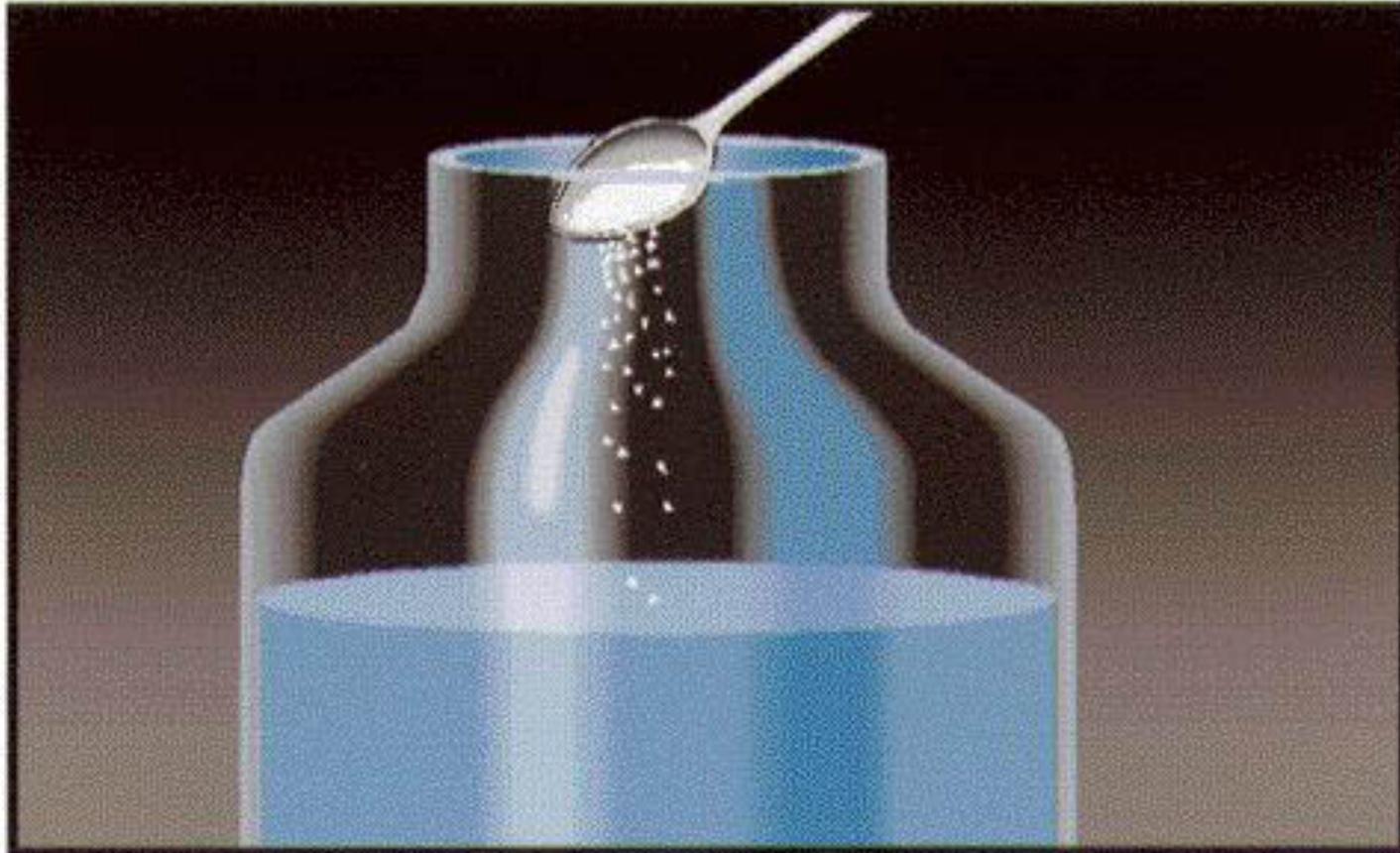
A candle flame seen at 30 miles on a clear, dark night

Absolute Threshold: Hearing



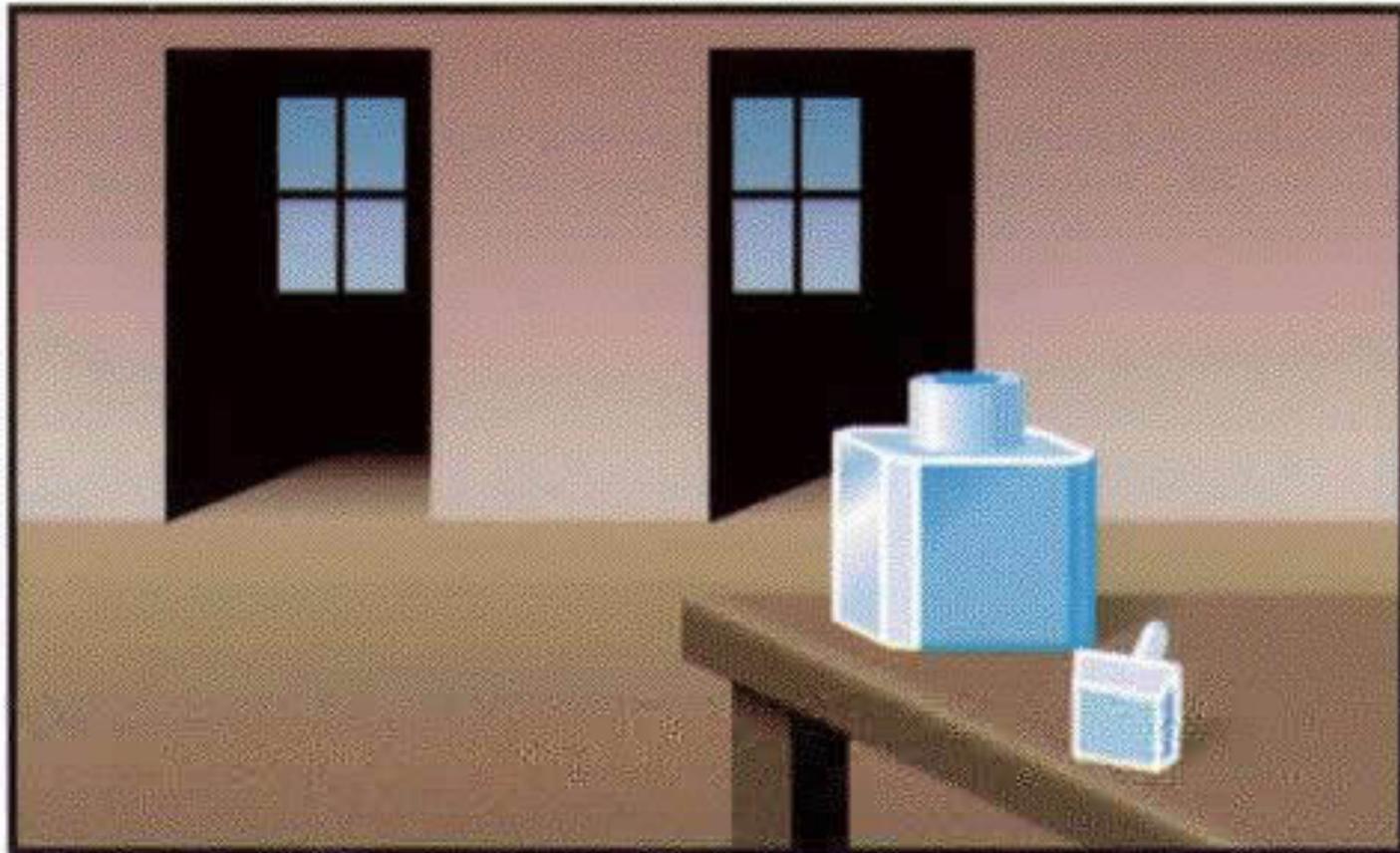
The tick of a watch under quiet conditions at 20 feet

Absolute Threshold: Taste



One teaspoon of sugar in 2 gallons
of water

Absolute Threshold: Smell



One drop of perfume diffused into the entire volume of a 3-room apartment

Absolute Threshold: Touch



The wing of a bee falling on your cheek from a height of 1 centimeter

Thresholds

Signal Detection

- Signal-detection theory
 - Ratio of “hits” to “false alarms”



Signal Detection Theory (SDT)

Predicts how and when we detect the presence of a faint stimulus (signal) amid background noise (other stimulation). SDT assumes that there is no single absolute threshold and detection depends on:

Person's
experience
Expectations
Motivation
Level of fatigue



Carol Lee/ Tony Stone Images

SDT Matrix

The observer decides whether she hears the tone or not, based on the signal being present or not. This translates into four outcomes.

		Decision	
		Yes	No
Signal	Present	Hit	Miss
	Absent	False Alarm	Correct Rejection

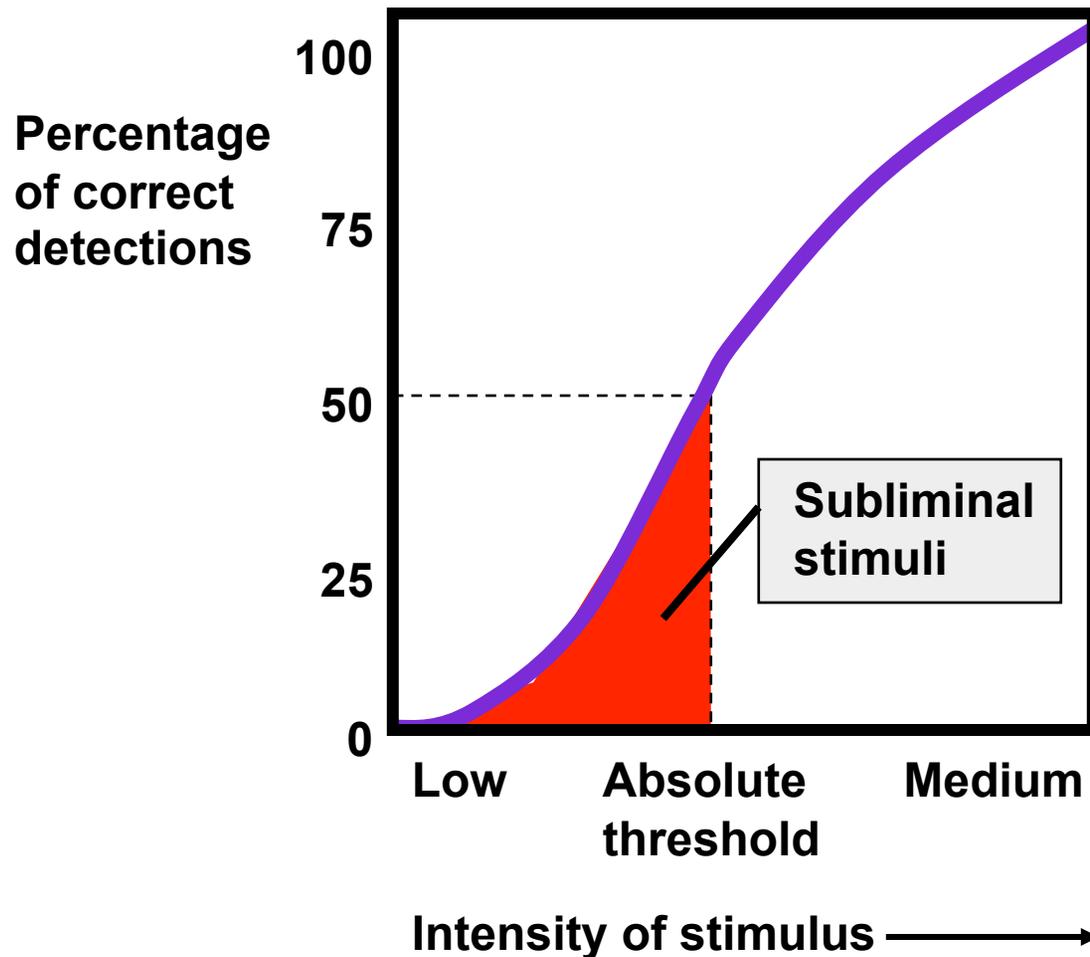
Thresholds

Subliminal Stimulation

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



Sensation- Thresholds



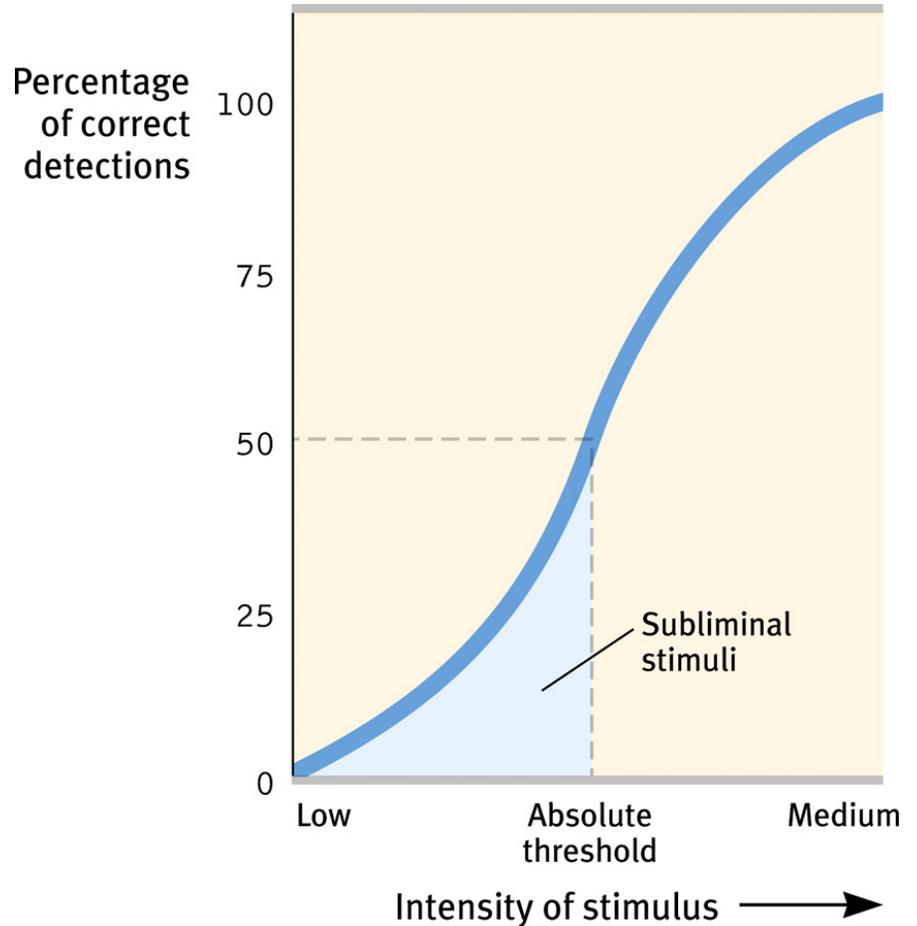
- **Subliminal**
 - When stimuli are below one's absolute threshold for conscious awareness

Subliminal Threshold

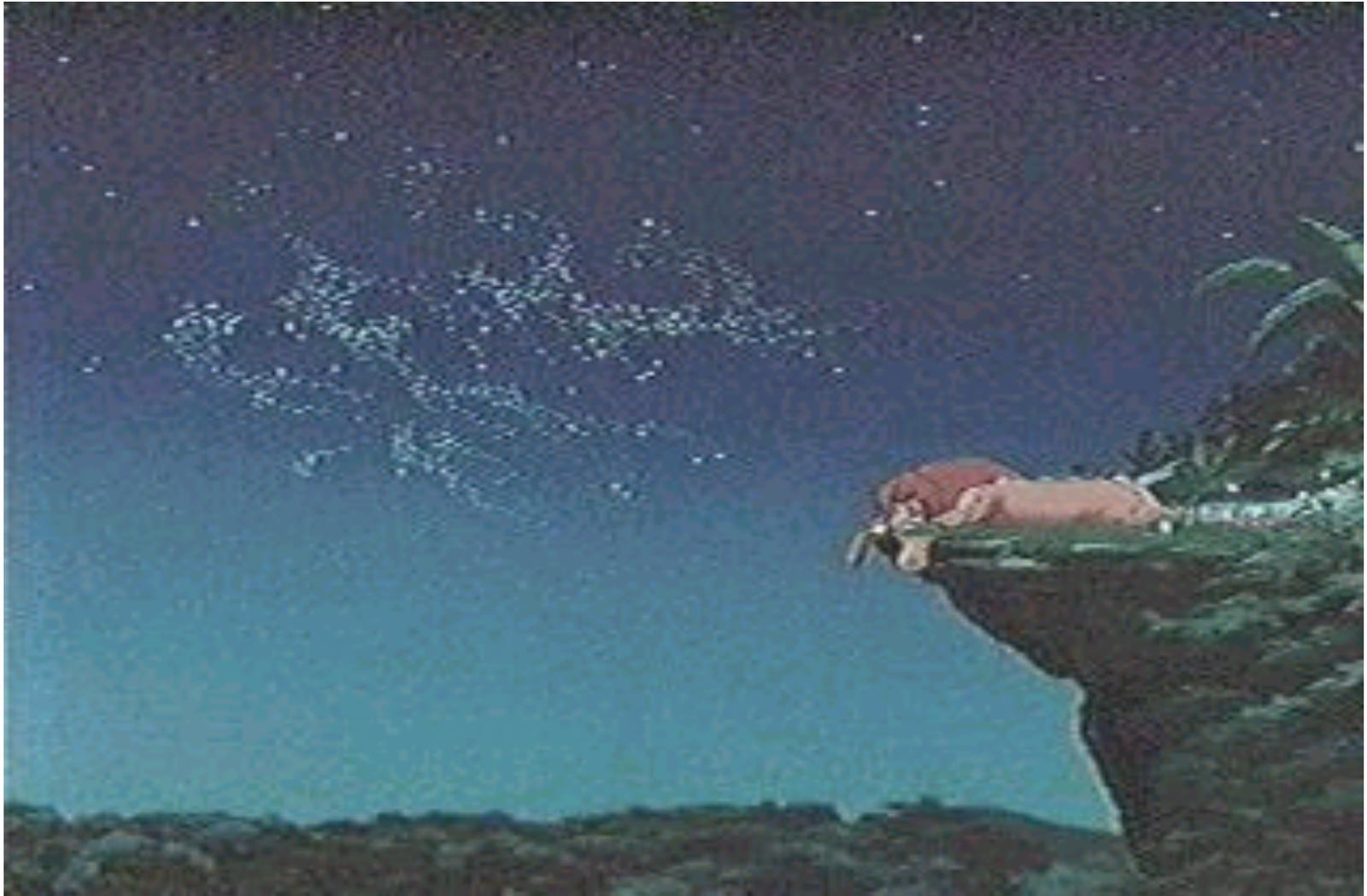
Subliminal Threshold: When stimuli are below one's absolute threshold for conscious awareness.



Kurt Scholz/ Superstock



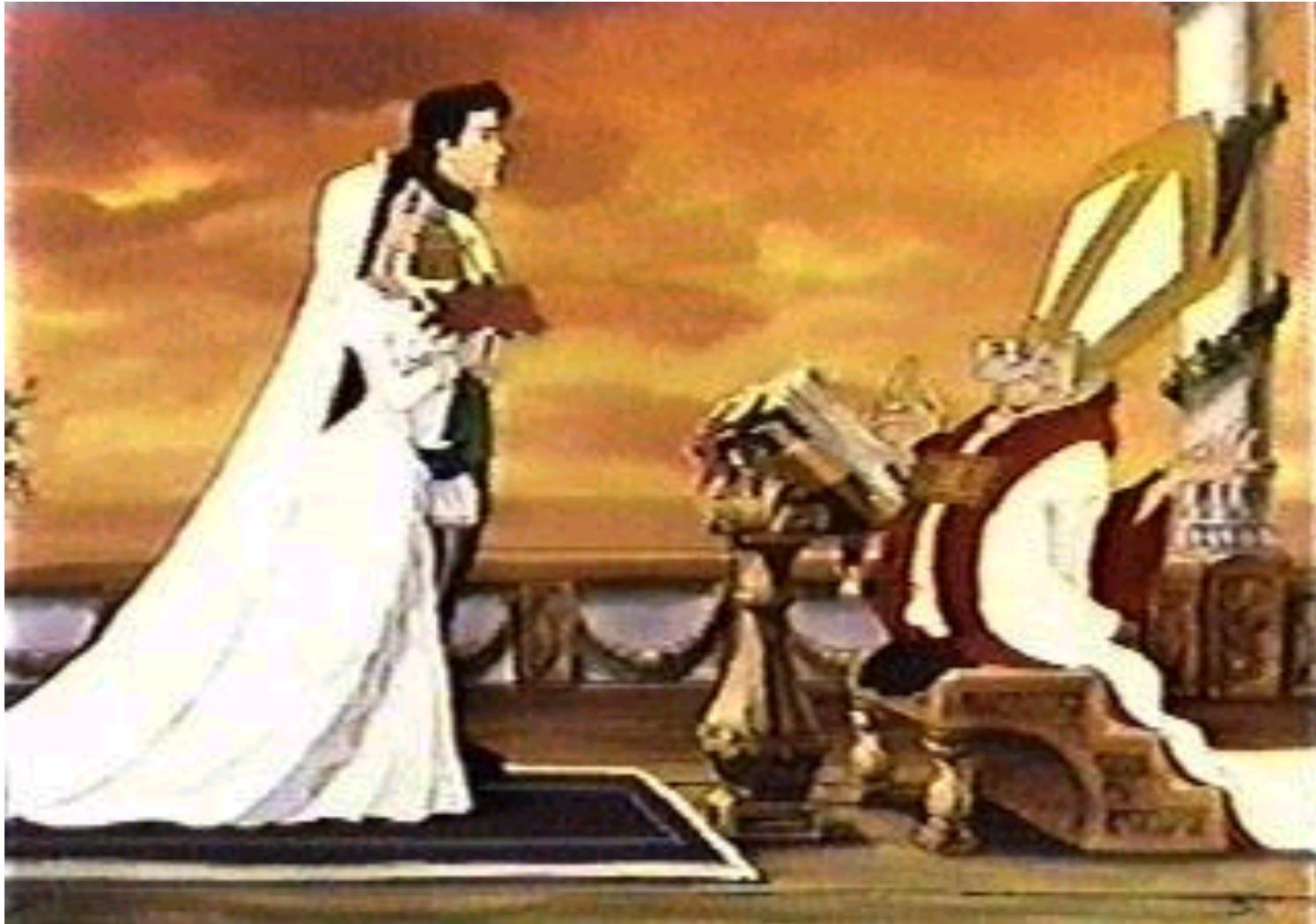
Subliminals



Subliminals



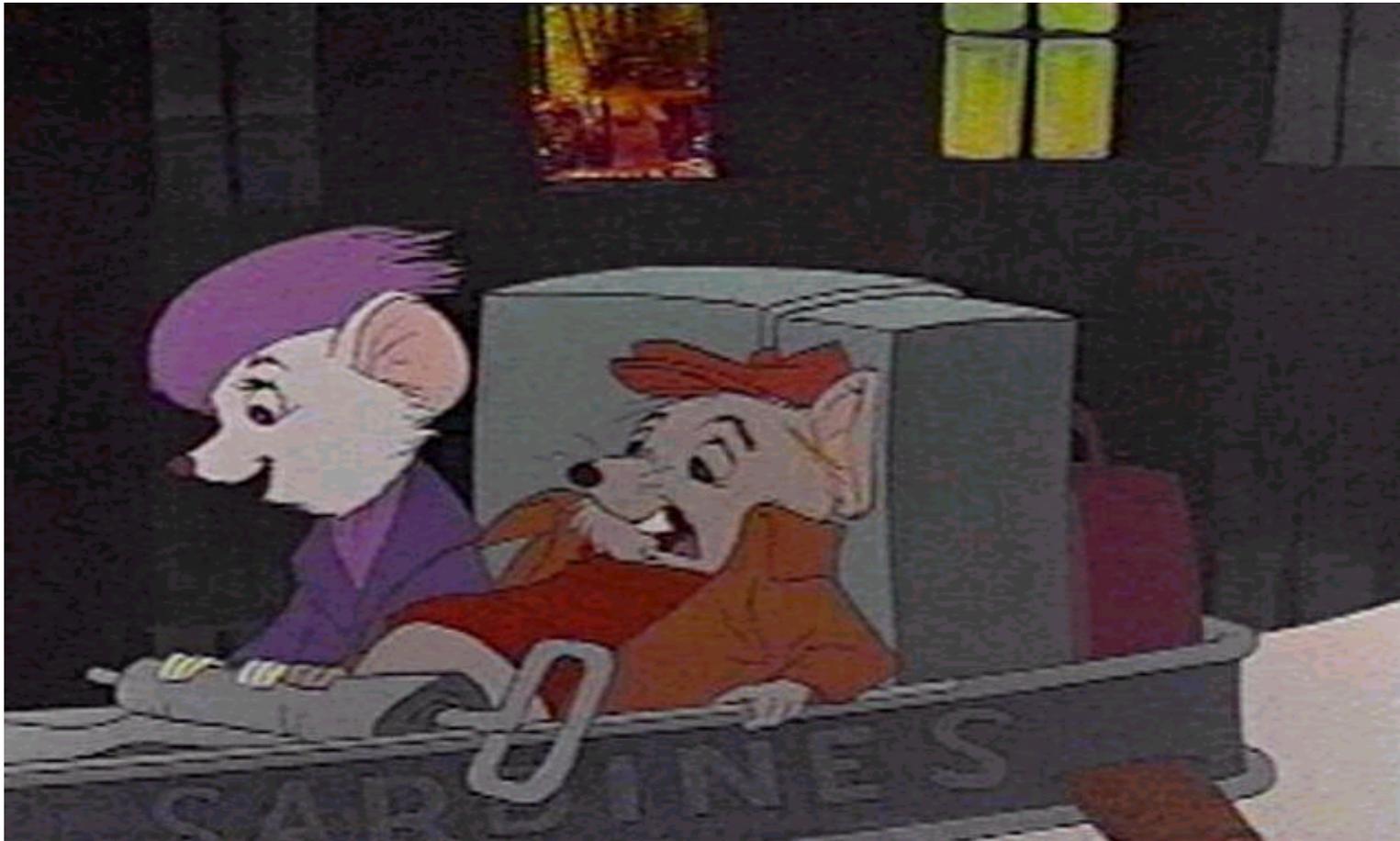
Subliminals



Subliminals



Subliminals



Subliminals



Subliminals



Thresholds

Difference Thresholds

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

Just noticeable difference

The LORD is my shepherd;
I shall not want.

Just noticeable difference

He maketh me to lie down
in green pastures:

Just noticeable difference

he leadeth me
beside the still waters.

Just noticeable difference

He restoreth my soul:
he leadeth me

Just noticeable difference

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

Just noticeable difference

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

Just noticeable difference

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

Just noticeable difference

thy rod and thy staff
they comfort me.

Just noticeable difference

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

Just noticeable difference

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

Just noticeable difference

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

Just noticeable difference

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

Just noticeable difference

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
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Thou preparest a table before me
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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.

Sensation- Thresholds

- Difference Threshold
 - minimum difference between two stimuli required for detection 50% of the time
 - just noticeable difference (JND)

Sensation- Thresholds

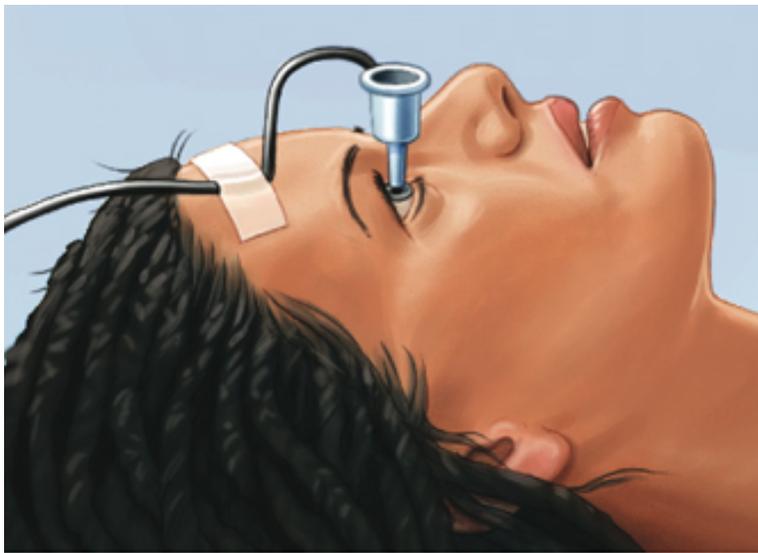
- **Weber's Law**- to perceive as different, two stimuli must differ by a constant minimum percentage
 - light intensity- 8%
 - weight- 2%
 - tone frequency- 0.3%

Sensory Adaptation

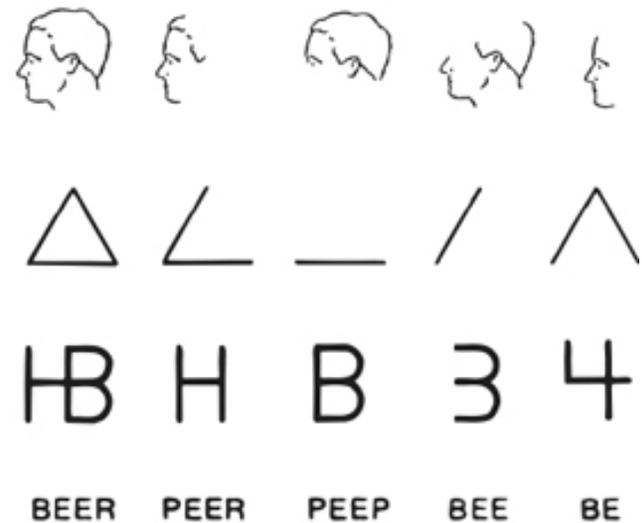
- Sensory Adaptation

- Informative changes

- Reality versus usefulness



(a)



(b)

Sensory Adaptation

Diminished sensitivity as a consequence of constant stimulation.



Put a band aid on your arm and after awhile you don't sense it.

Transduction

In sensation, the transformation of stimulus energy into neural impulses-- conversion of one form of energy to another

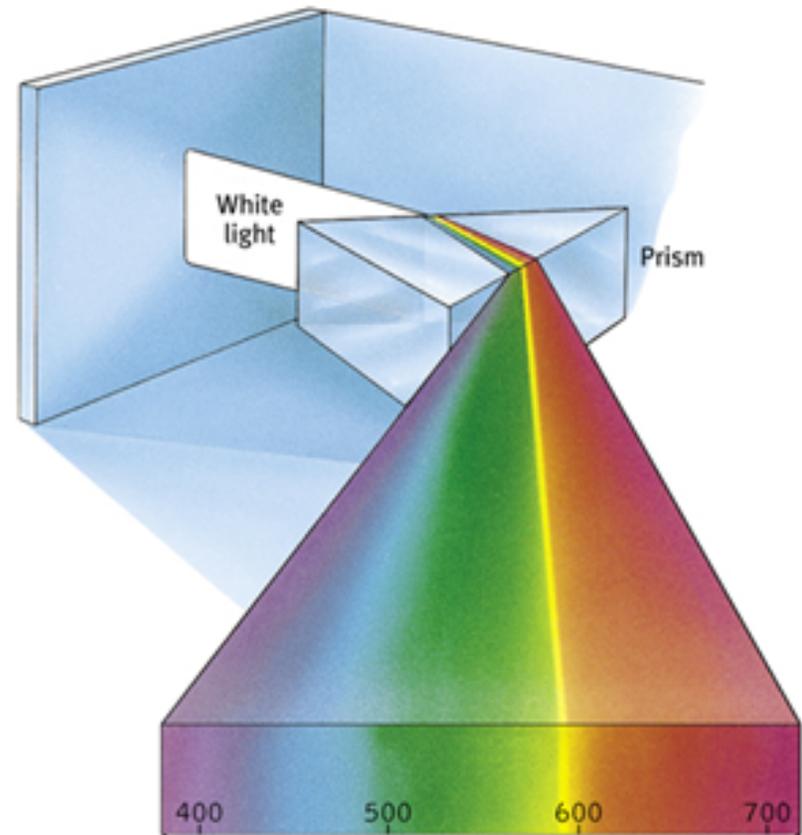
Phototransduction: Conversion of light energy into neural impulses that the brain can understand.

Vision



The Stimulus Input: Light Energy

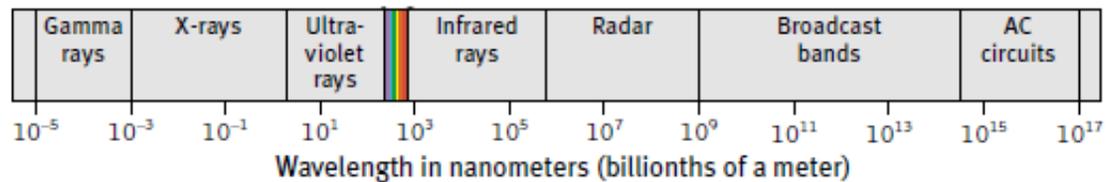
- Transduction (transform)
- Wavelength
- Hue (color)
 - Wavelength
- Intensity
 - Wave amplitude



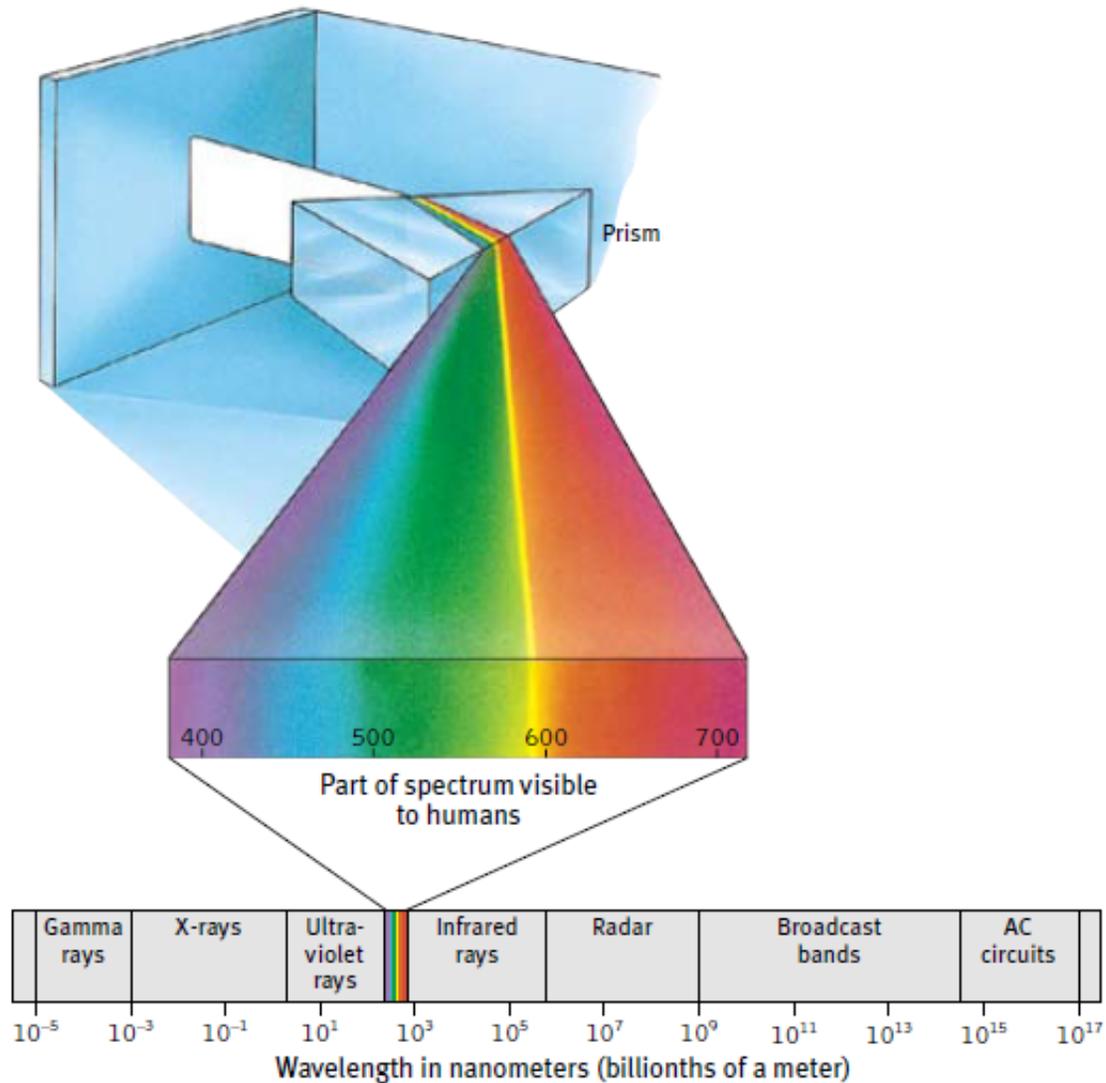
Light Characteristics

1. Wavelength (hue/color)
2. Intensity (brightness)
3. Saturation (purity)

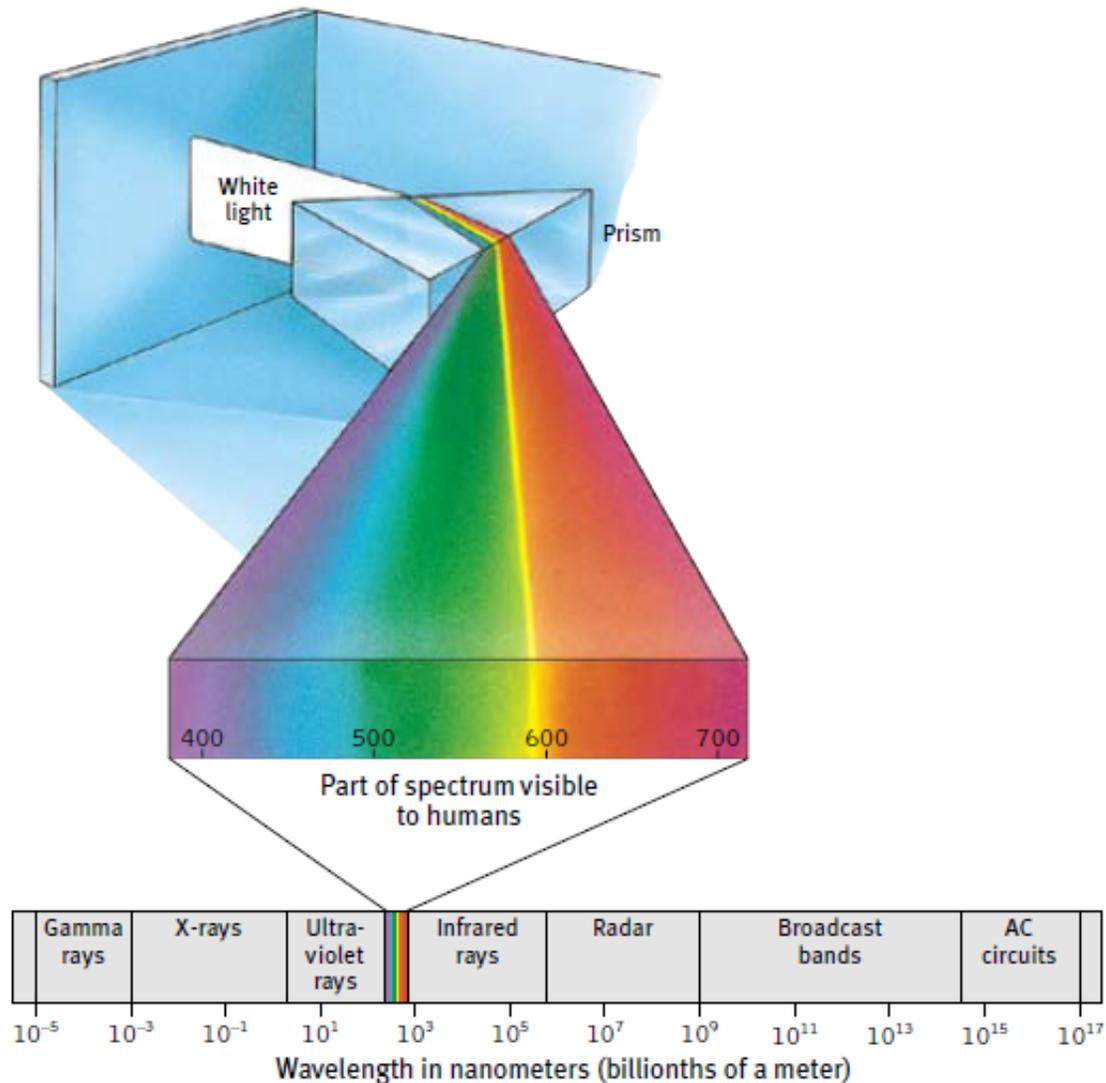
Electromagnetic Energy Spectrum



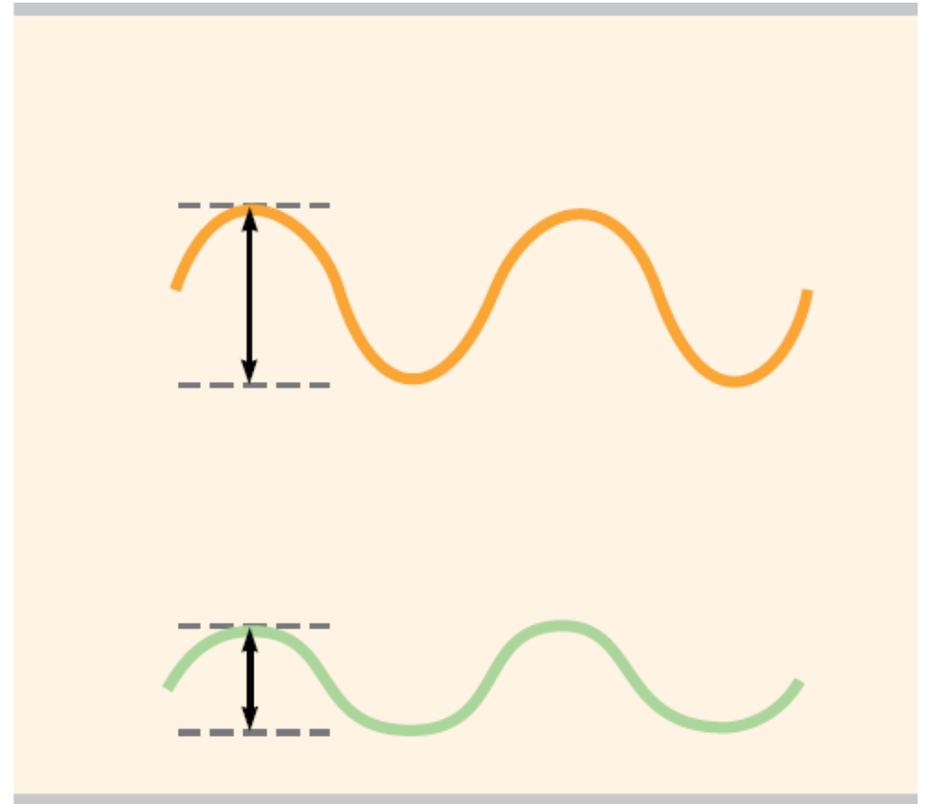
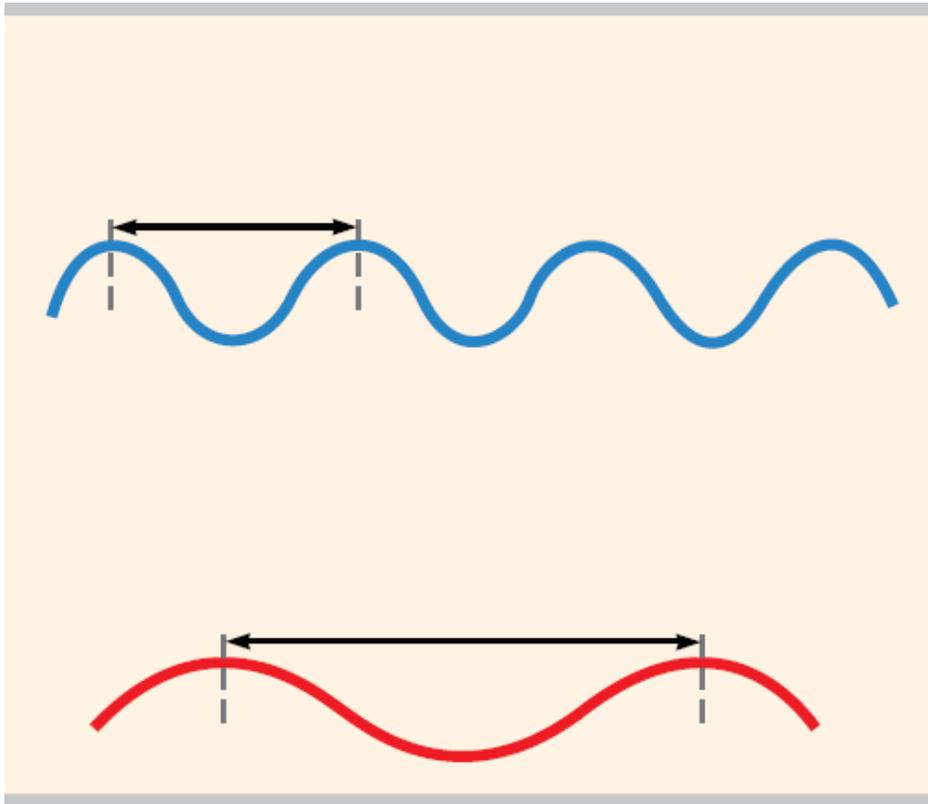
Electromagnetic Energy Spectrum



Electromagnetic Energy Spectrum



The Physical Property of Waves



The Physical Property of Waves

Short wavelength = high frequency
(bluish colors)



The Physical Property of Waves

Short wavelength = high frequency
(bluish colors)



Long wavelength = low frequency
(reddish colors)



The Physical Property of Waves

Short wavelength = high frequency
(bluish colors)



Long wavelength = low frequency
(reddish colors)



Great amplitude
(bright colors)



The Physical Property of Waves

Short wavelength = high frequency
(bluish colors)



Long wavelength = low frequency
(reddish colors)



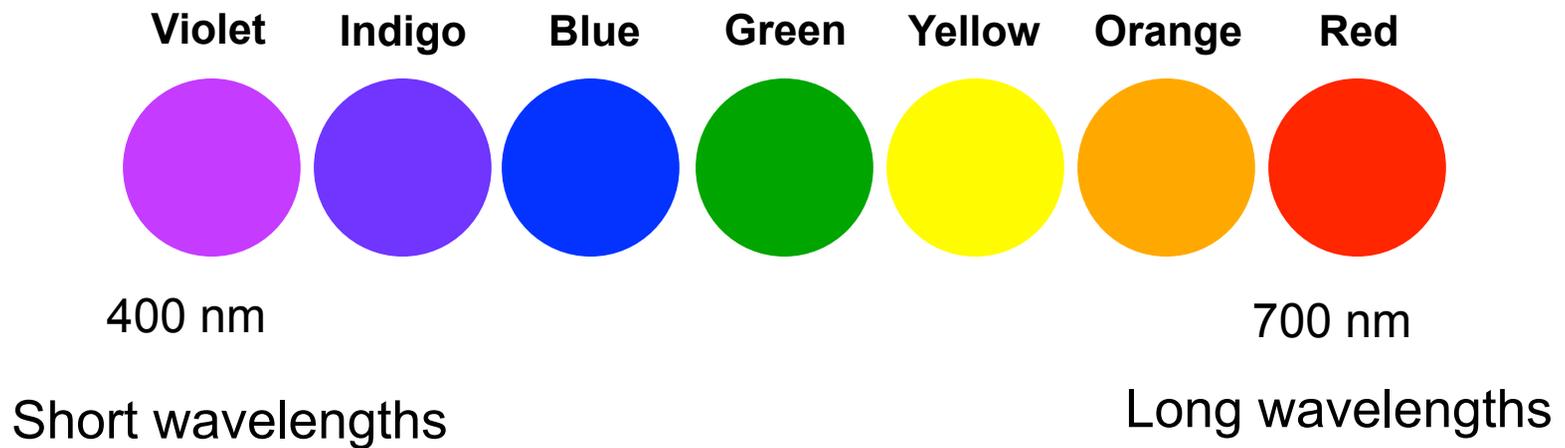
Great amplitude
(bright colors)



Small amplitude
(dull colors)

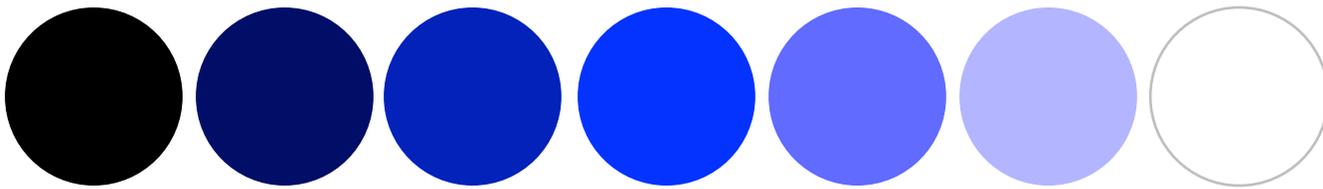


Wavelength (Hue)



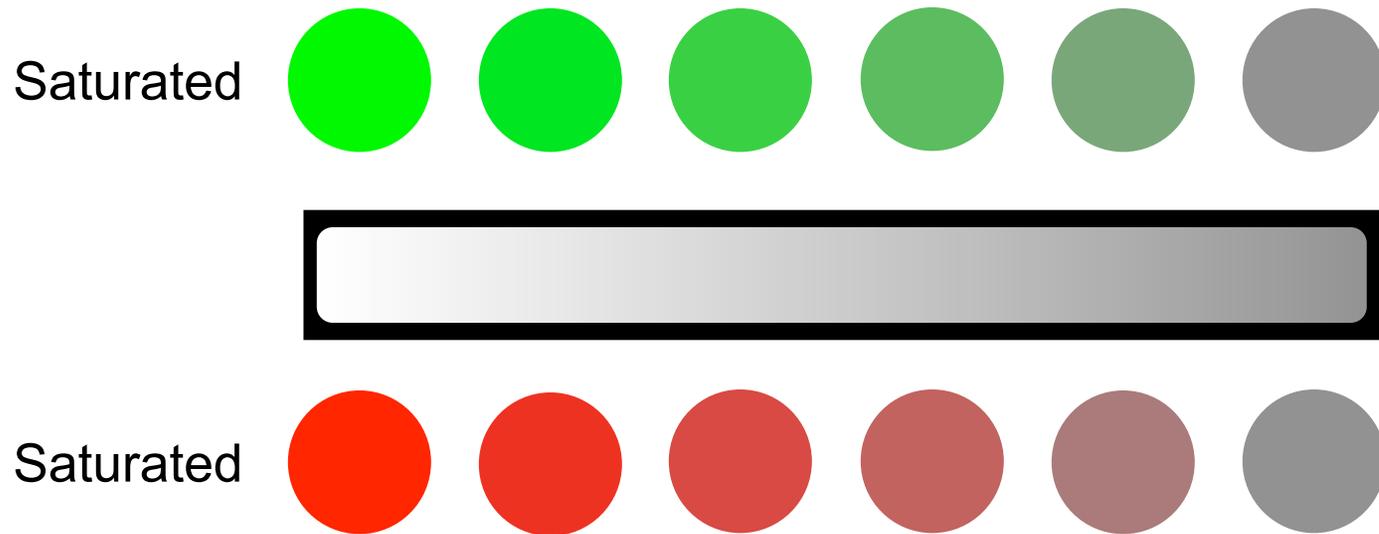
Different wavelengths of light result in different colors.

Intensity (Brightness)



Blue color with varying levels of intensity.
As intensity increases or decreases, blue color
looks more “washed out” or “darkened.”

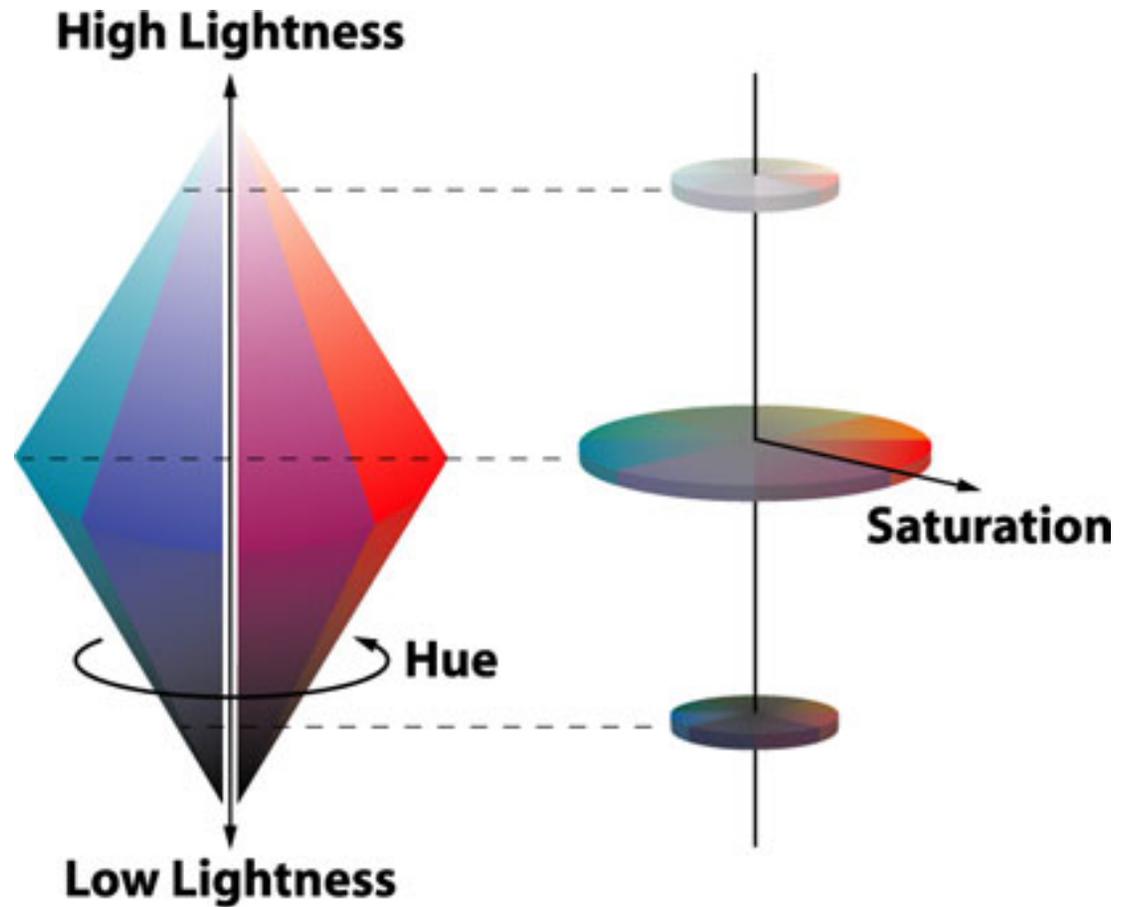
Purity (Saturation)



Monochromatic light added to green and red makes them less saturated.

Color Solid

Represents all three characteristics of light stimulus on this model.



Light: The Visual Stimulus

- Light can be described as both a particle and a wave
- Wavelength of a light is the distance of one complete cycle of the wave
- Visible light has wavelengths from about 400nm to 700nm
- Wavelength of light is related to its perceived color

When it comes to vision, humans and bees are on different wavelengths. The bee detects reflected ultraviolet wavelengths, enabling it to see the pollen landing field where it will find nutrients.



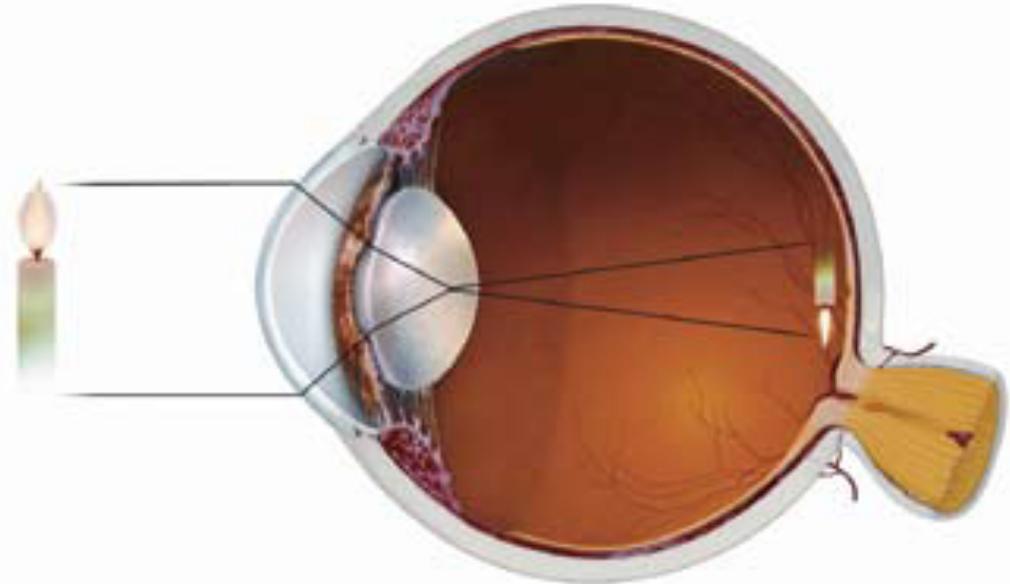
Human eye



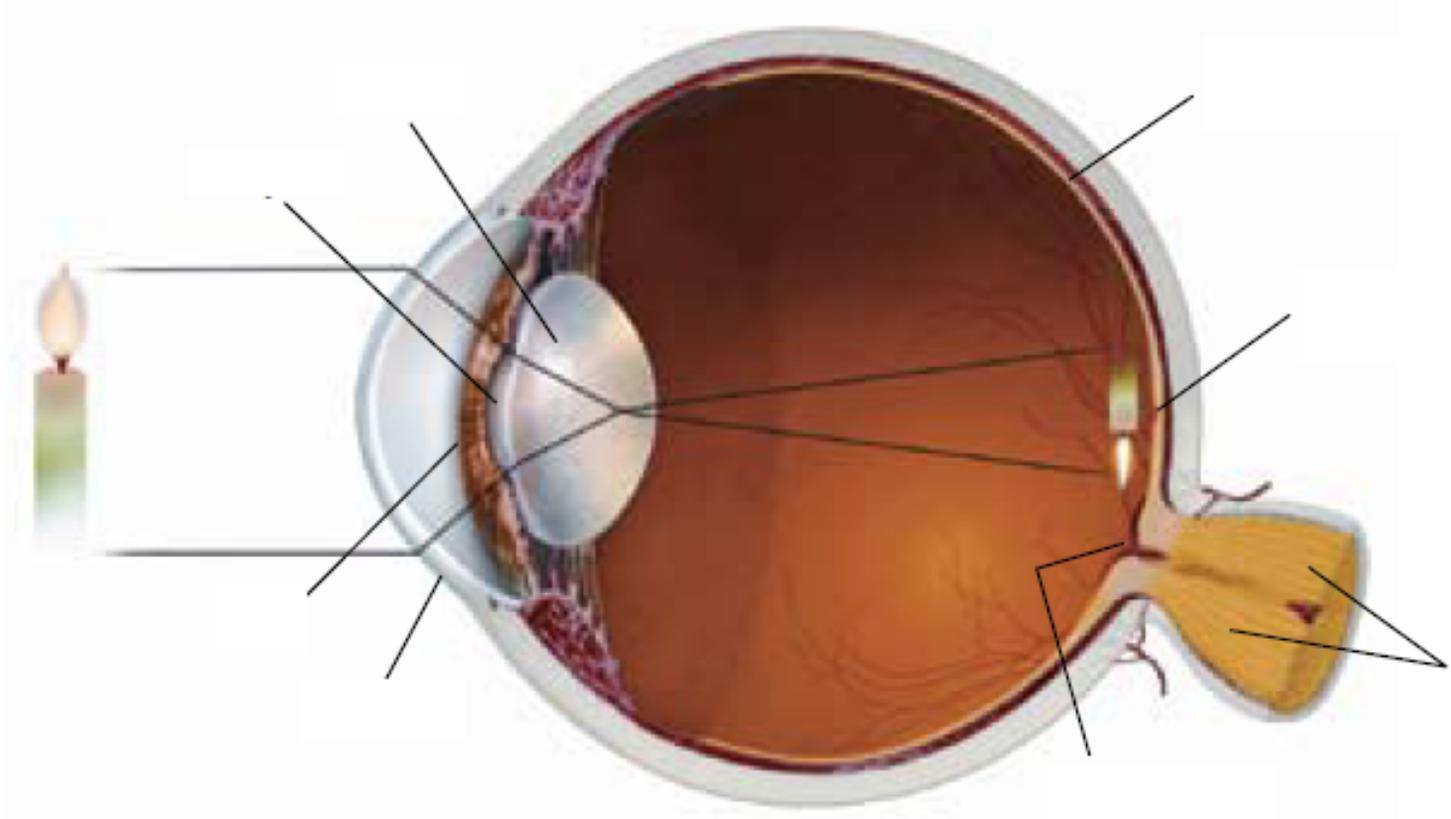
Bee's eye

The Eye

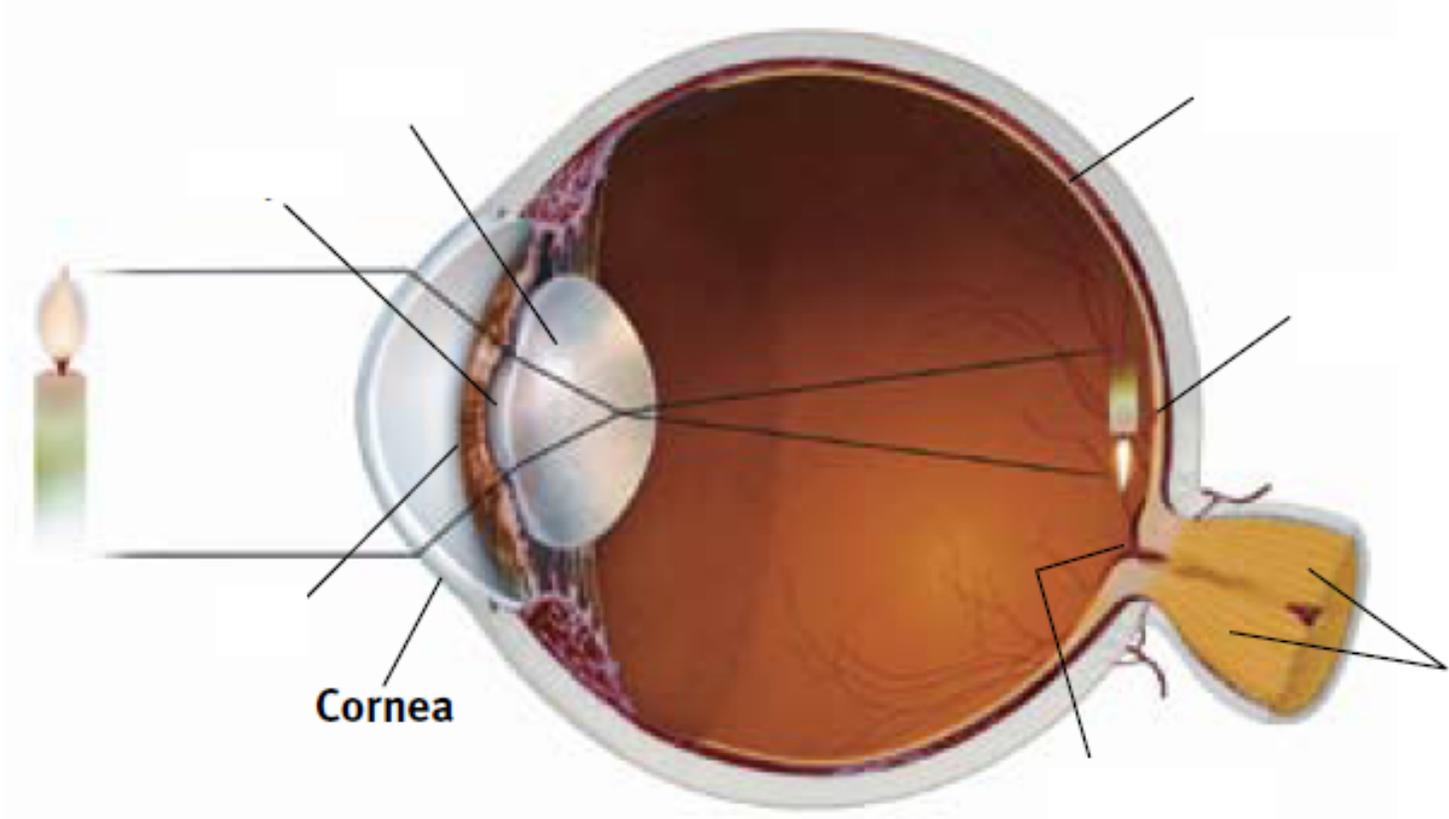
- Cornea
- Pupil
- Iris
- Lens
 - accommodation
- Retina



The Structure of the Eye

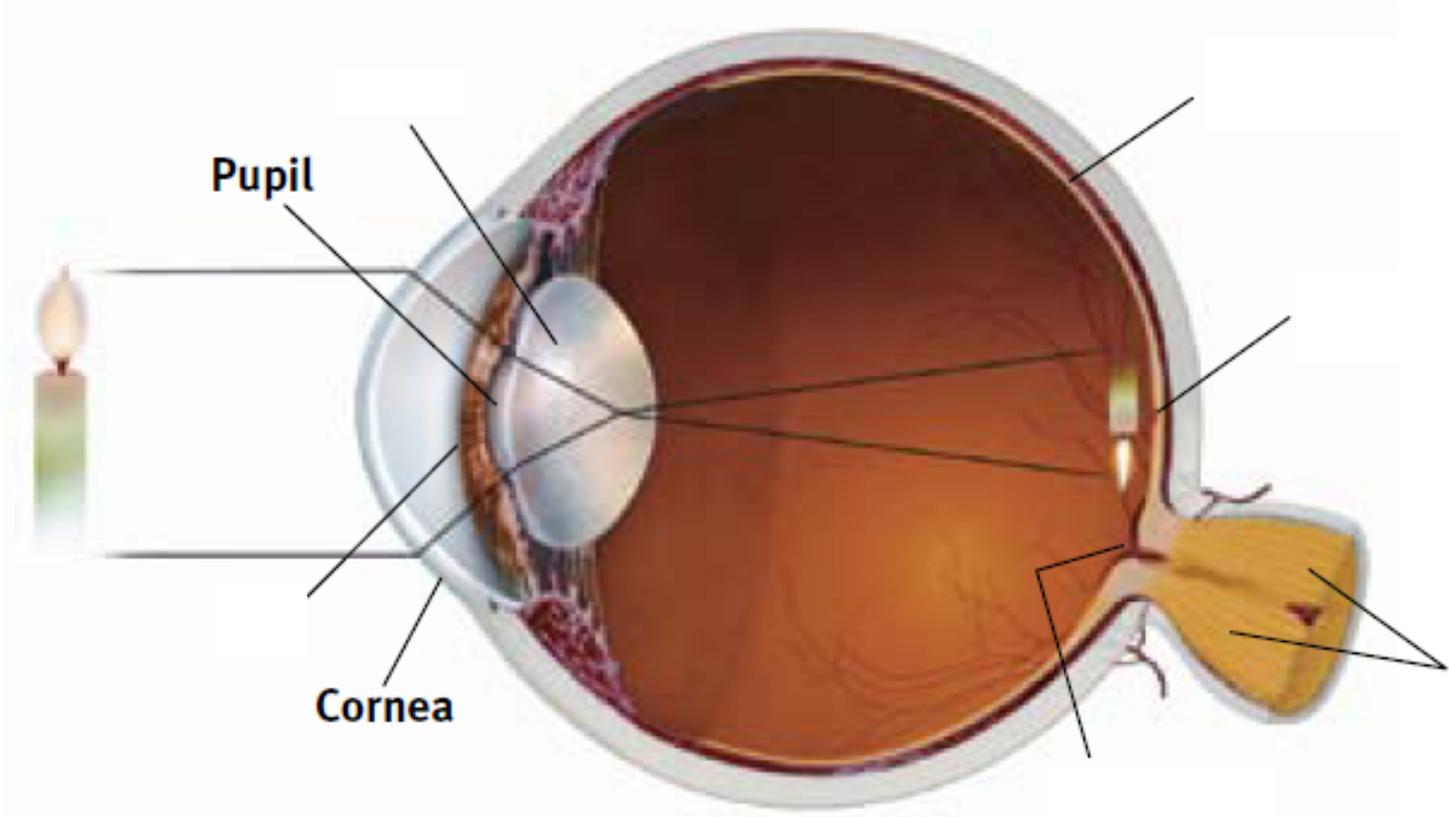


The Structure of the Eye



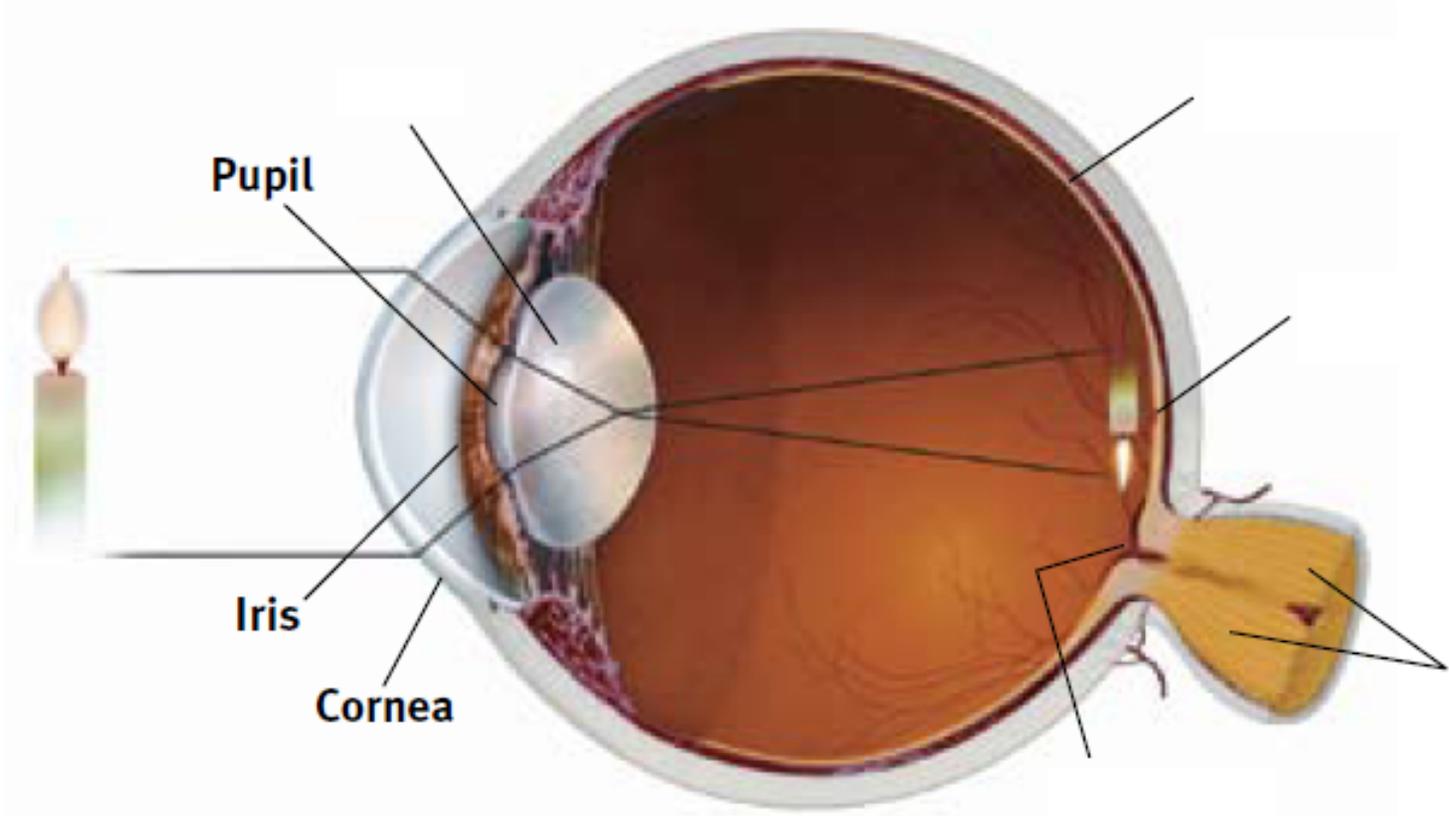
Cornea = outer covering of the eye.

The Structure of the Eye



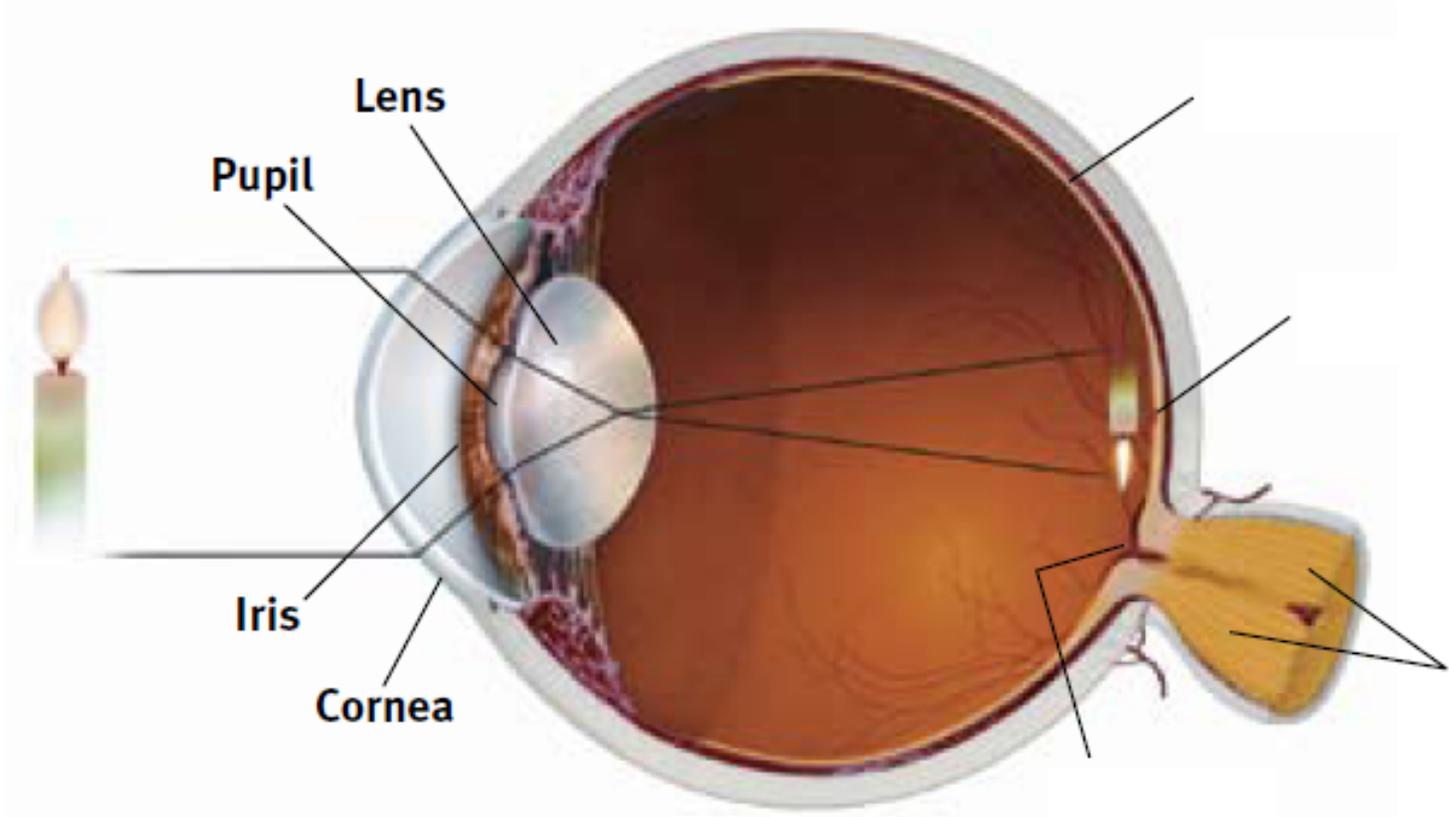
Pupil = the adjustable opening in the center of the eye through which light enters.

The Structure of the Eye



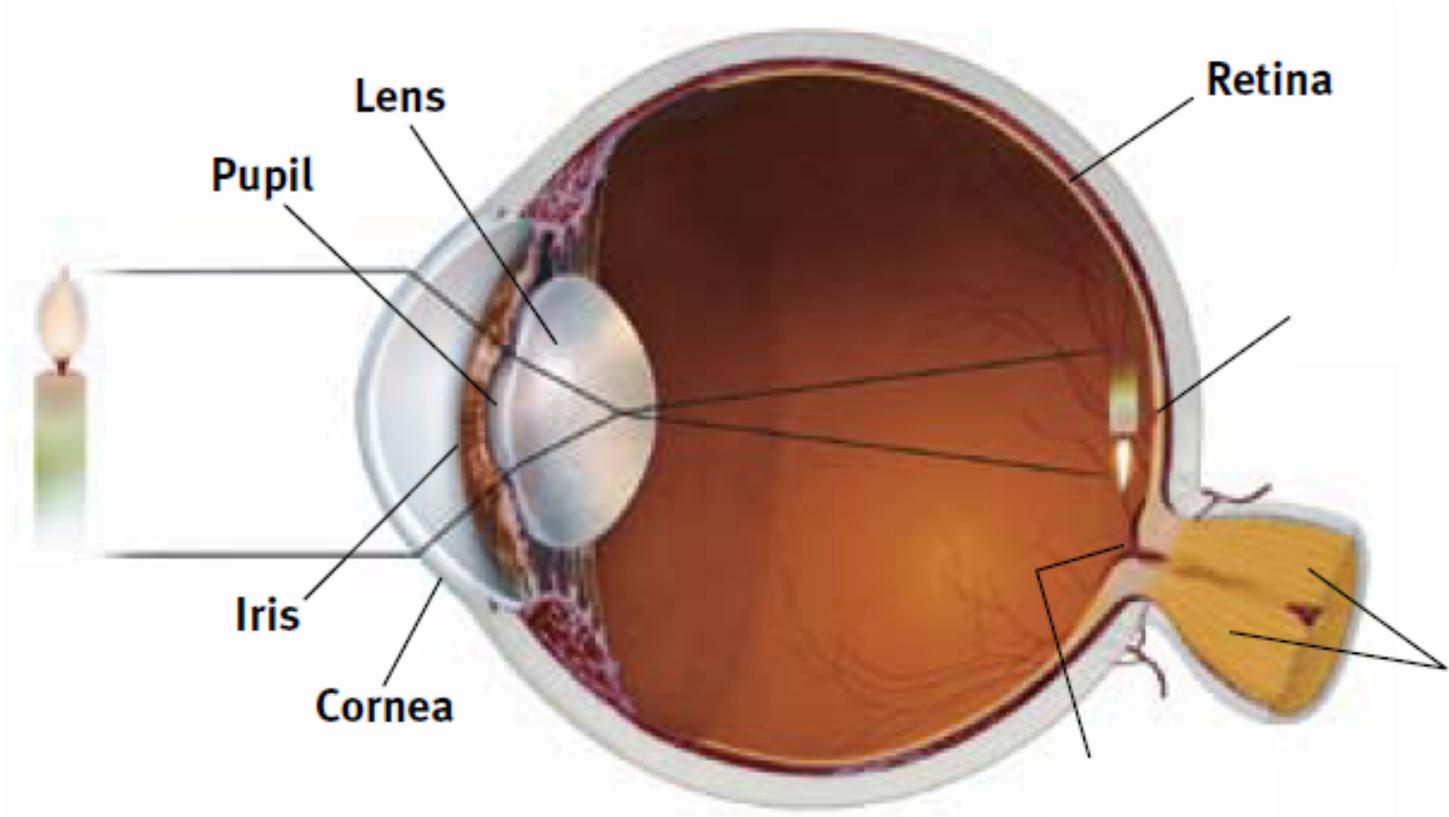
- Iris = a ring of muscle tissue that forms the colored portion of the eye around the pupil and controls the size of the pupil opening.
- The iris dilates/constricts in response to changing light intensity

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

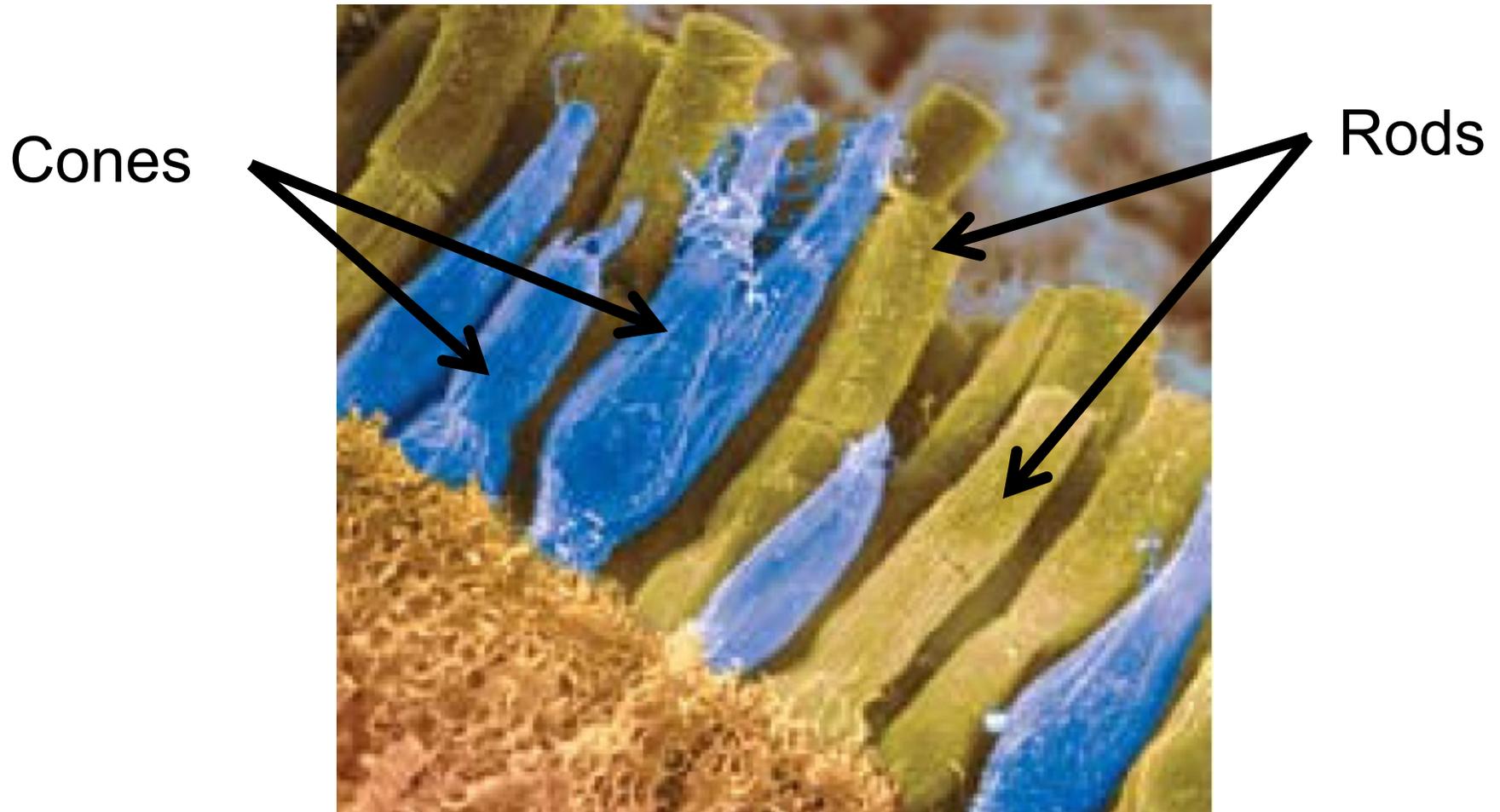


Retina = the light-sensitive inner surface of the eye, containing the receptor rods and cones plus layers of neurons that begin the processing of visual information.

The Eye

The Retina

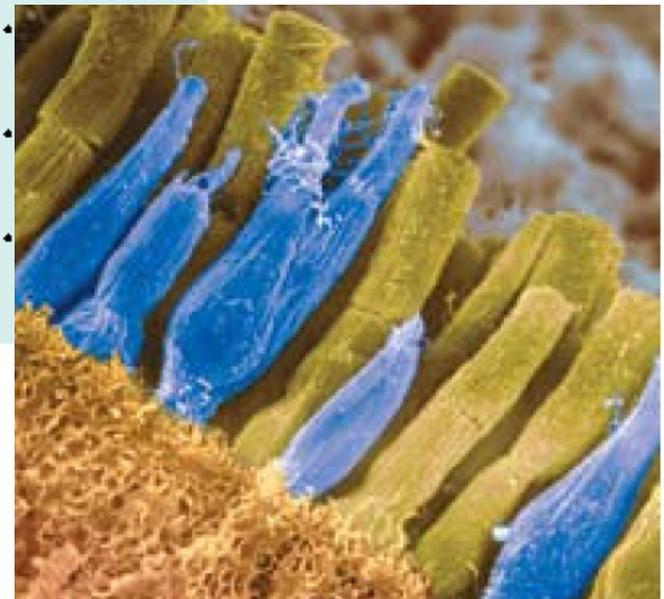
- Rods and Cones



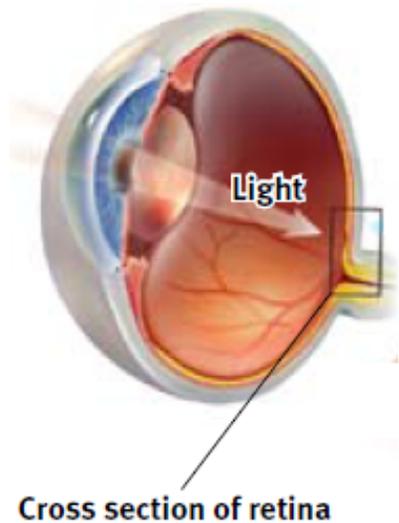
Rods versus Cones

RECEPTORS IN THE HUMAN EYE: ROD-SHAPED RODS AND CONE-SHAPED CONES

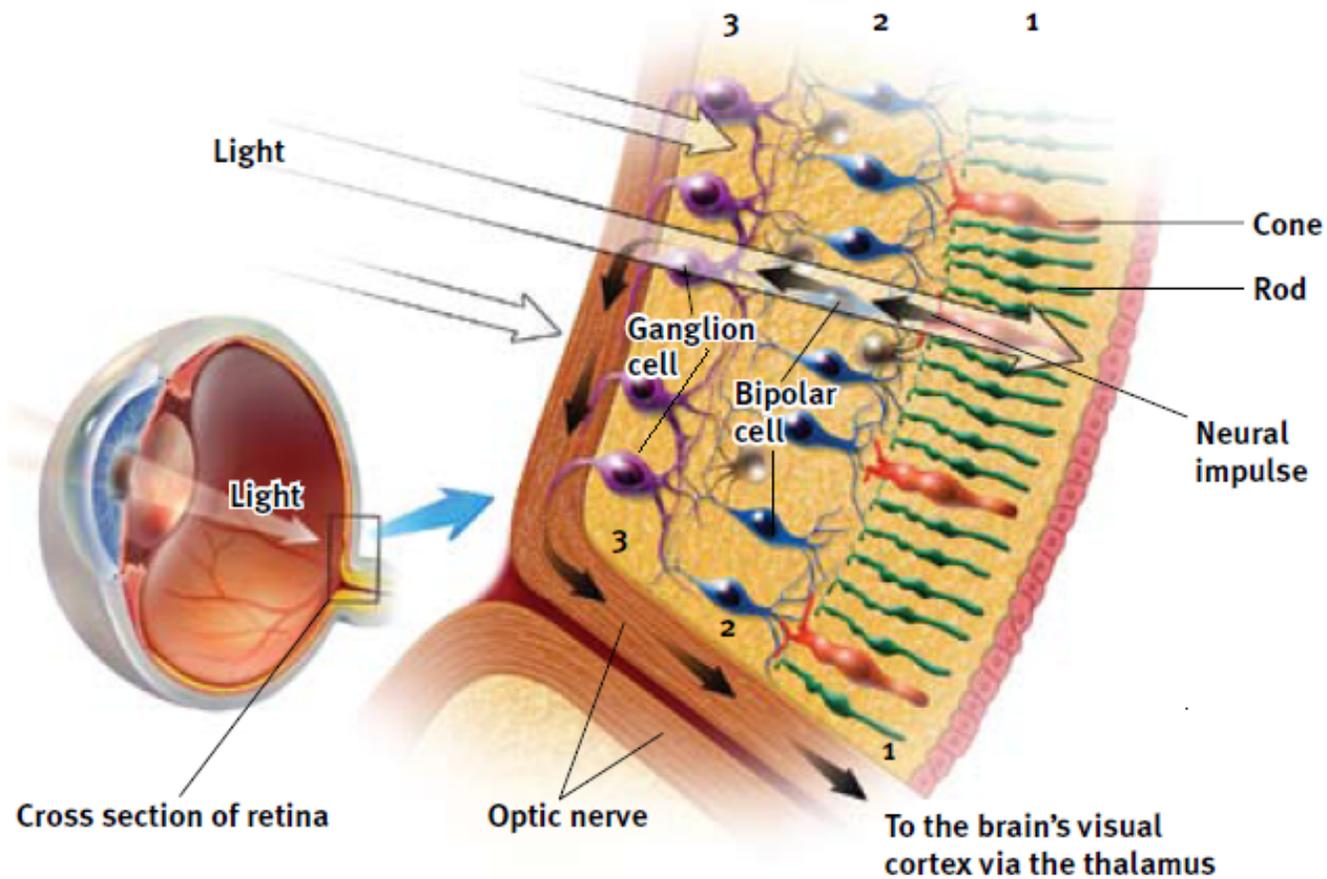
	Cones	Rods
Number	6 million	120 million
Location in retina	Center	Periphery
Sensitivity in dim light	Low	High
Color sensitivity	High	Low
Detail sensitivity	High	Low



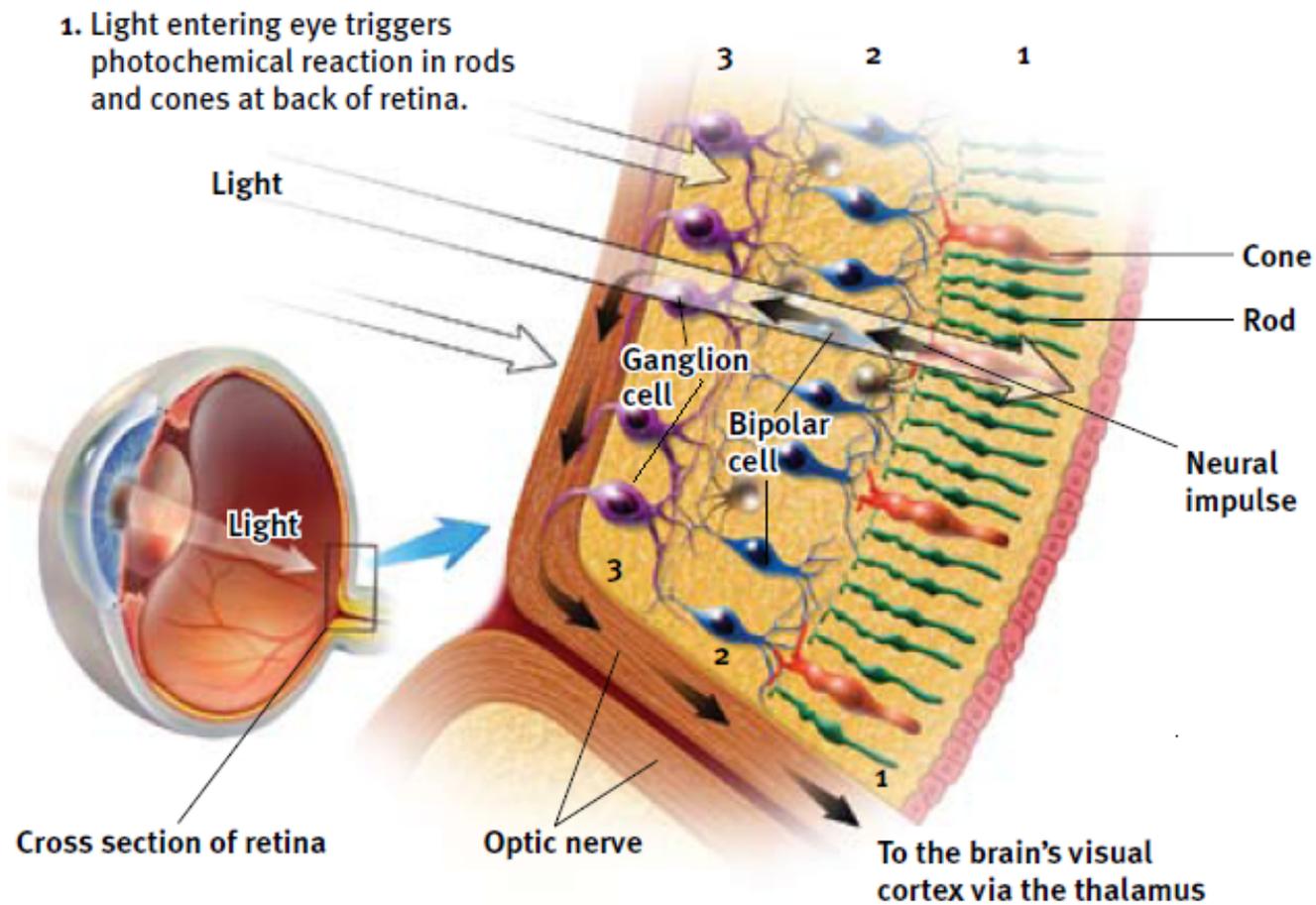
The Retina's Reaction to Light



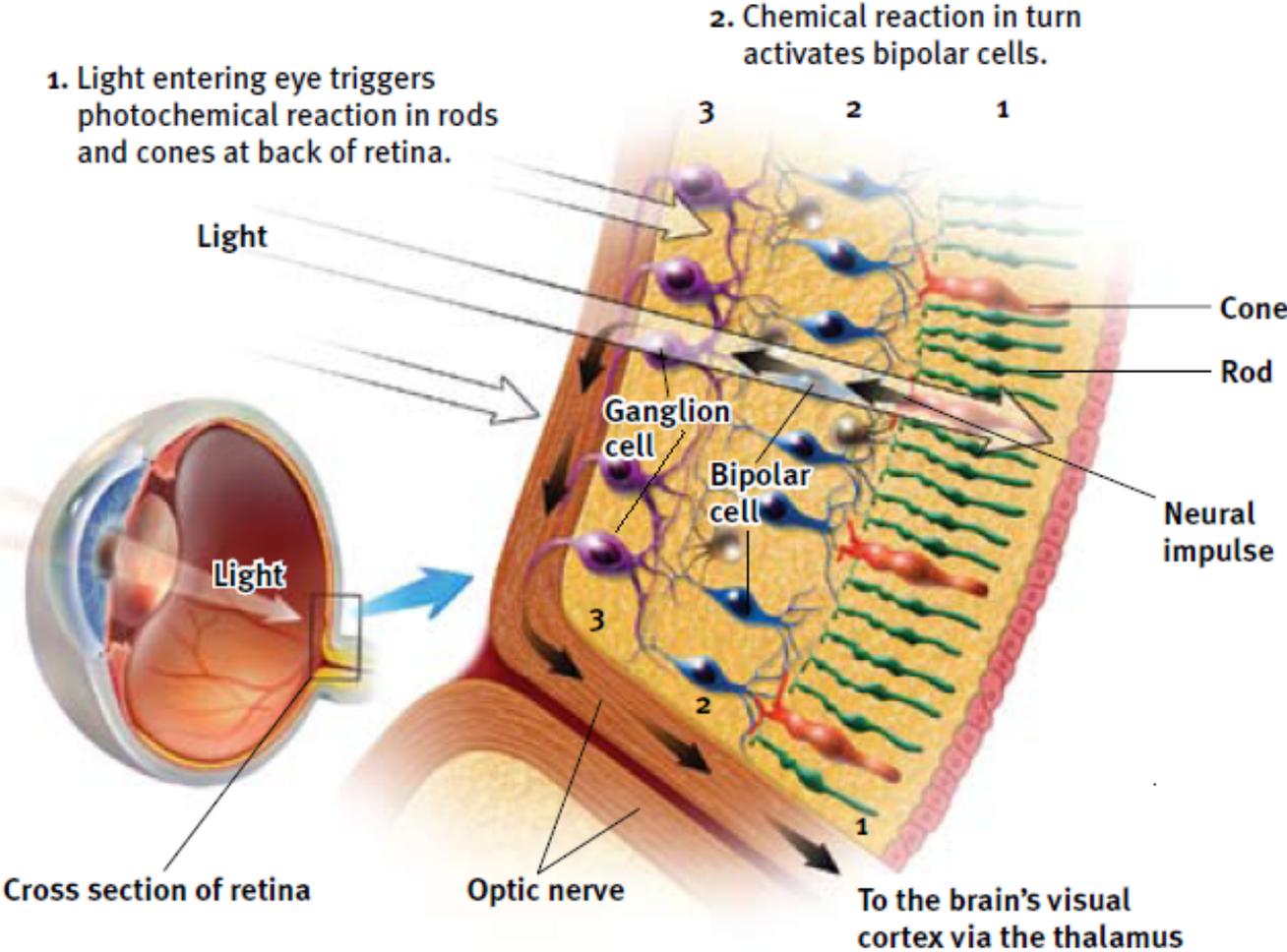
The Retina's Reaction to Light



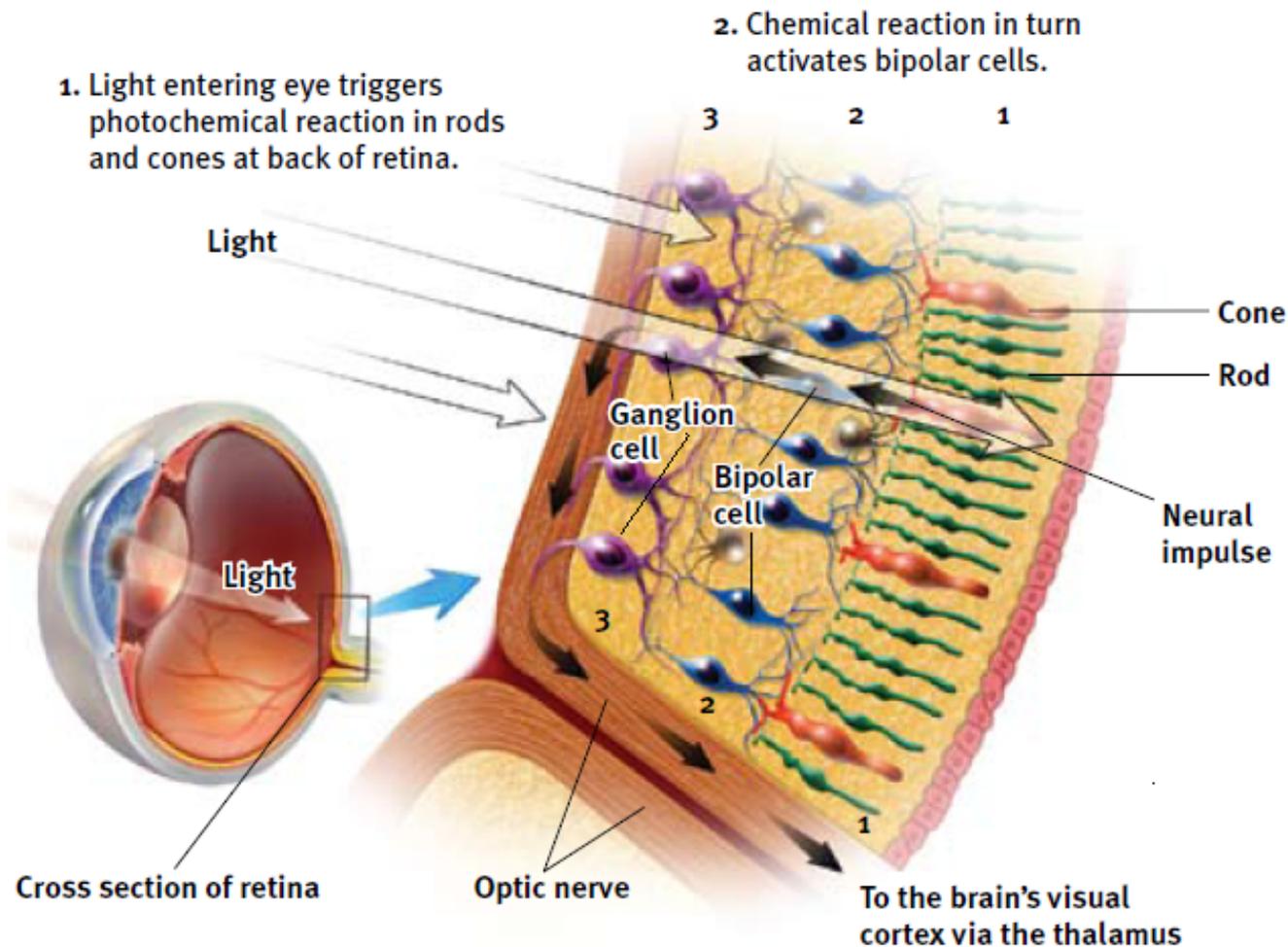
The Retina's Reaction to Light



The Retina's Reaction to Light



The Retina's Reaction to Light



3. Bipolar cells then activate the ganglion cells, the axons of which converge to form the optic nerve. This nerve transmits information to the visual cortex (via the thalamus) in the brain.

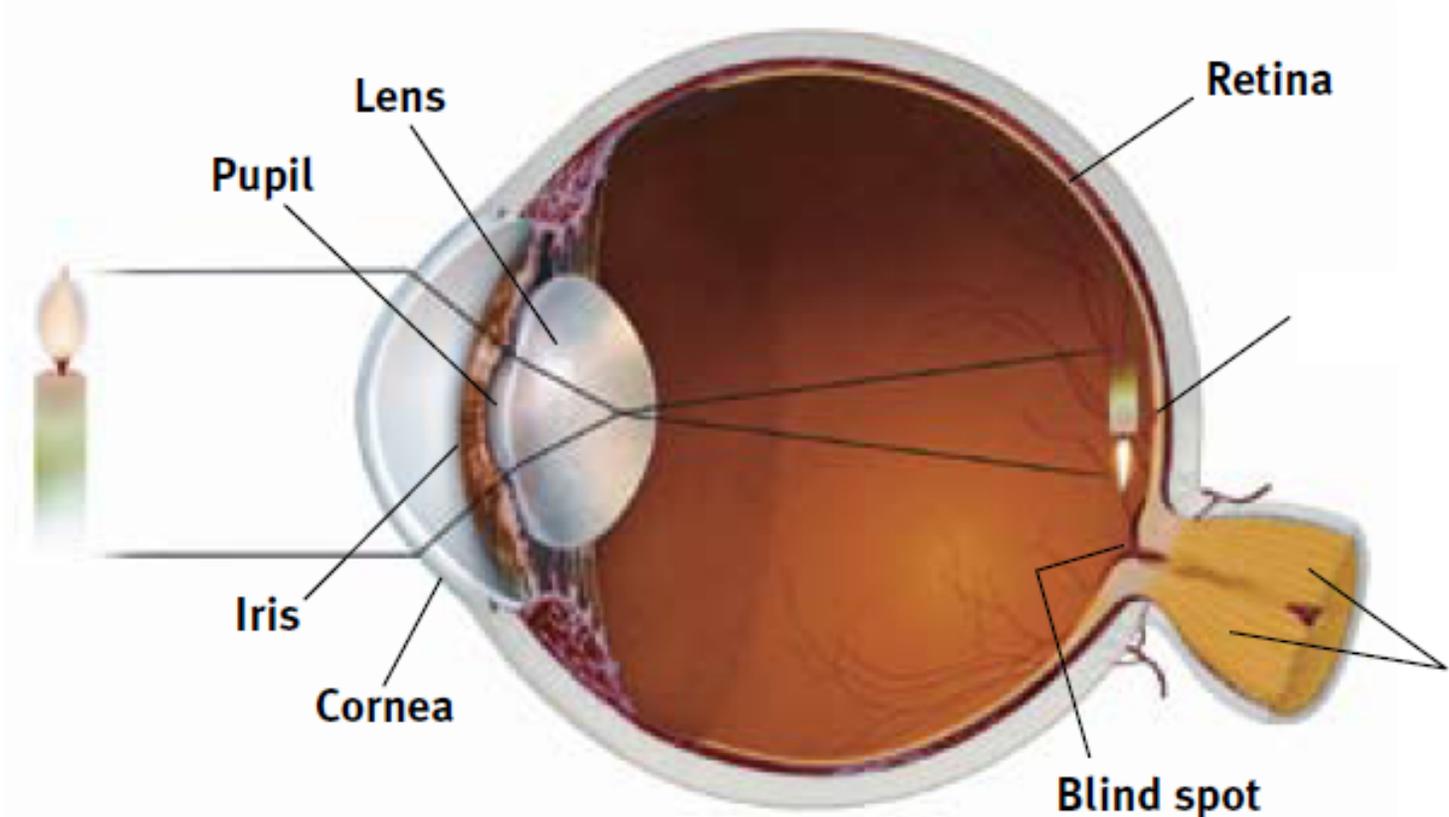
The Eye

The Retina

- Optic nerve
- Blind spot
- Fovea

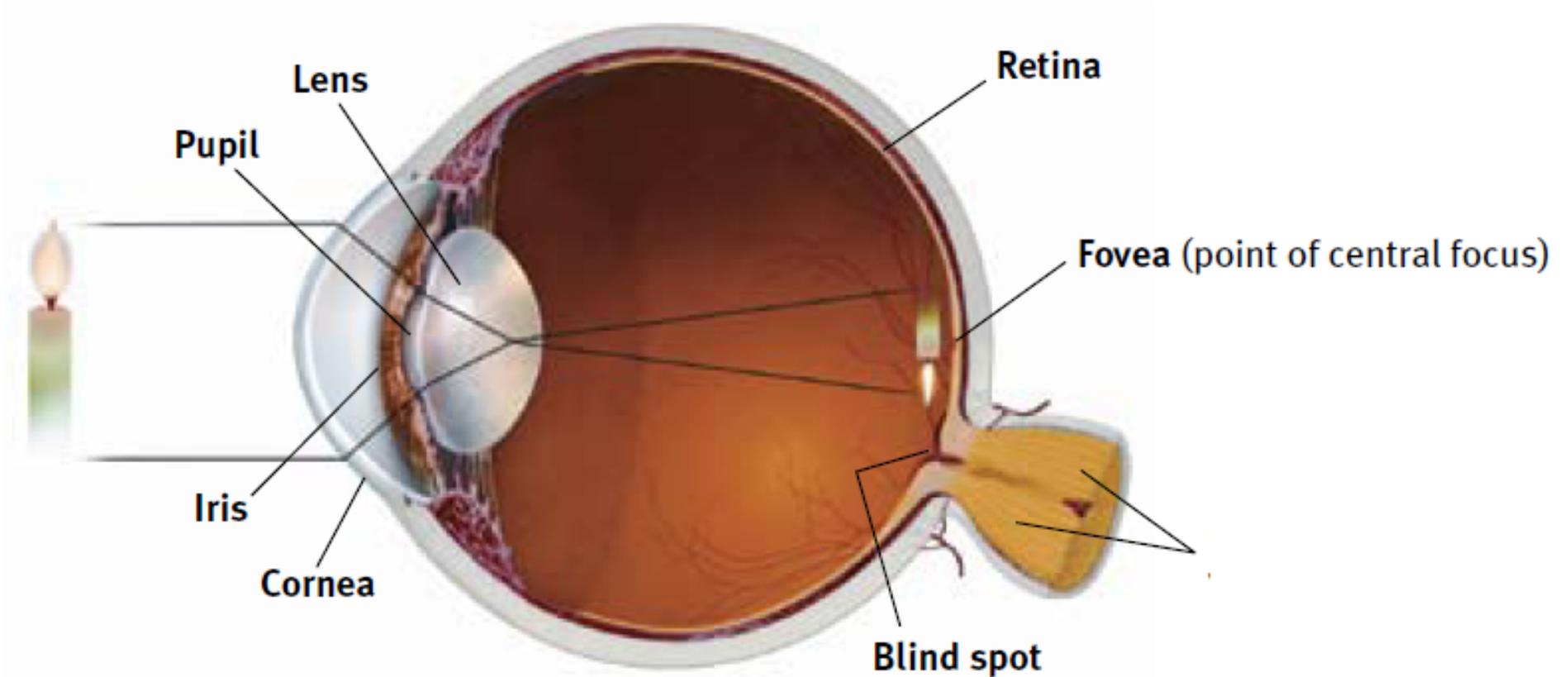


The Structure of the Eye



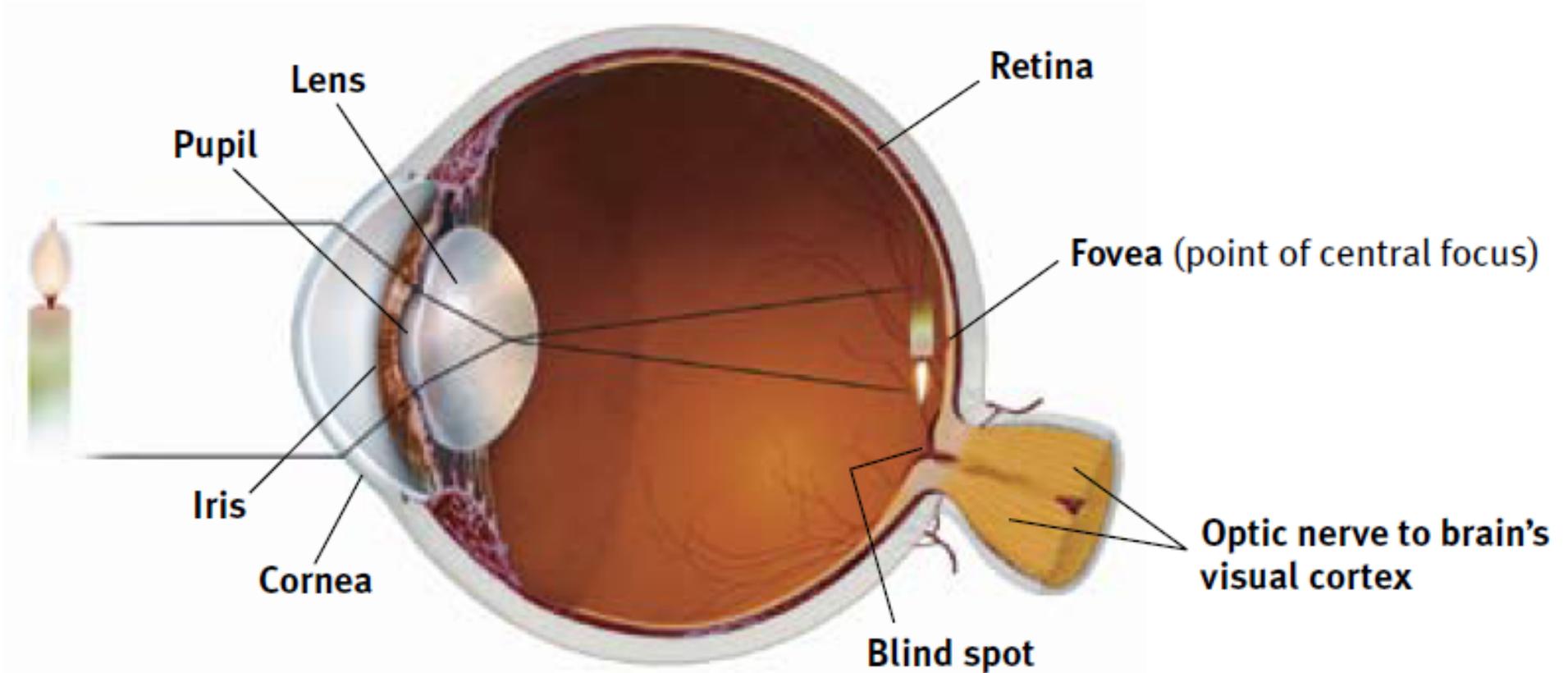
Blind Spot = the point at which the optic nerve leaves the eye, creating a “blind” spot because no receptor cells are located there.

The Structure of the Eye



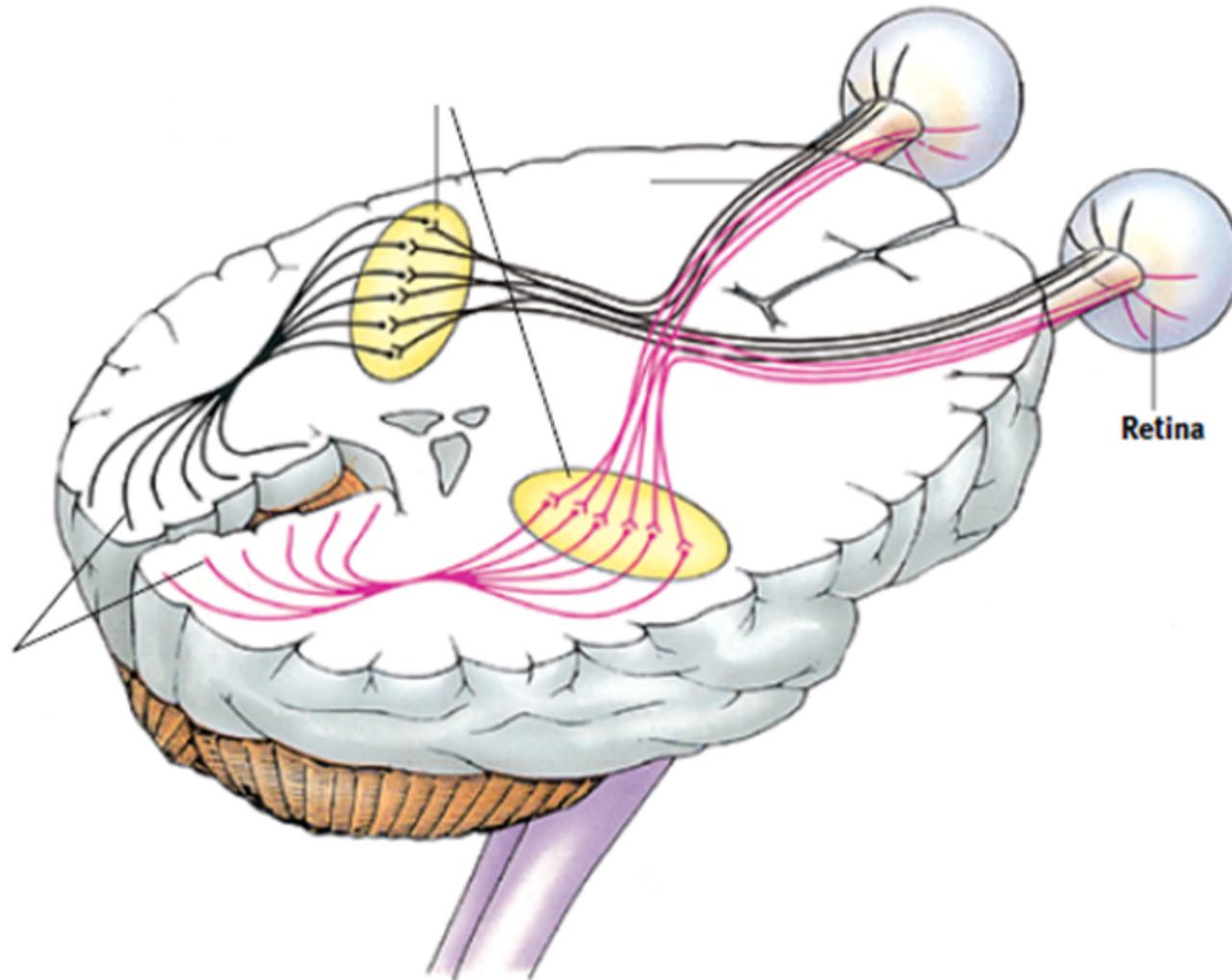
Fovea = the central focal point in the retina, around which the eye's cones cluster.

The Structure of the Eye

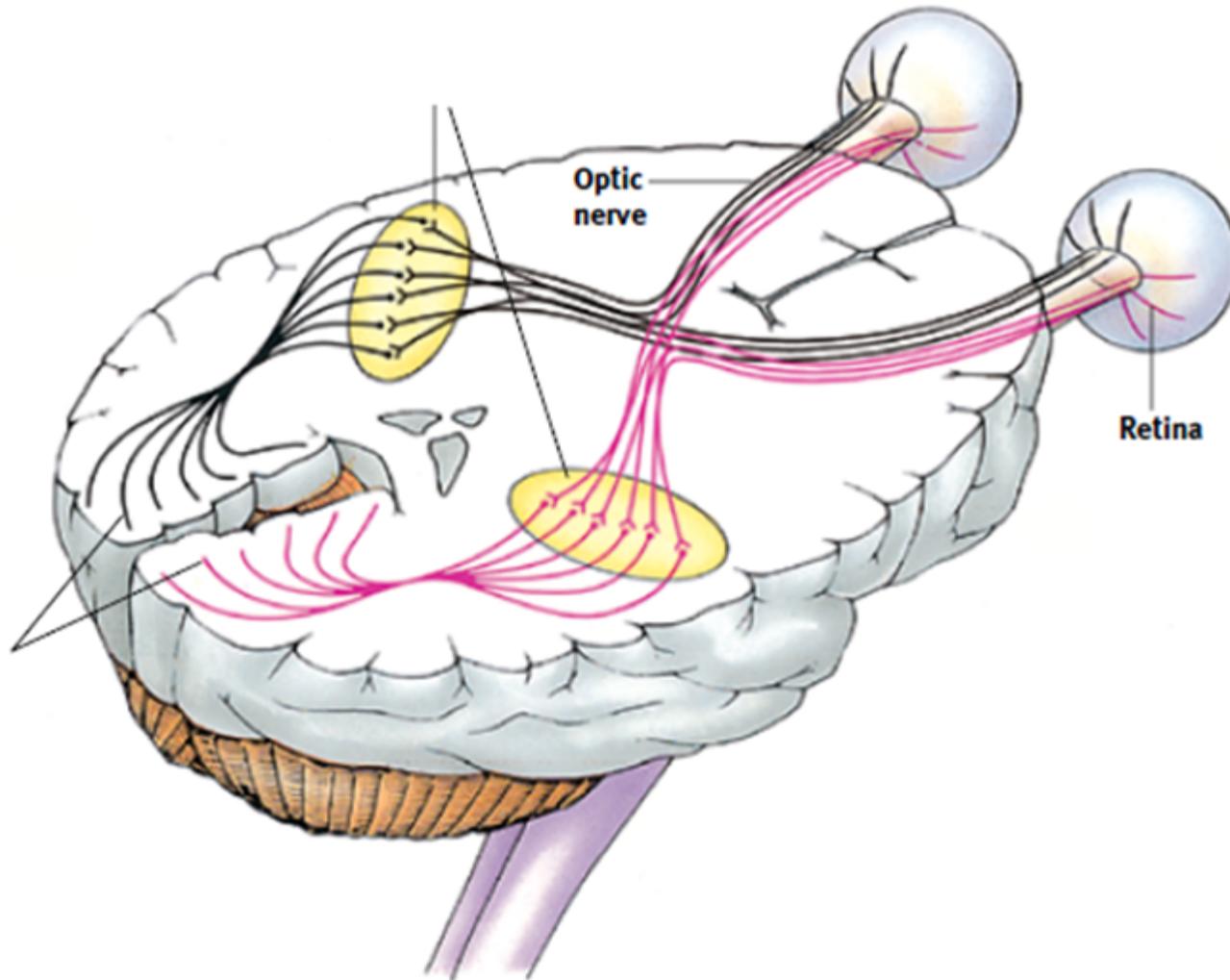


Optic Nerve = the nerve that carries neural impulses from the eye to the brain.

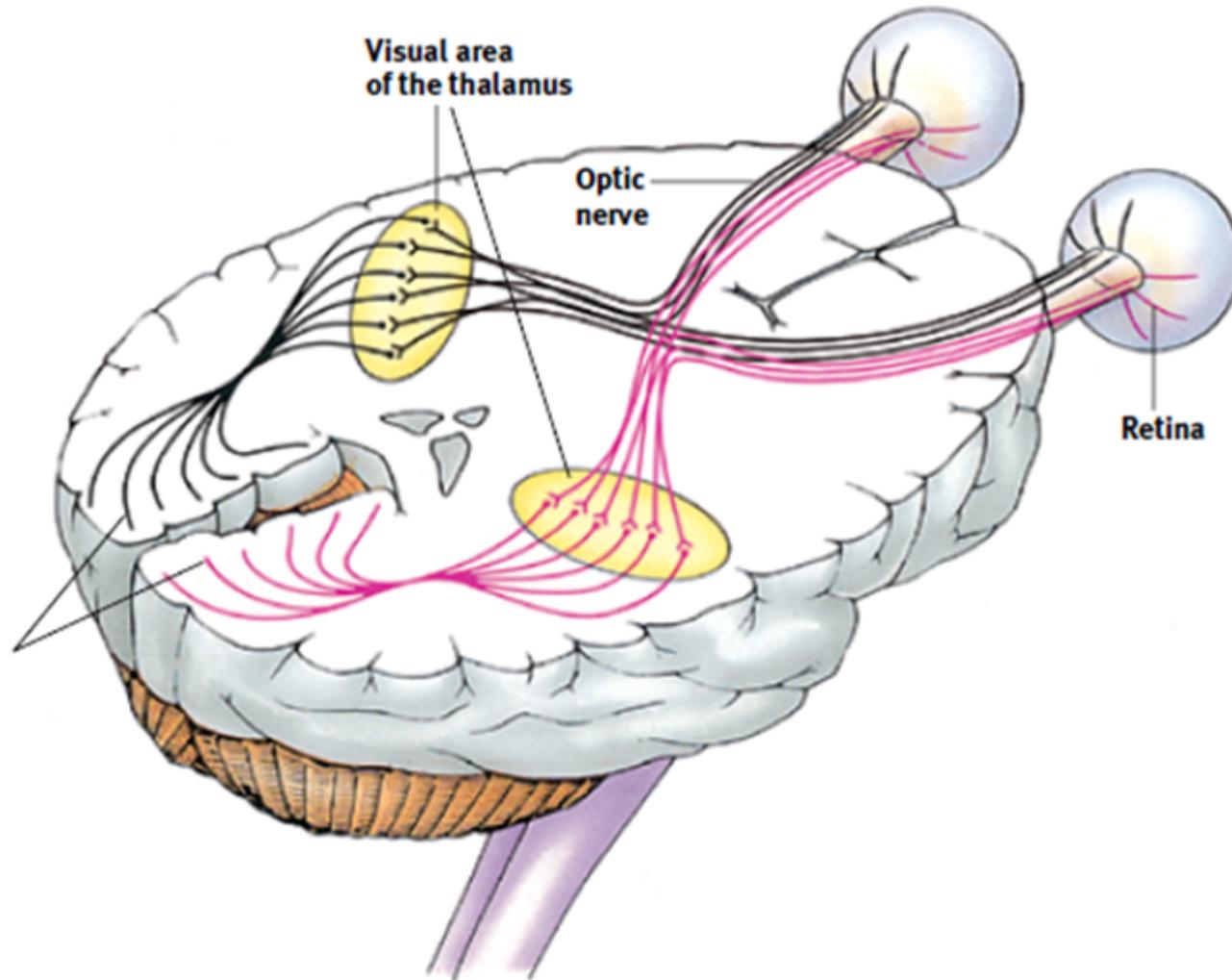
Pathways from the eyes to the visual cortex



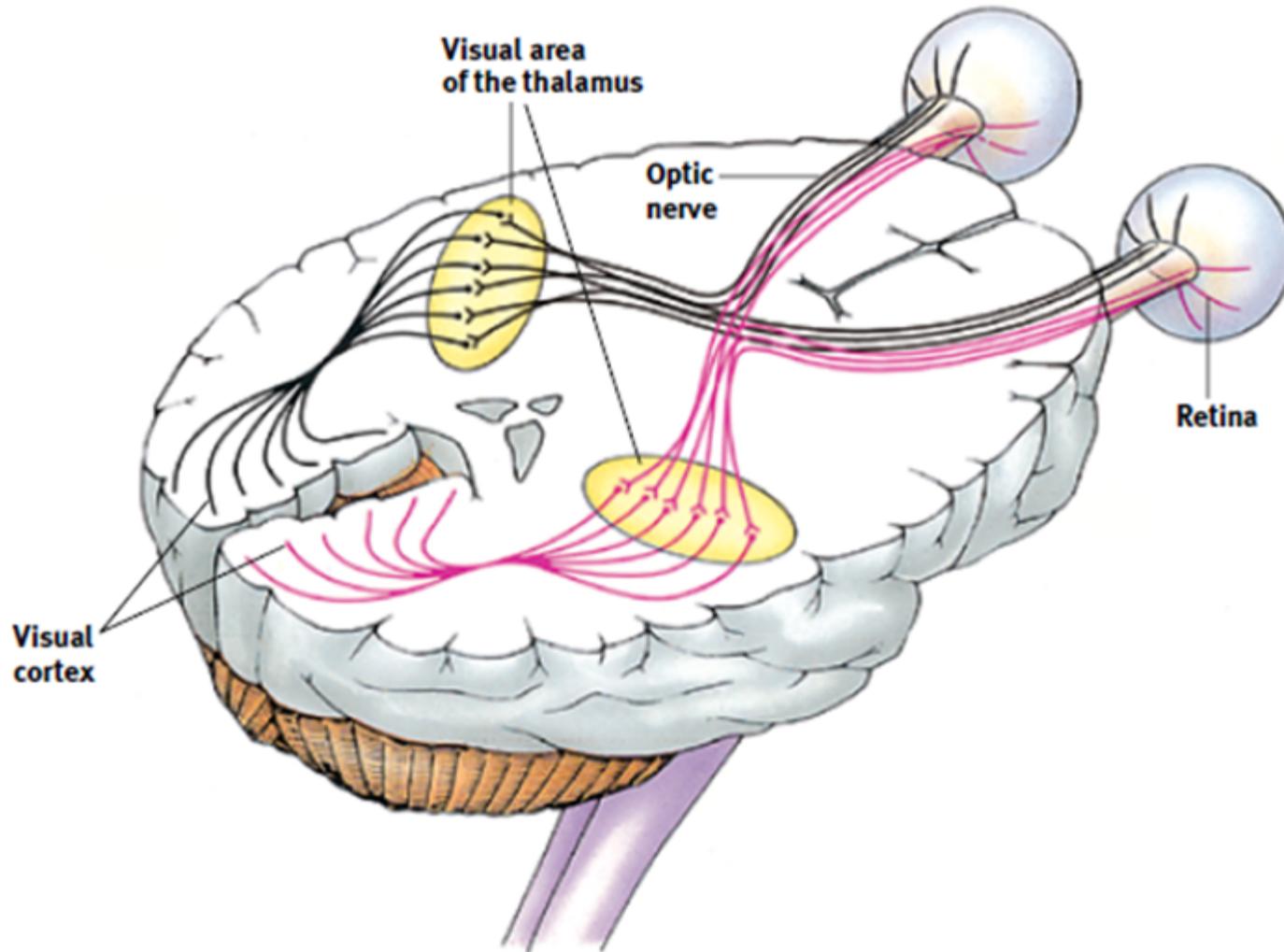
Pathways from the eyes to the visual cortex



Pathways from the eyes to the visual cortex



Pathways from the eyes to the visual cortex



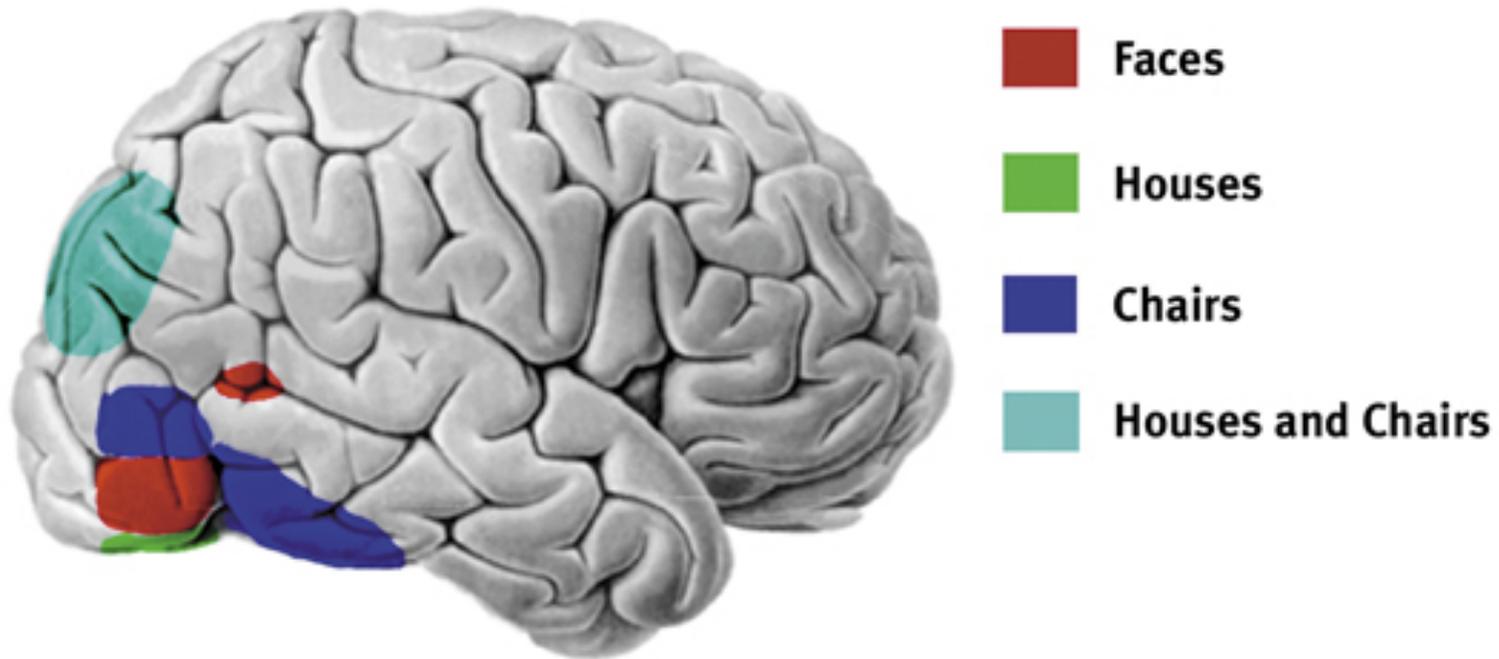
Visual Pathway

- Axons of the ganglion cells come together to form the optic nerve
- Half of optic nerve fibers cross into opposite hemisphere and synapse onto LGN (lateral geniculate nucleus)
- LGN neurons synapse onto primary visual cortex

Visual Information Processing

Feature Detection

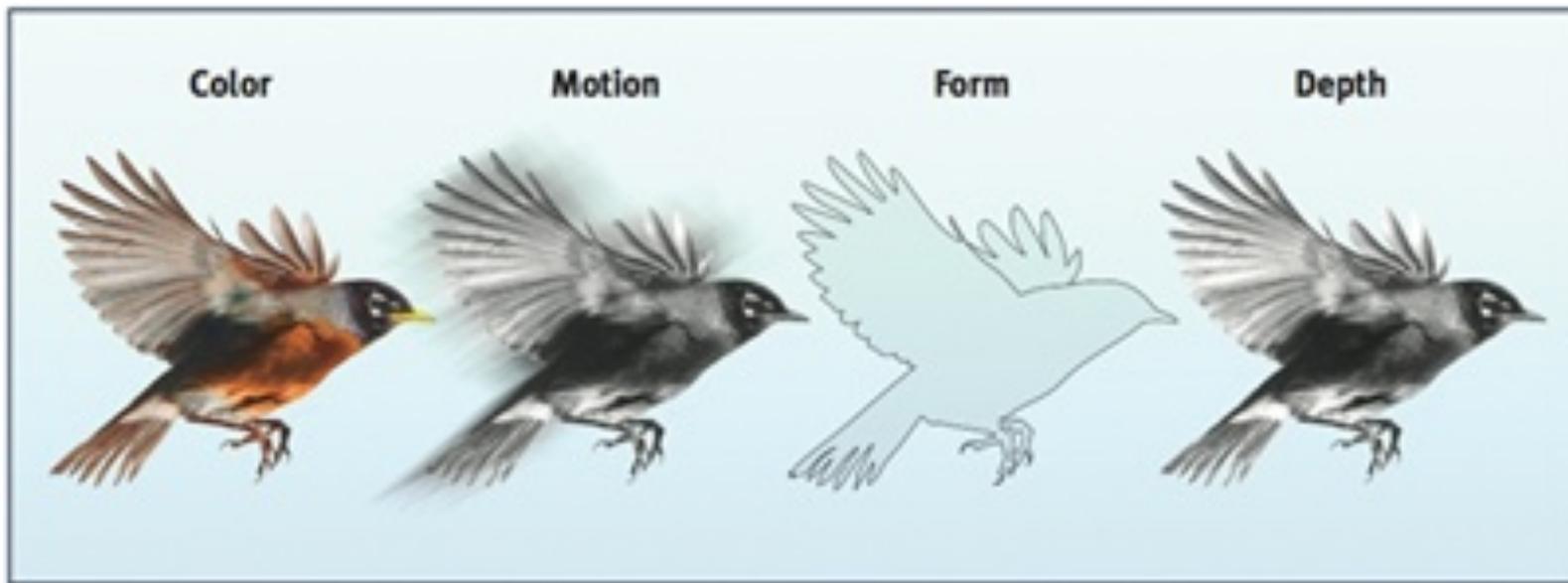
- Feature detectors



Visual Information Processing

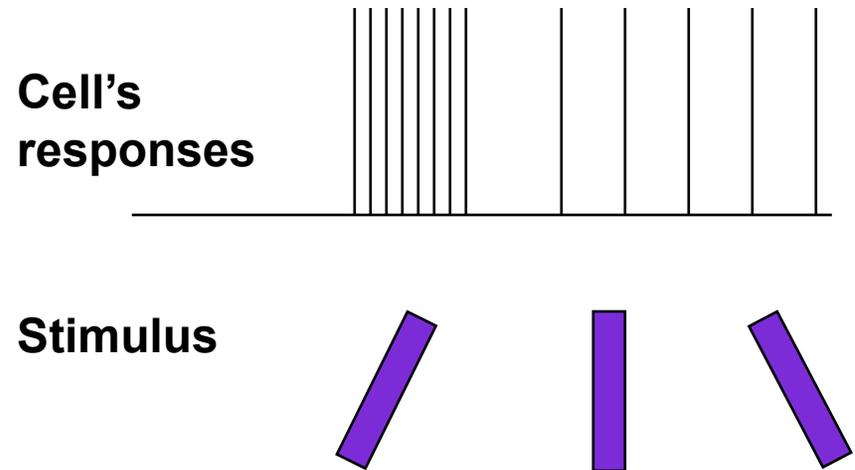
Parallel Processing

- Parallel processing
 - Blind sight

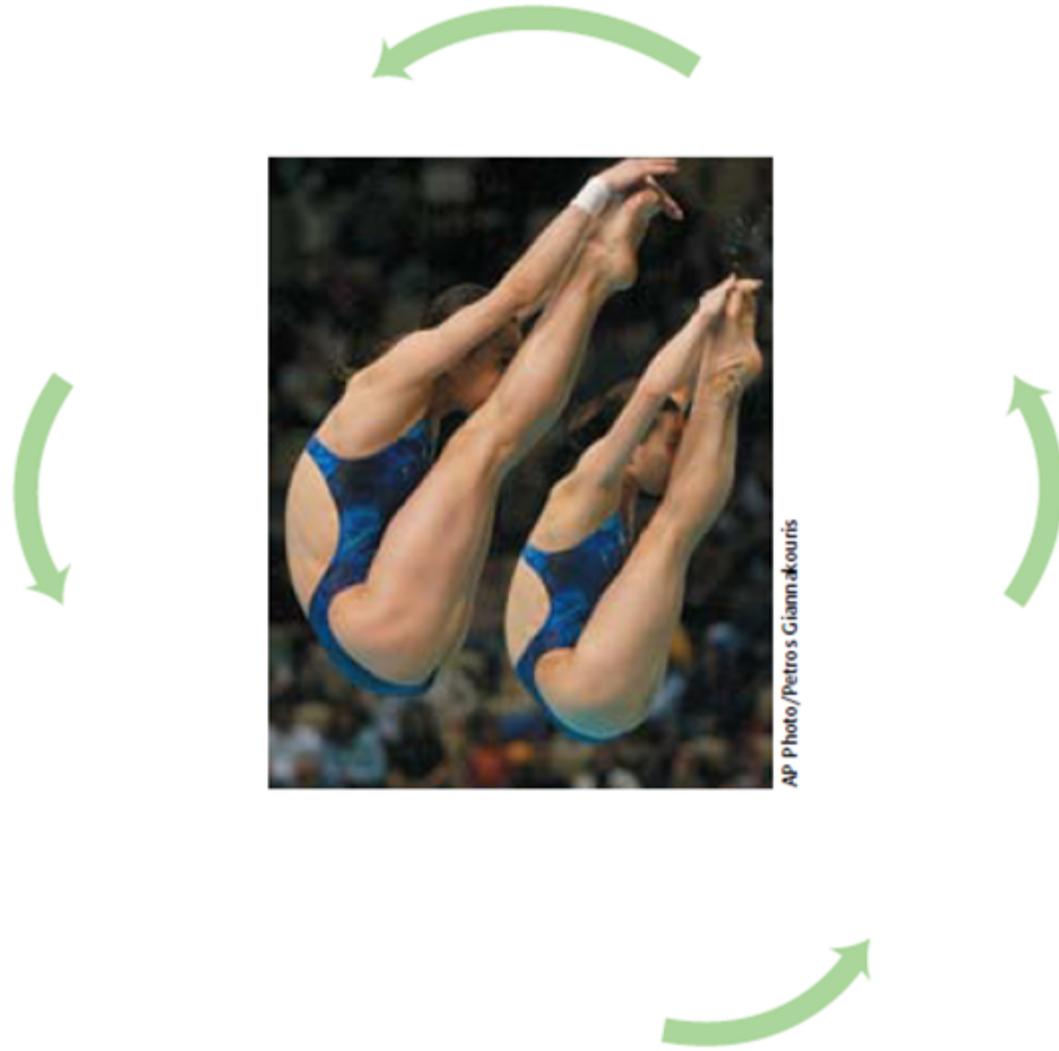


Visual Information Processing

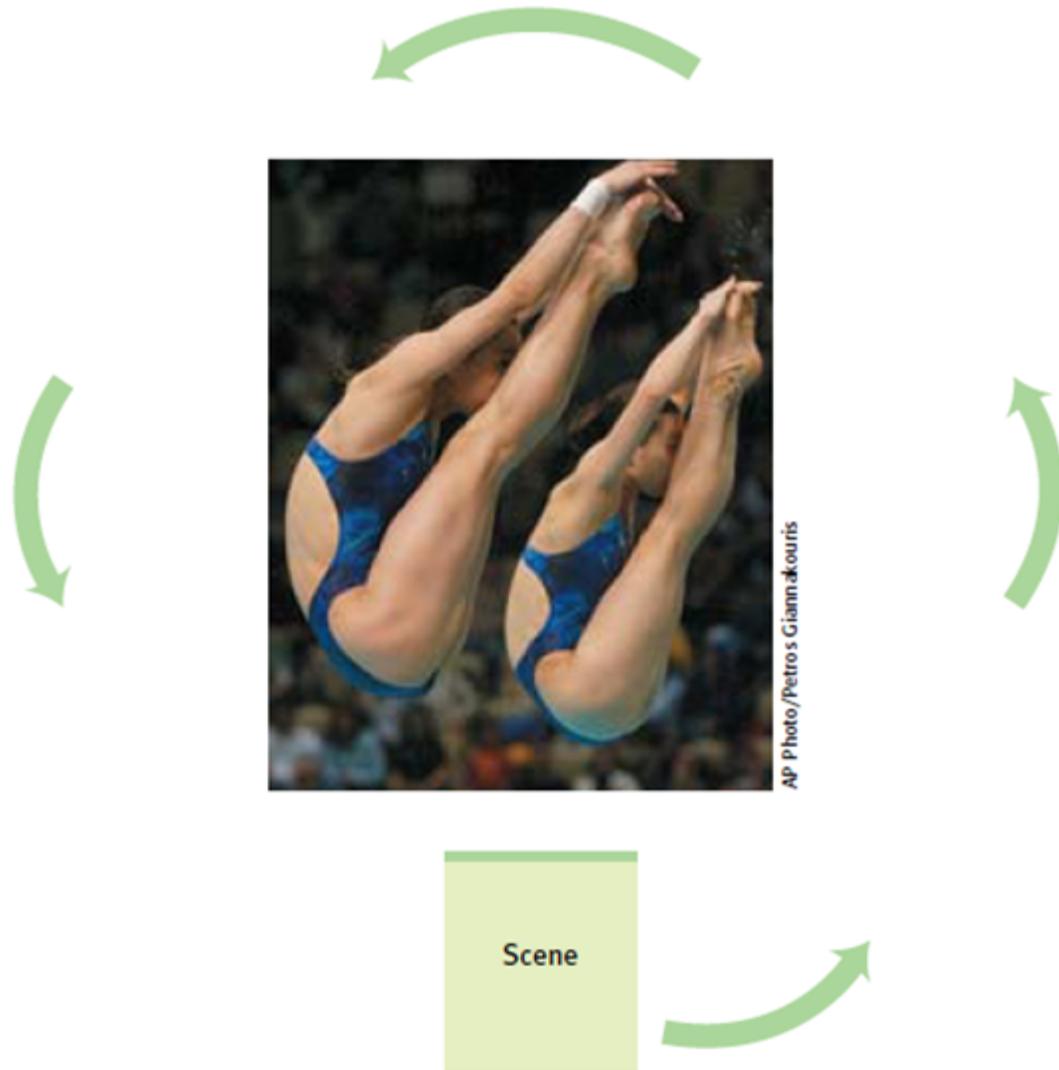
- Feature Detectors
 - nerve cells in the brain that respond to specific features
 - shape
 - angle
 - movement



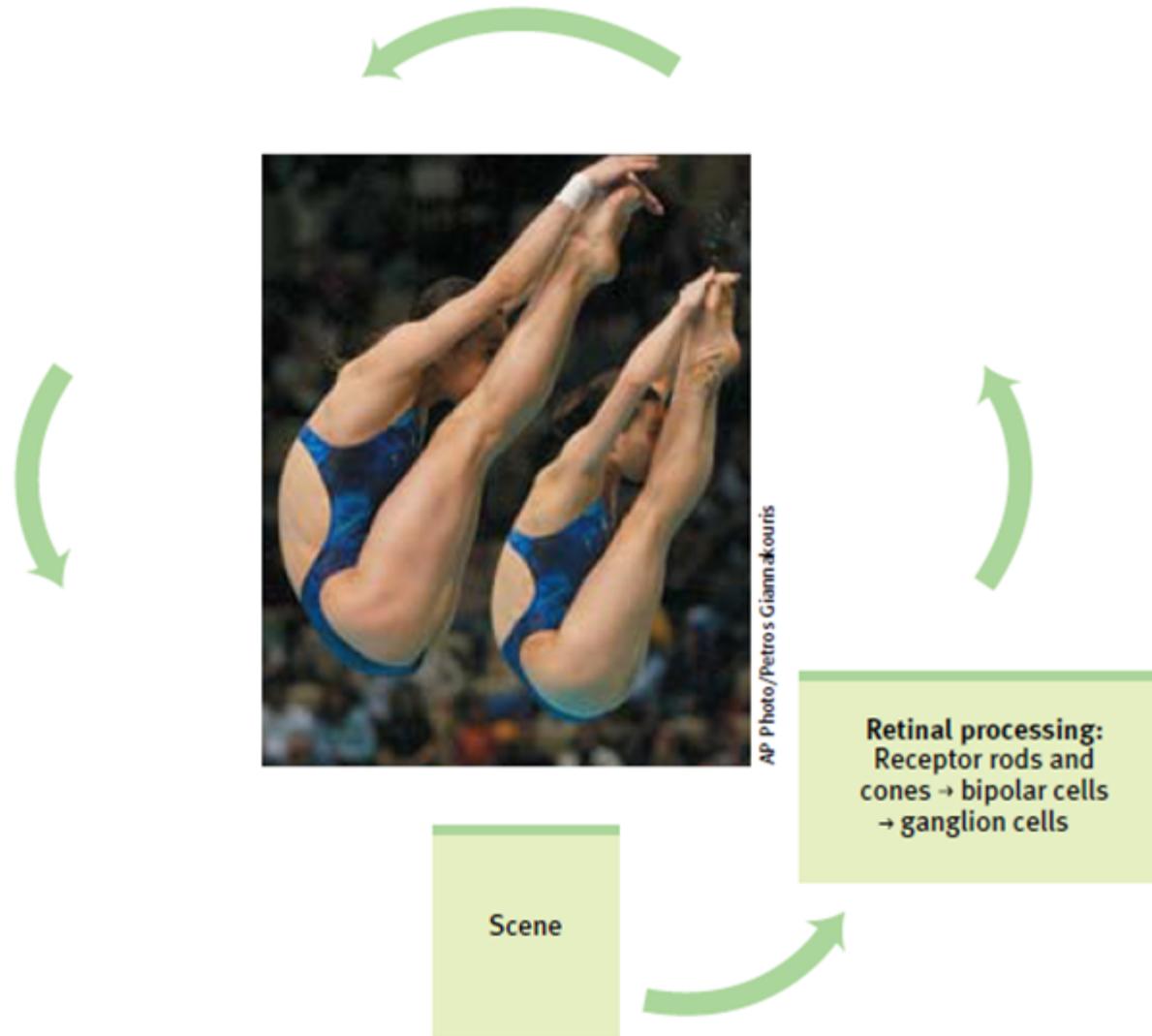
Visual information processing



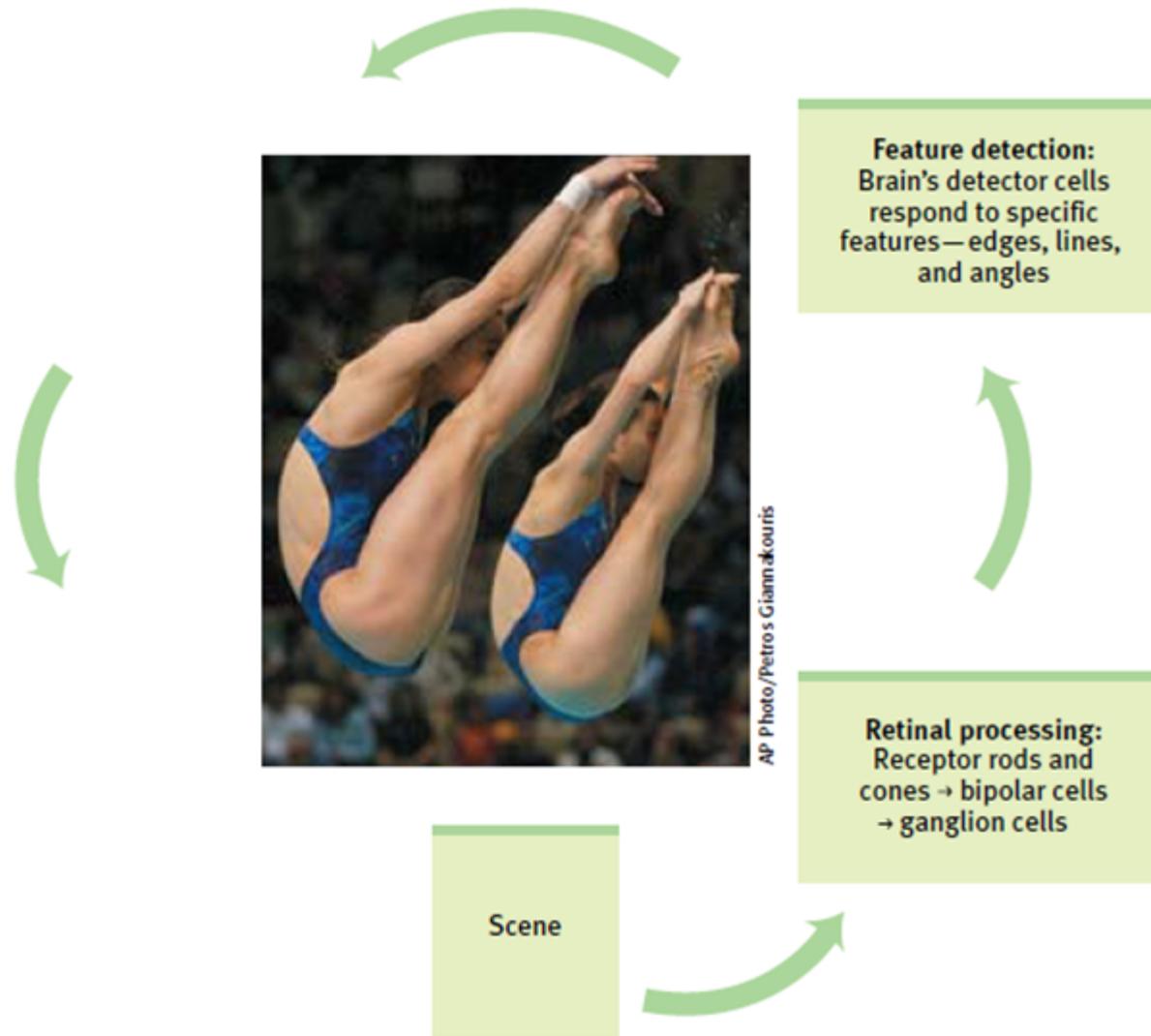
Visual information processing



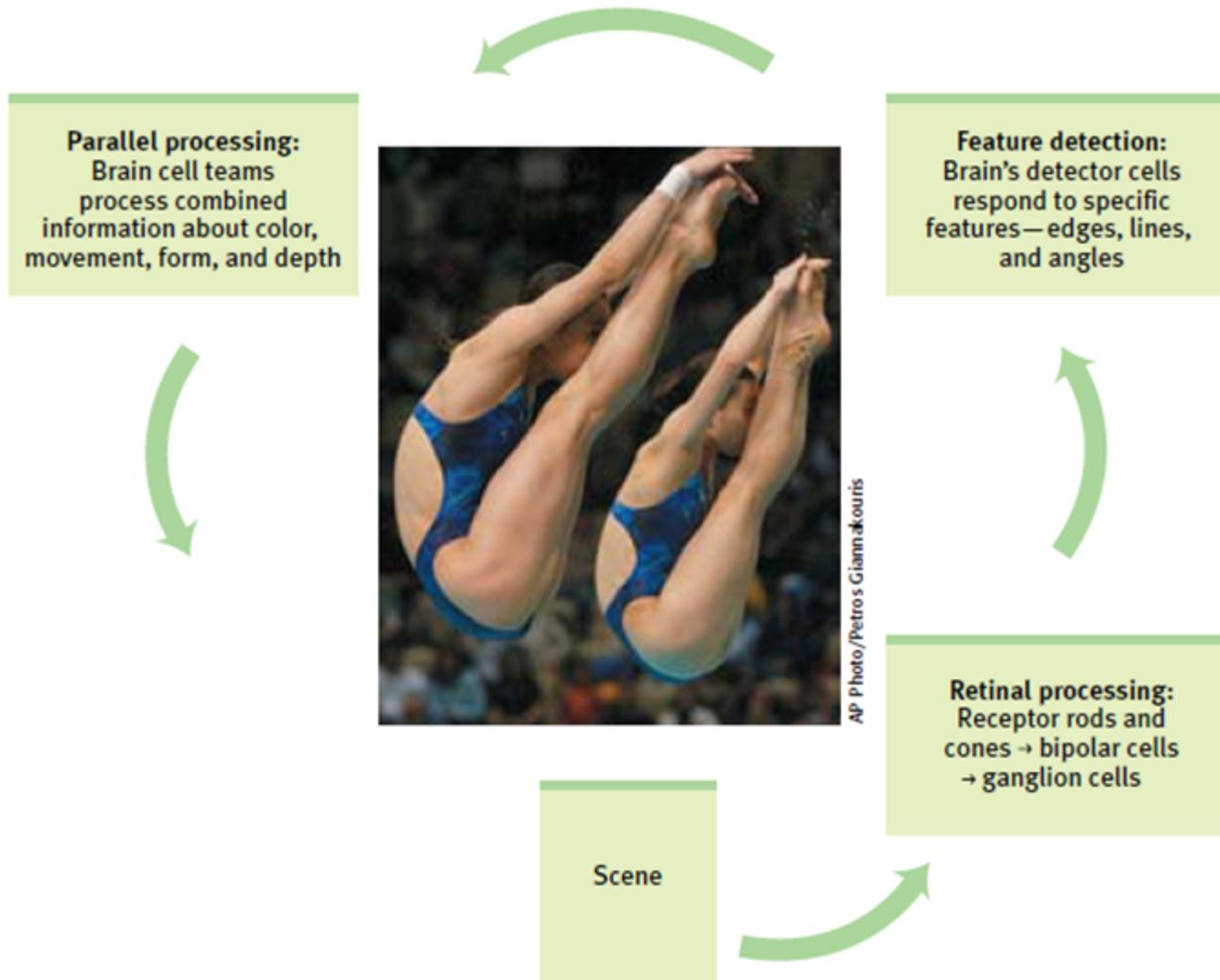
Visual information processing



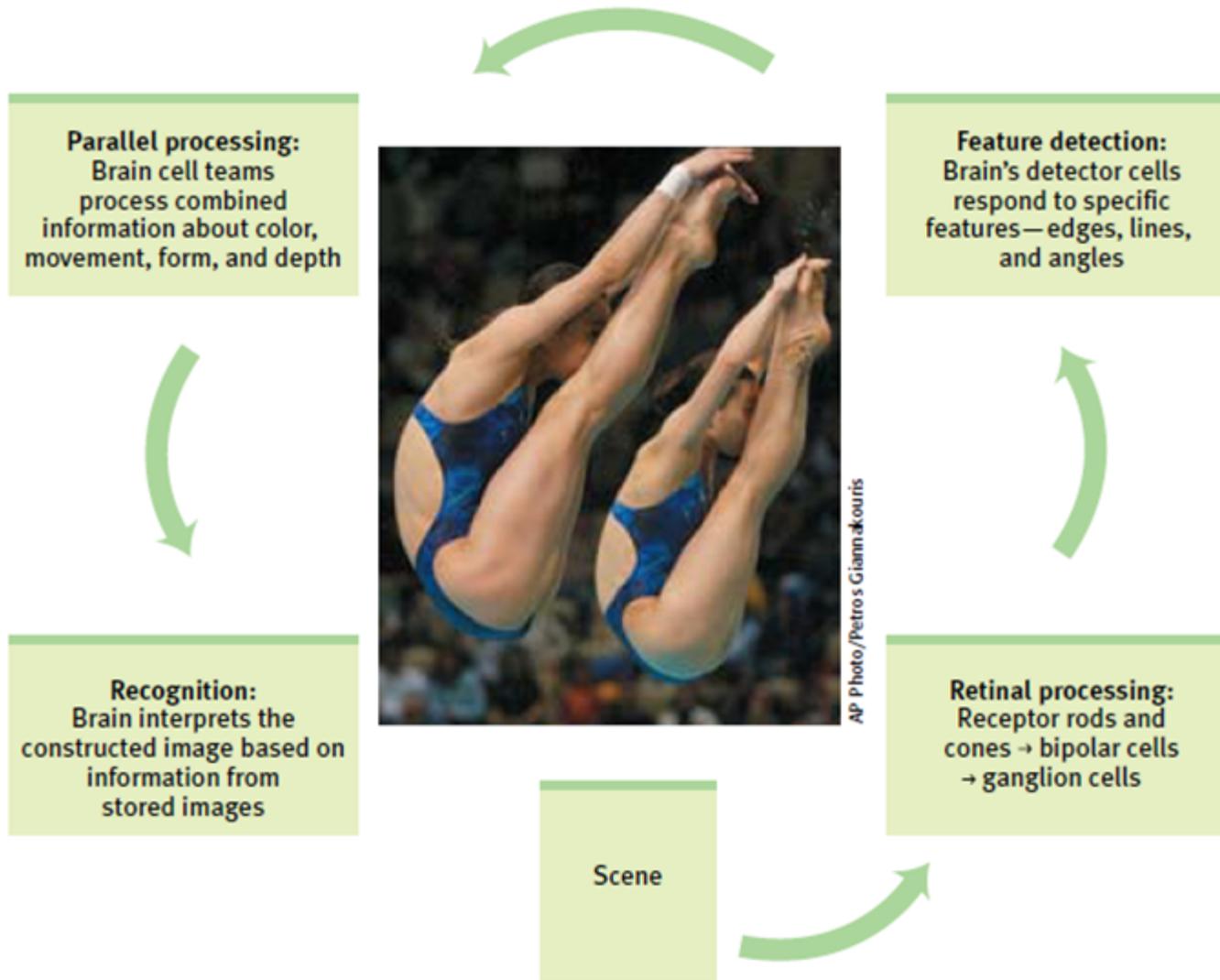
Visual information processing



Visual information processing

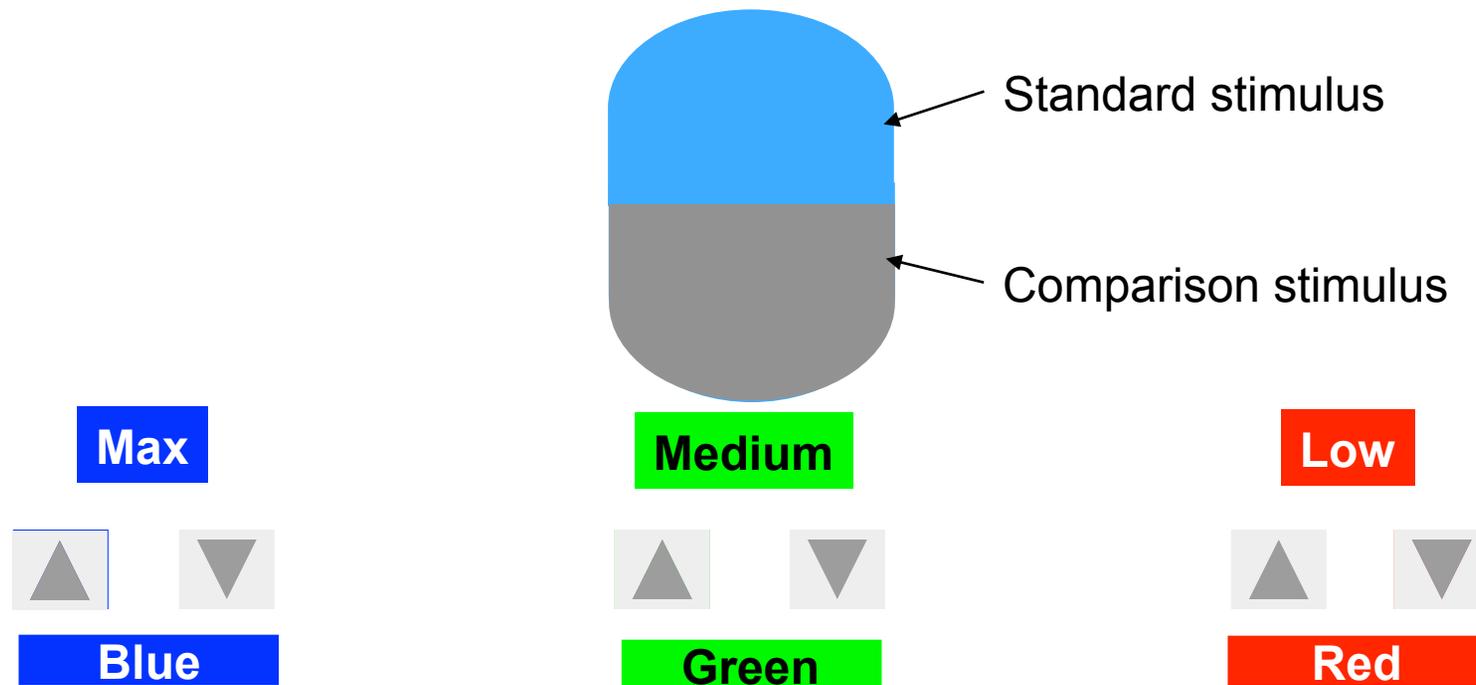


Visual information processing



Theories of Color Vision

Trichromatic theory: Based on behavioral experiments, Helmholtz suggested that the retina should contain three receptors that are sensitive to **red**, **blue** and **green** colors.



Subtraction of Colors

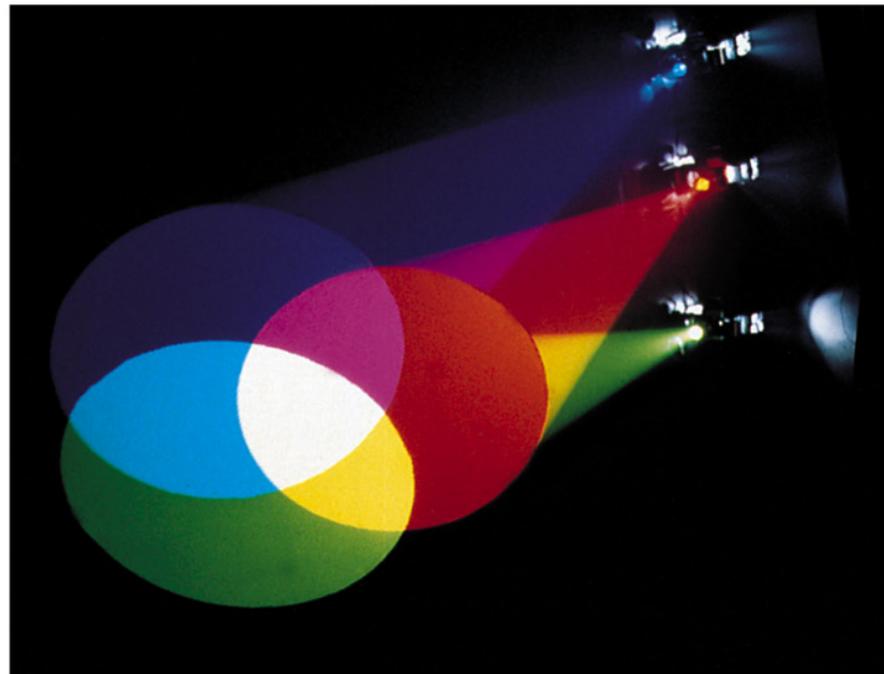
If three primary colors (pigments) are mixed, subtraction of all wavelengths occurs and the color black is the result.



Subtractive color mixing

Addition of Colors

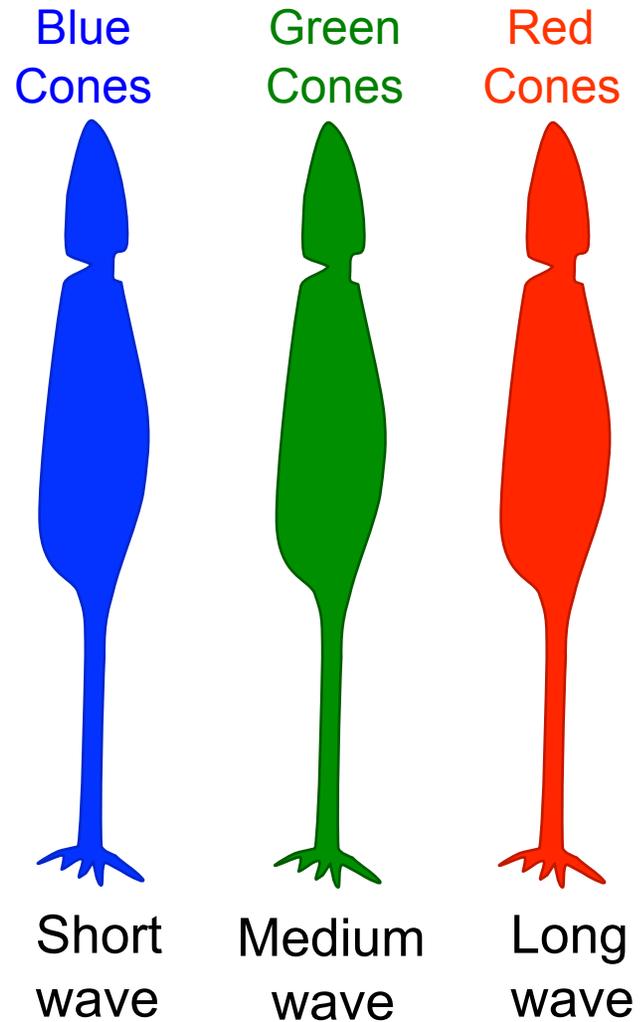
If three primary colors (lights) are mixed, the wavelengths are added and the color white is the result.



Additive color mixing

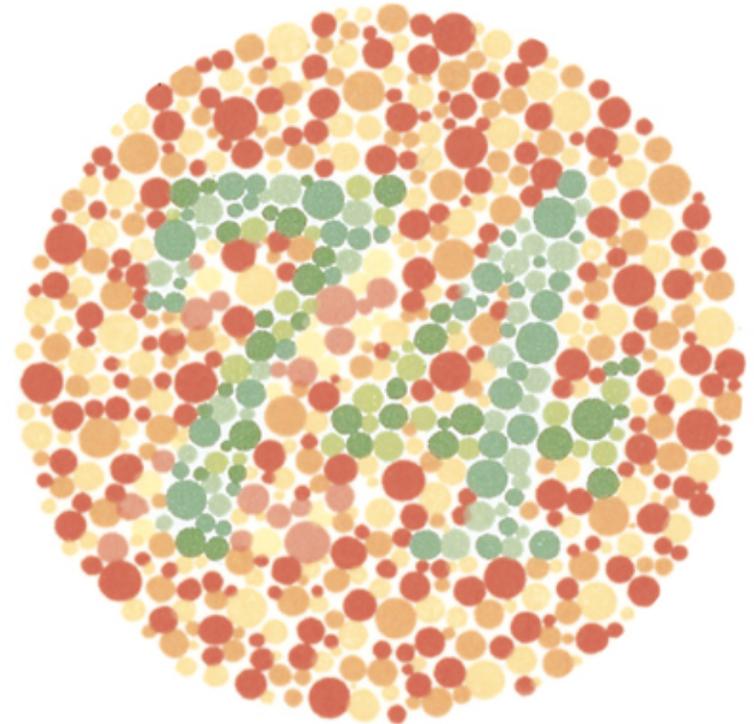
Photoreceptors

MacNichol, Wald and Brown (1967) measured directly the absorption spectra of visual pigments of single cones obtained from the retinas of humans.



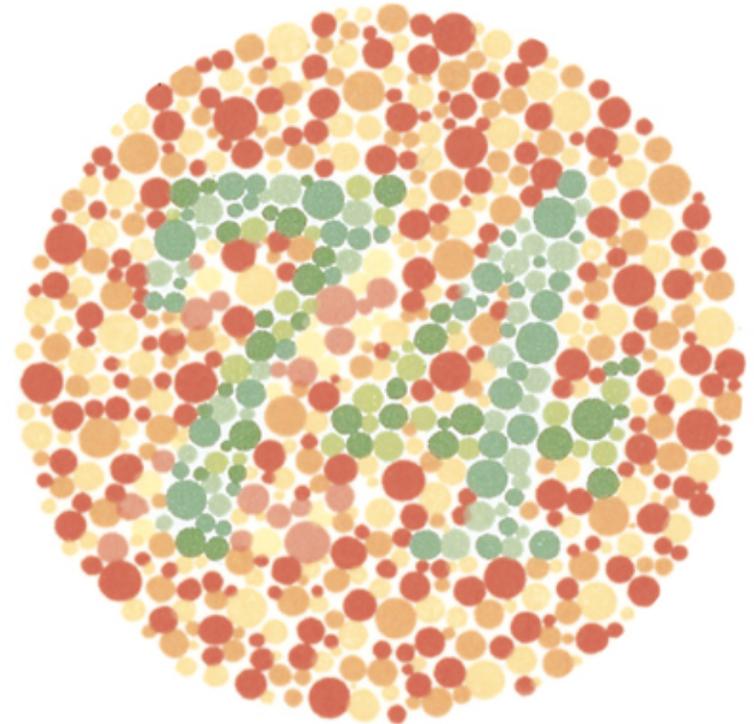
Color Vision

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



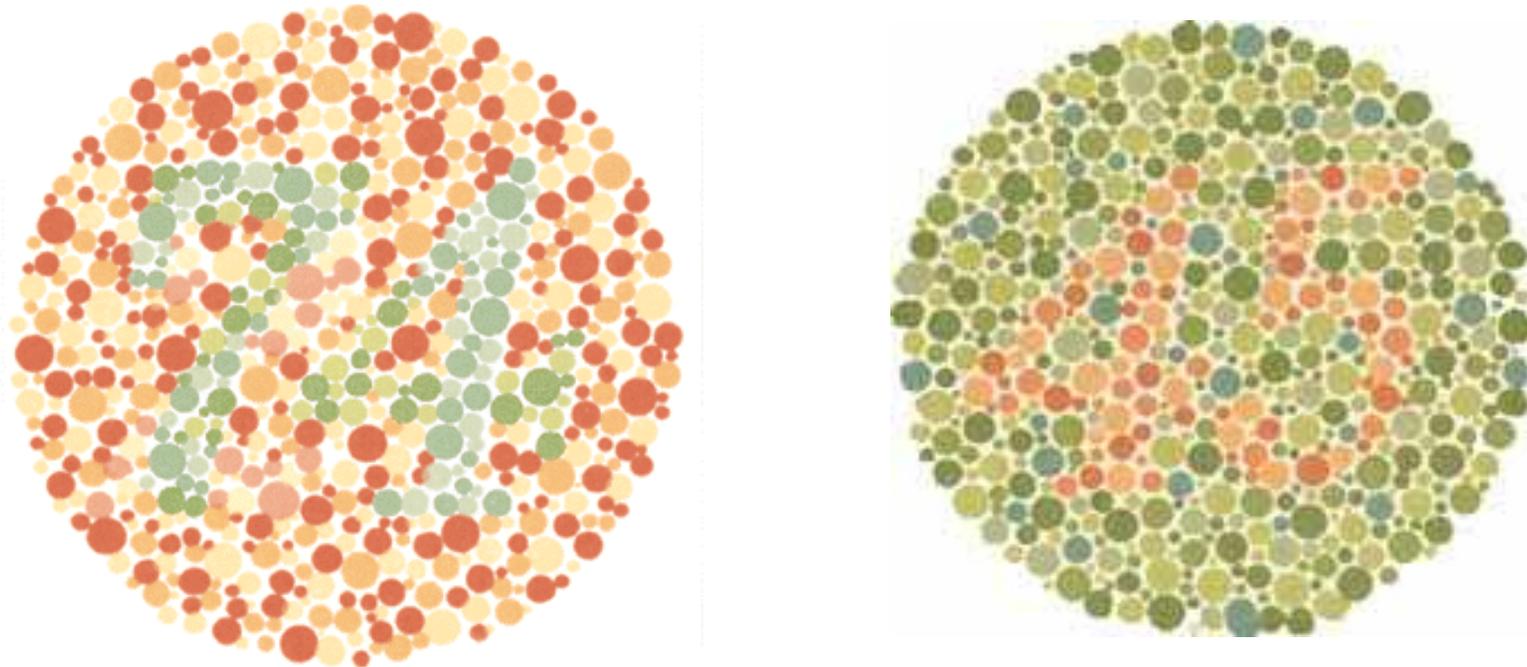
Color Vision

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



Color Blindness

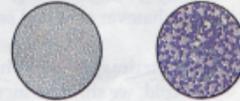
Genetic disorder in which people are blind to green or red colors. This supports the Trichromatic theory.



Ishihara Test



(a) Photo and chips as seen by normal person



(b) Photo and chips as seen by red-green blind person



(c) Photo and chips as seen by yellow-blue blind person



(d) Photo and chips as seen by totally colorblind person

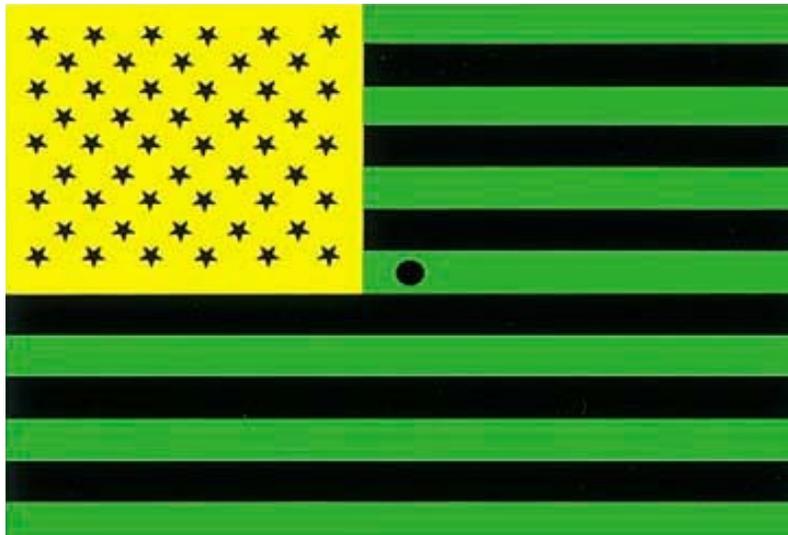
After image



Opponent Process Theory of Color Vision

- Some aspects of our color perception are difficult to explain by the trichromatic theory alone
- Example: **afterimages**
 - if we view colored stimuli for an extended period of time, we will see an afterimage in a complementary color

Complementary Afterimages



Overview of Visual System

- The eye is like a camera, but instead of using film to catch the light we have rods and cones
- Cones allow us to see fine spatial detail and color, but cannot function well in dim light
- Rods enable us to see in dim light, but at the loss of color and fine spatial detail
- Our color vision is based on the presence of 3 types of cones, each maximally sensitive to a different range of wavelengths

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Hearing



The Stimulus Input: Sound Waves

- Audition
- Amplitude
 - loudness
- Frequency
 - Pitch



Audition

- Audition
 - the sense of hearing
- Frequency
 - the number of complete wavelengths that pass a point in a given time
- Pitch
 - a tone's highness or lowness
 - depends on frequency

Sound Characteristics

1. Frequency (pitch)
2. Intensity (loudness)
3. Quality (timbre)

Overtone

Overtone: Makes the distinction among musical instruments possible.



Sine Wave



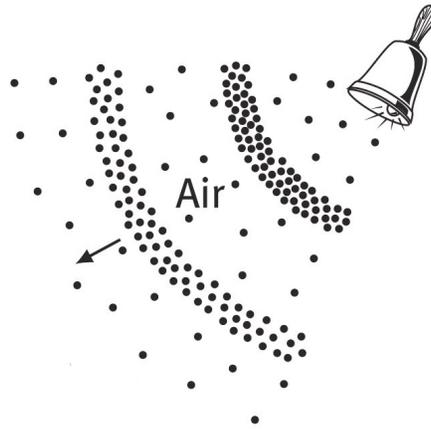
Violin



Piano

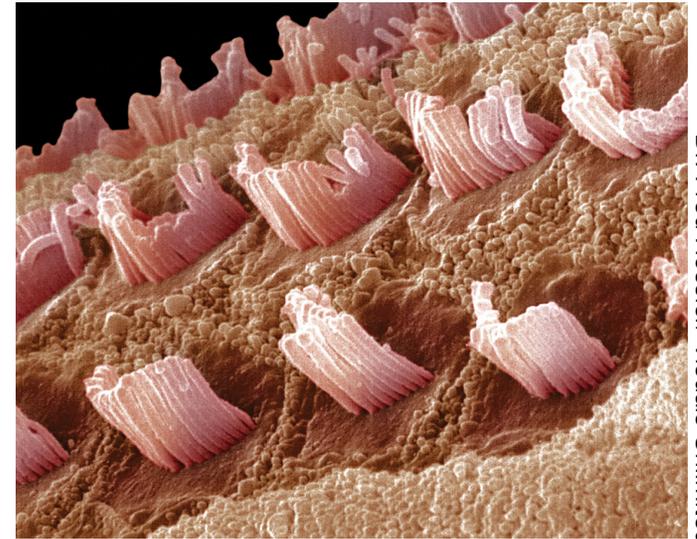
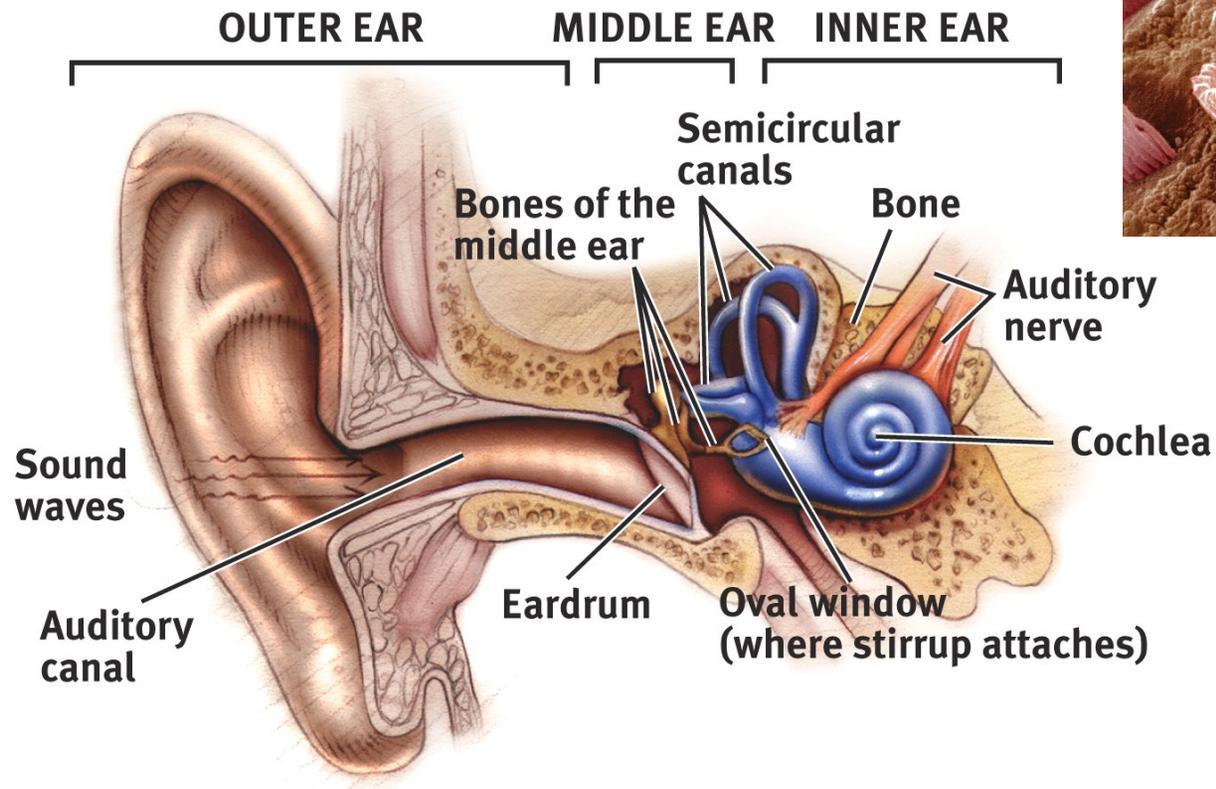
The Stimulus Input: Sound Waves

Sound waves are composed of compression and rarefaction of air molecules.



Acoustical transduction: Conversion of sound waves into neural impulses in the hair cells of the inner ear.

The Ear



Dr. Fred Hossler/ Visuals Unlimited

The Ear

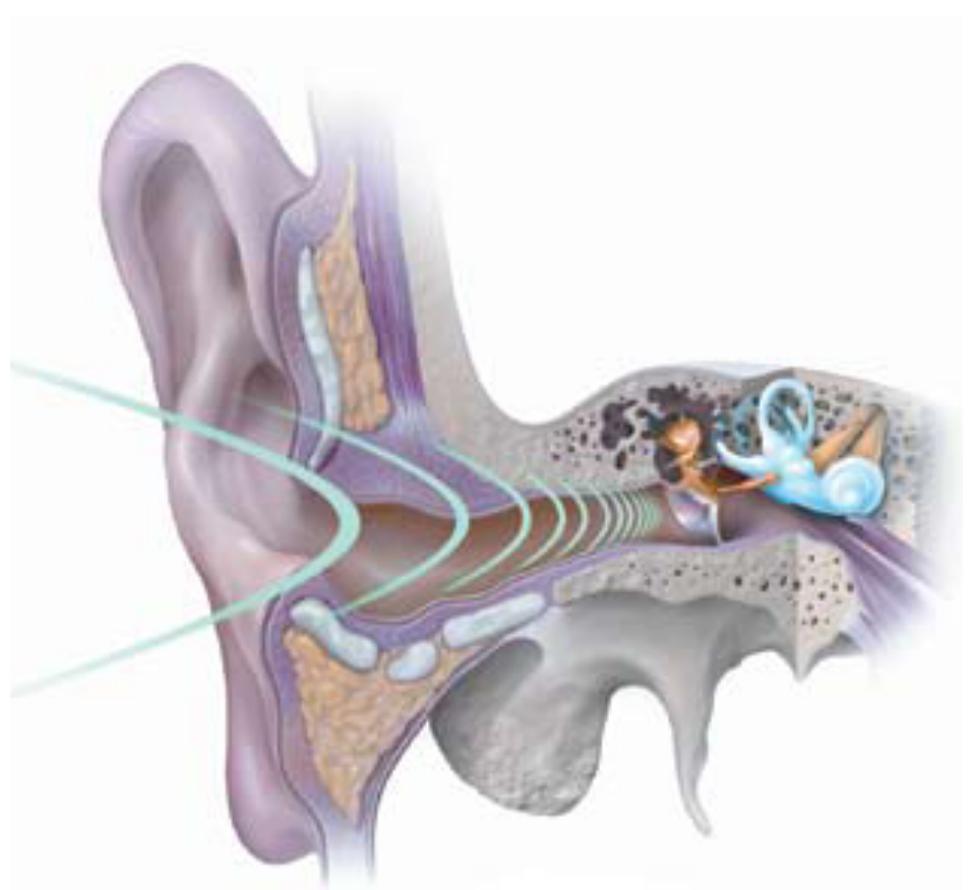
Outer Ear: Pinna. Collects sounds.

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

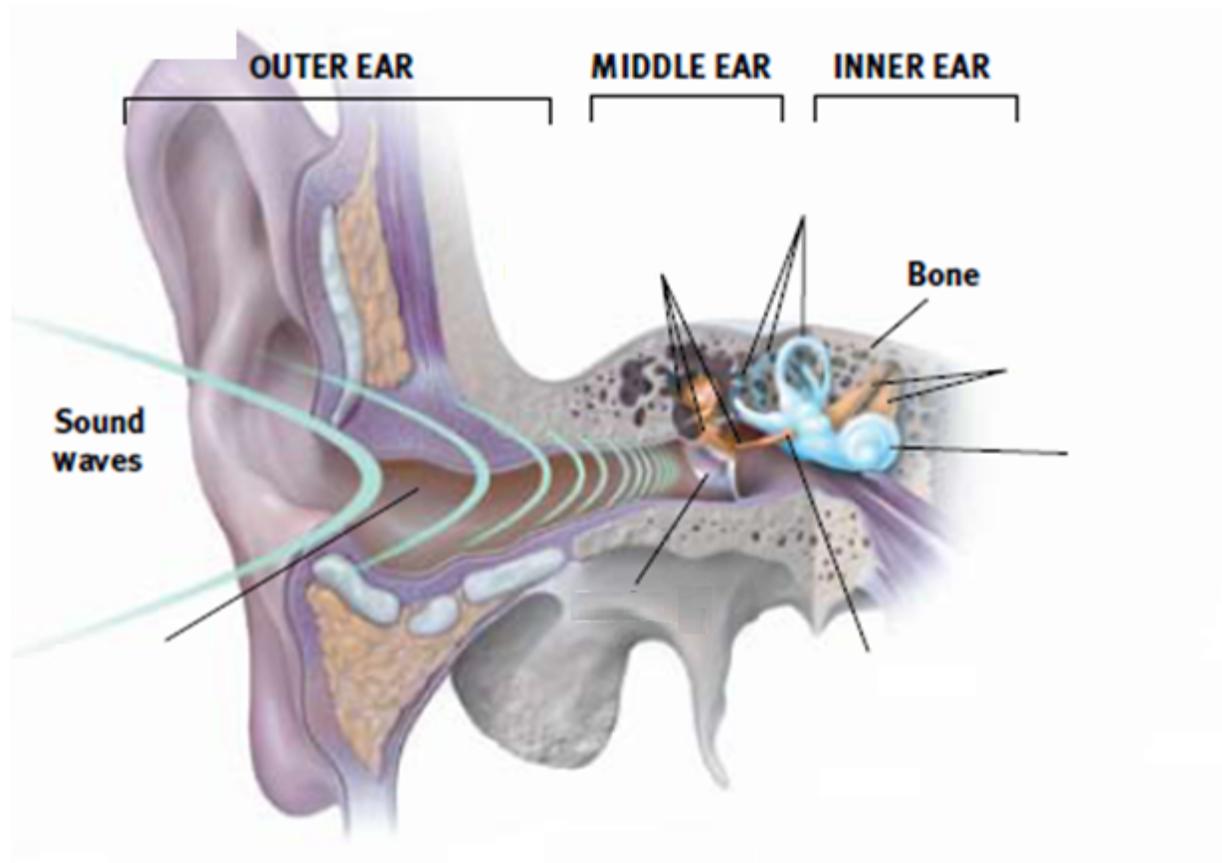
Inner Ear: Innermost part of the ear, containing the cochlea, semicircular canals, and vestibular sacs.

The Ear

- Outer ear
 - Auditory canal
 - Ear drum

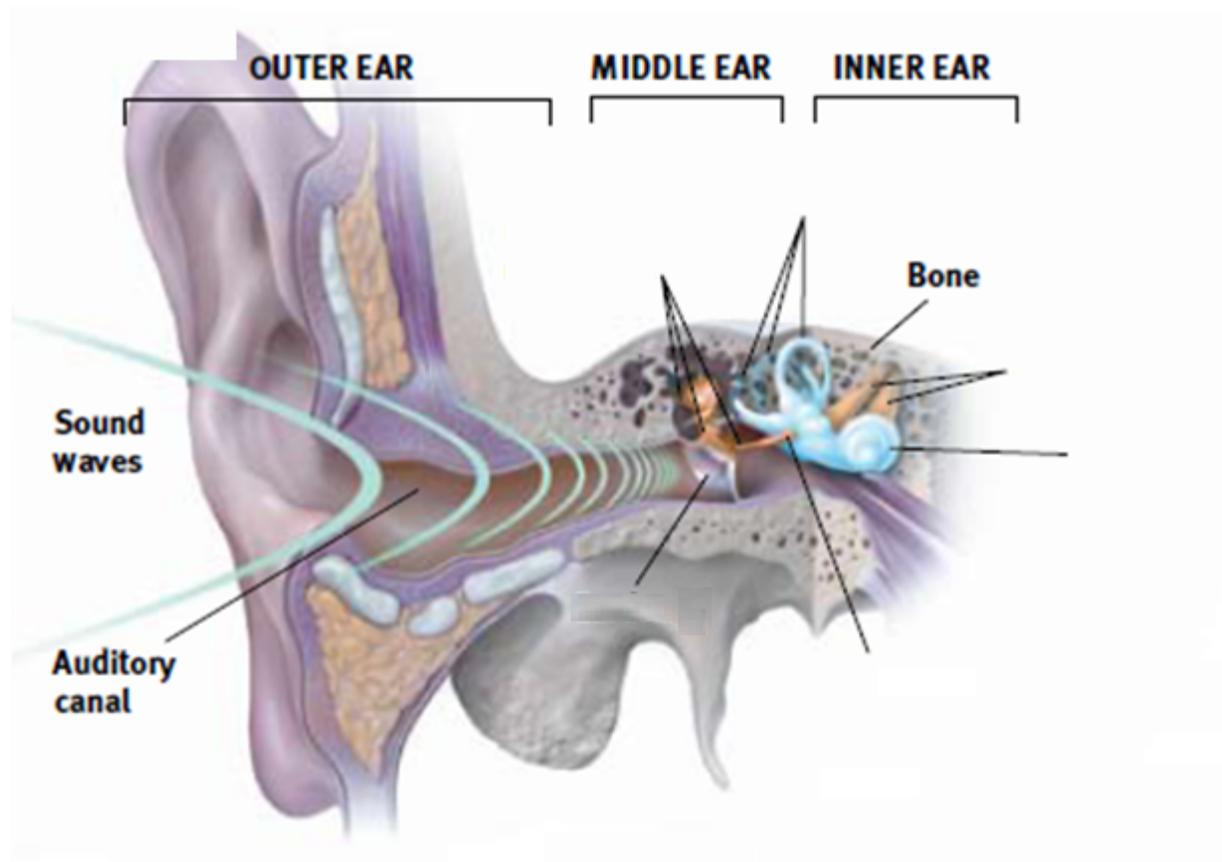


The structure of the ear



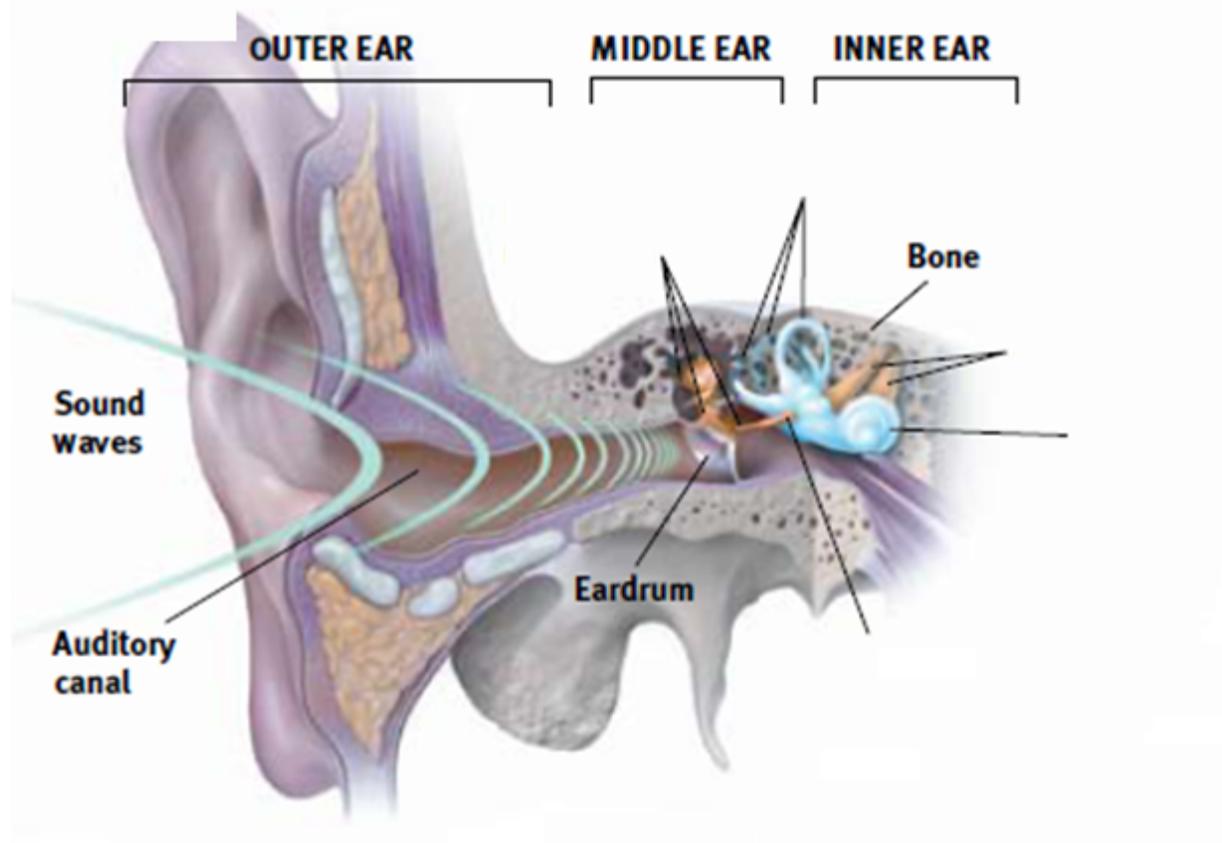
The ear is divided into the outer, middle and inner ear.

The structure of the ear



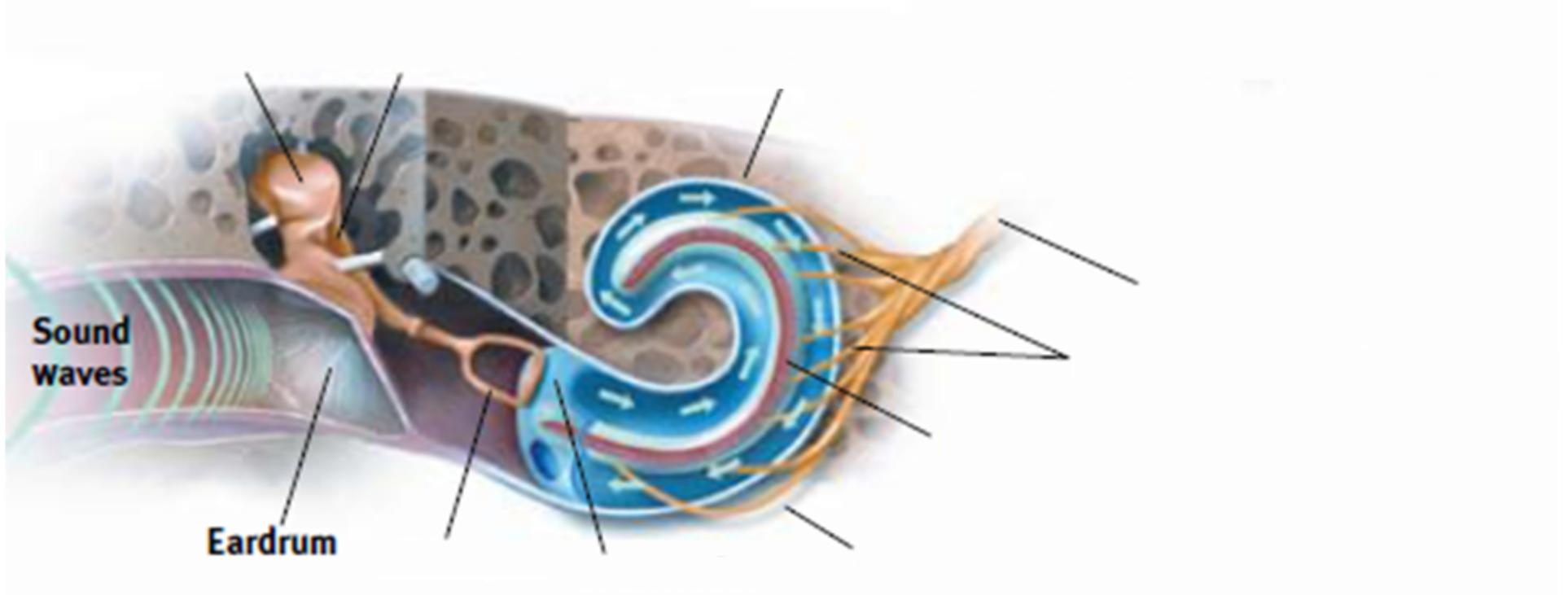
The sound waves travel down the auditory canal to the eardrum.

The structure of the ear



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

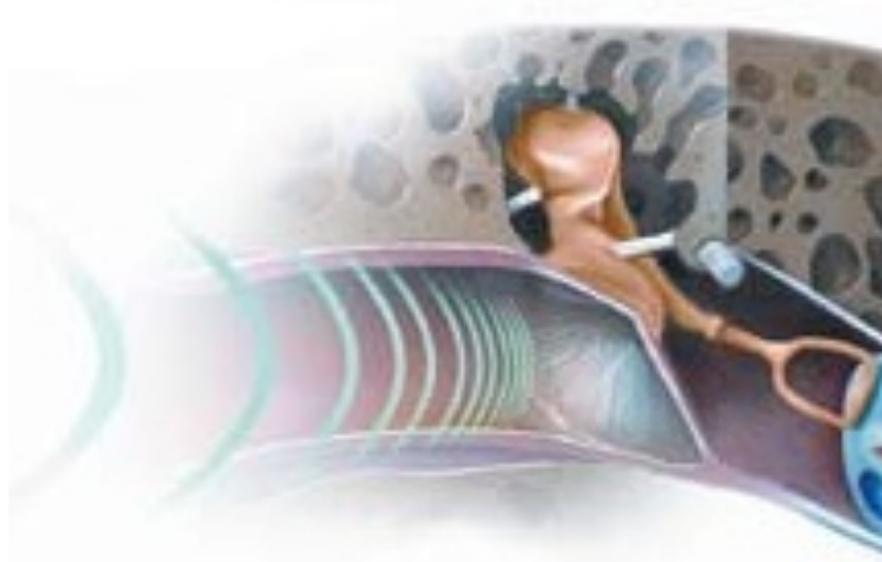
The structure of the ear



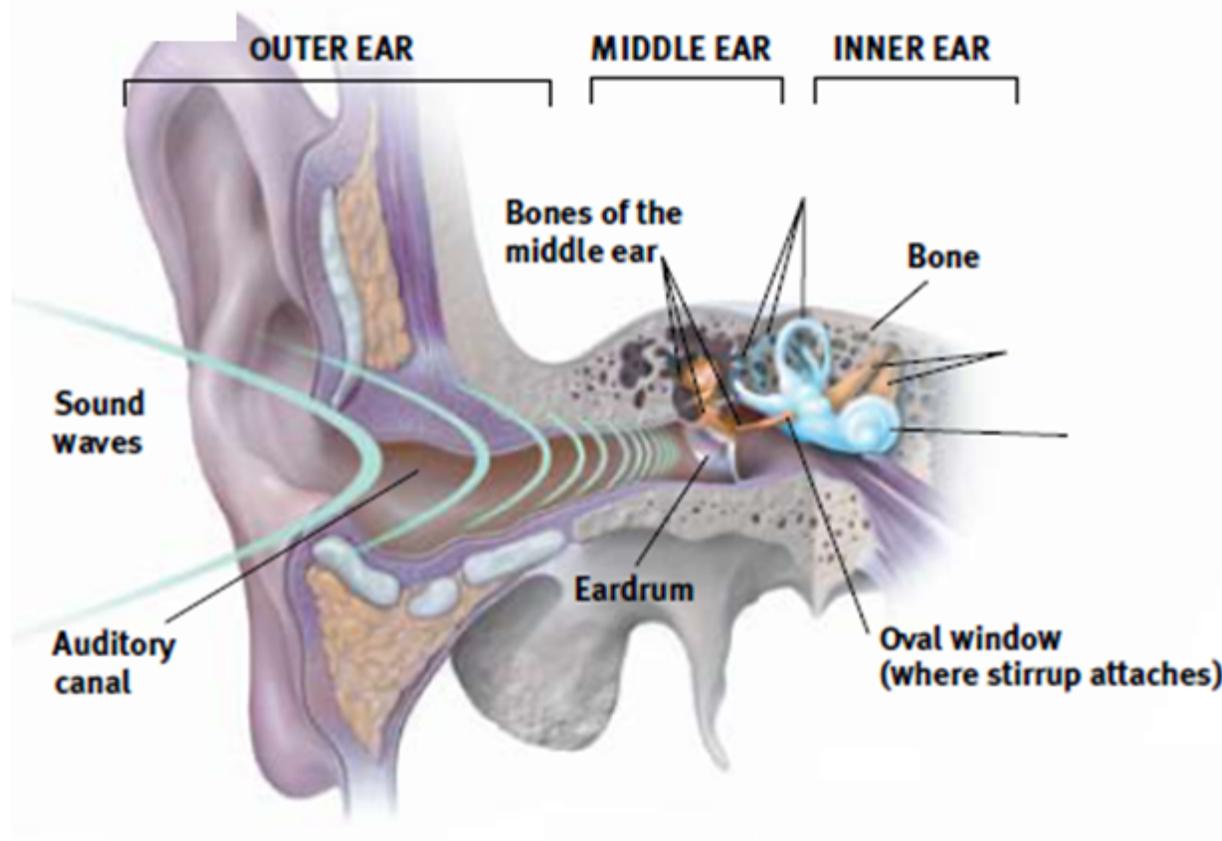
Eardrum

The Ear

- Middle ear
 - Hammer, anvil, stirrup

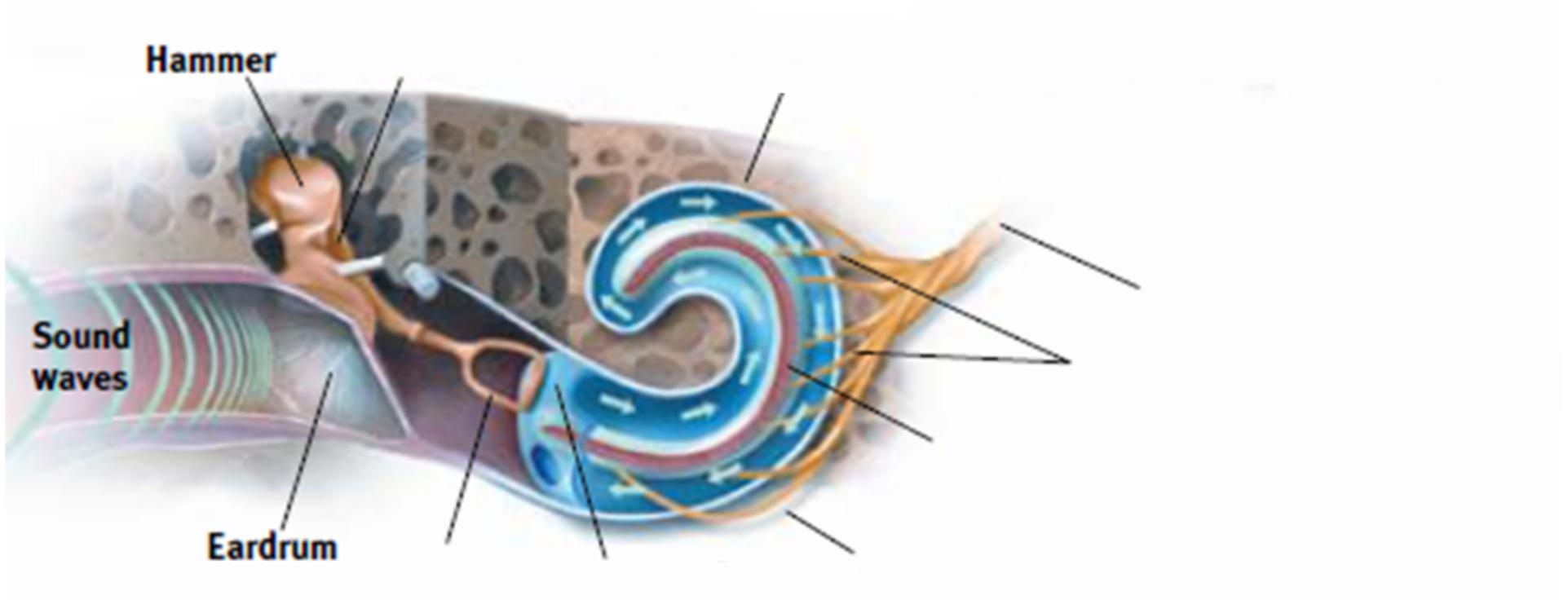


The structure of the ear



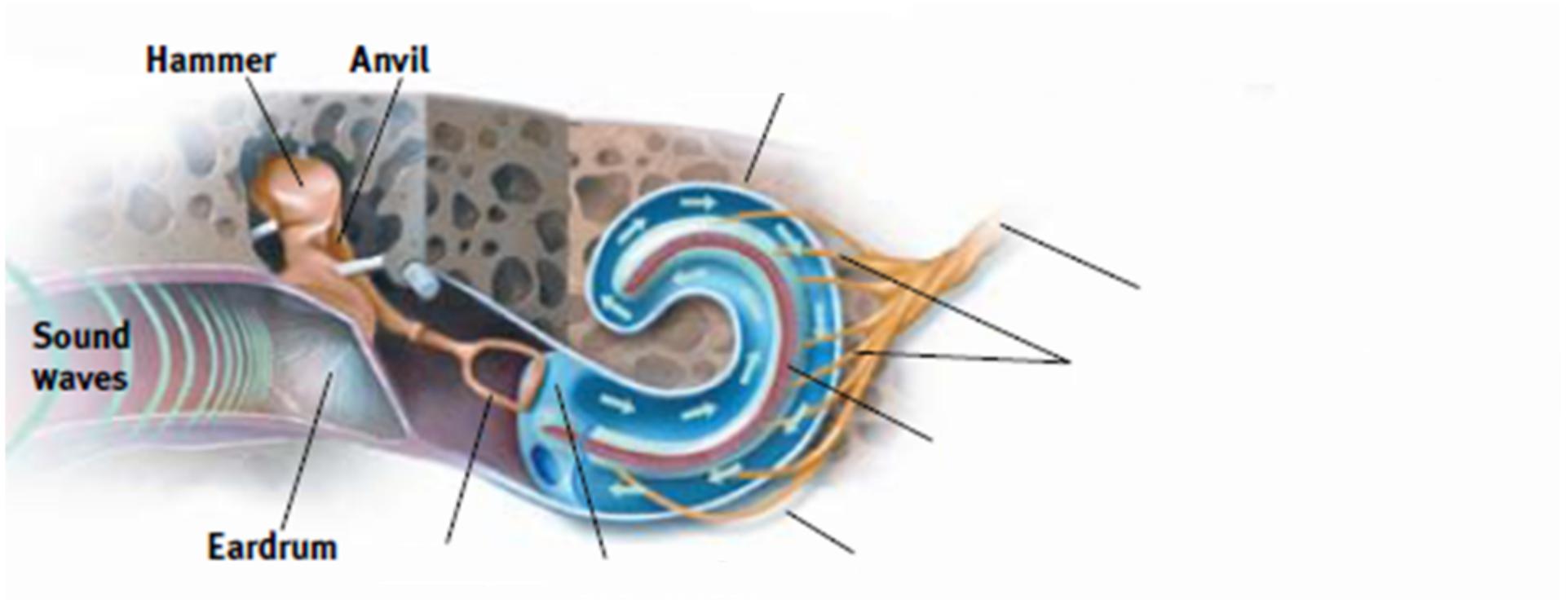
Bones of the middle ear = the hammer, anvil, stirrup which vibrate with the eardrum.

The structure of the ear



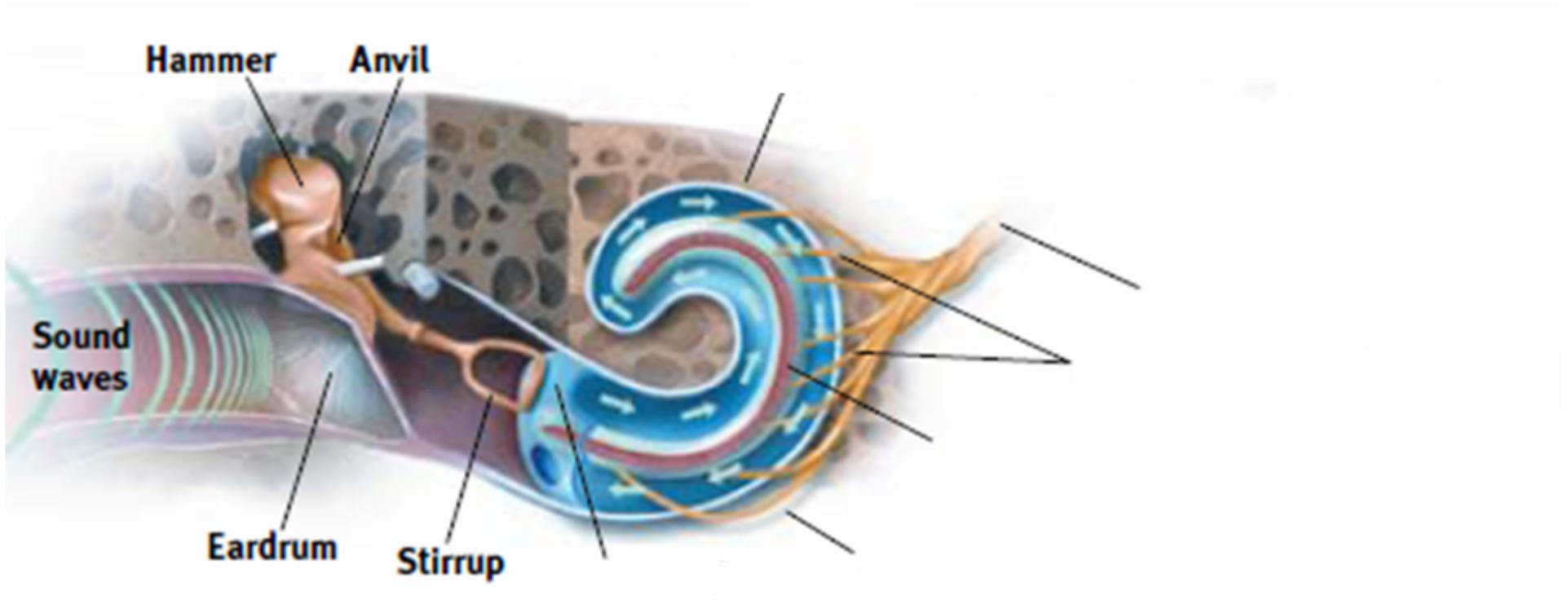
Hammer

The structure of the ear



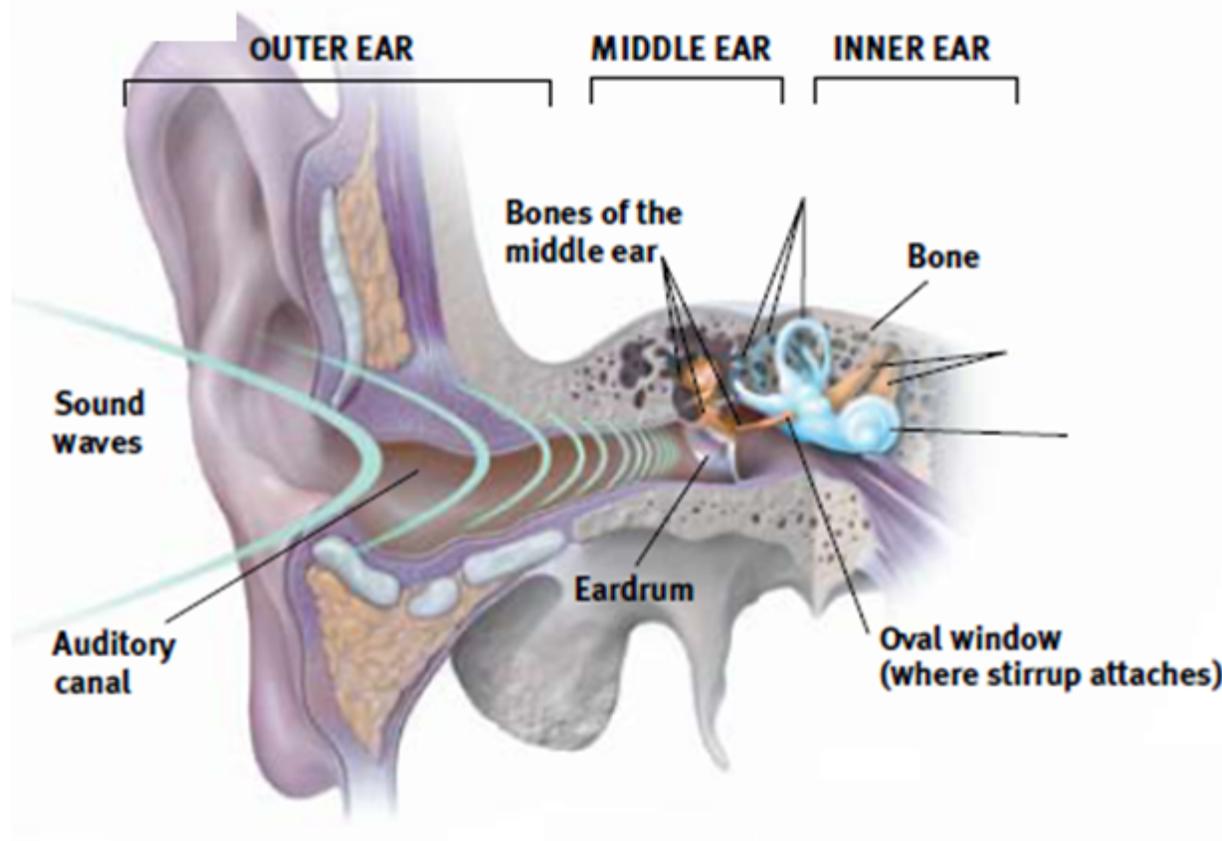
Anvil

The structure of the ear



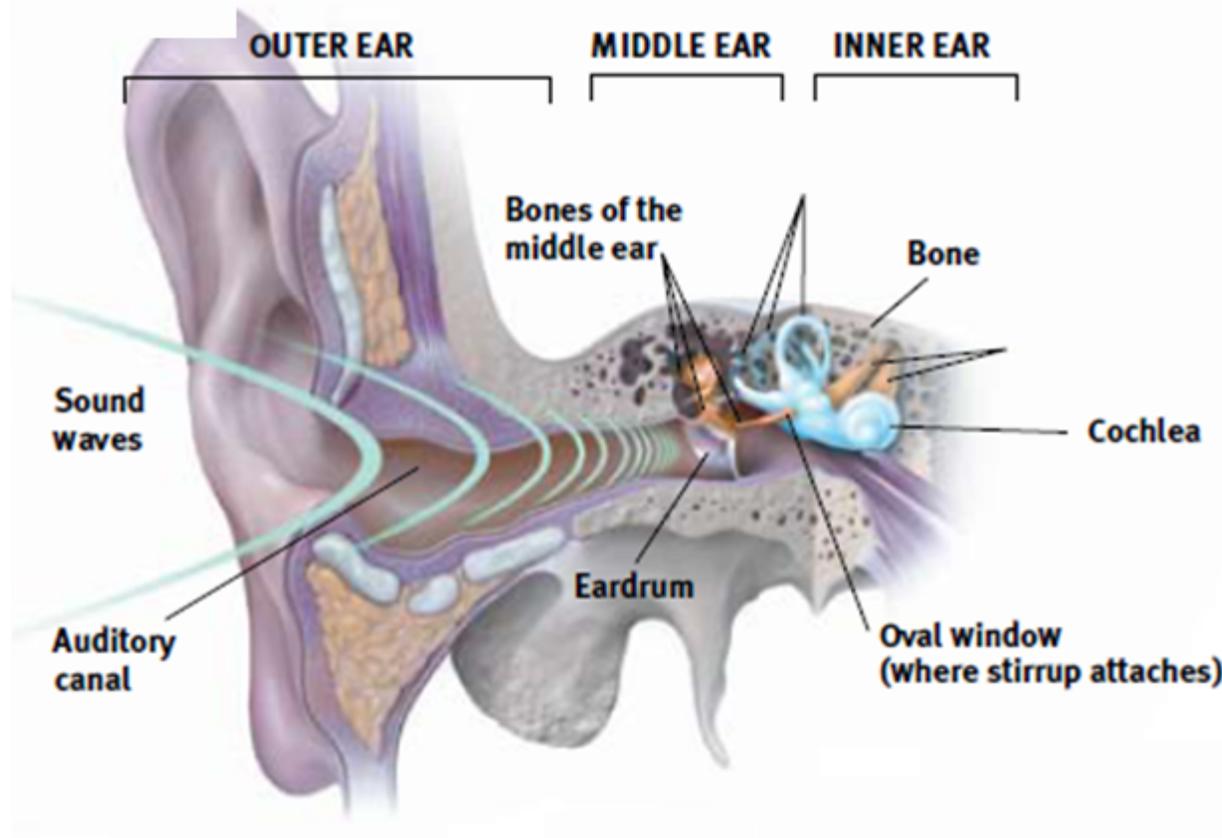
Stirrup

The structure of the ear



Oval window = where the stirrup connects to the cochlea.

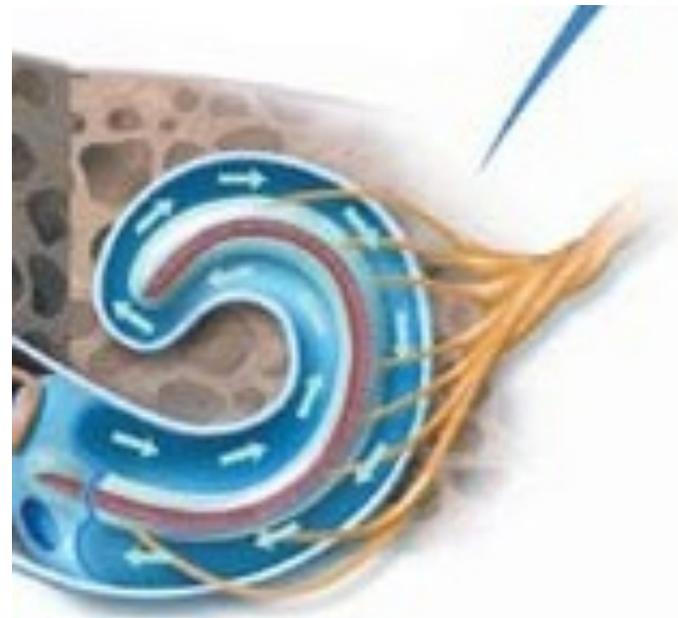
The structure of the ear



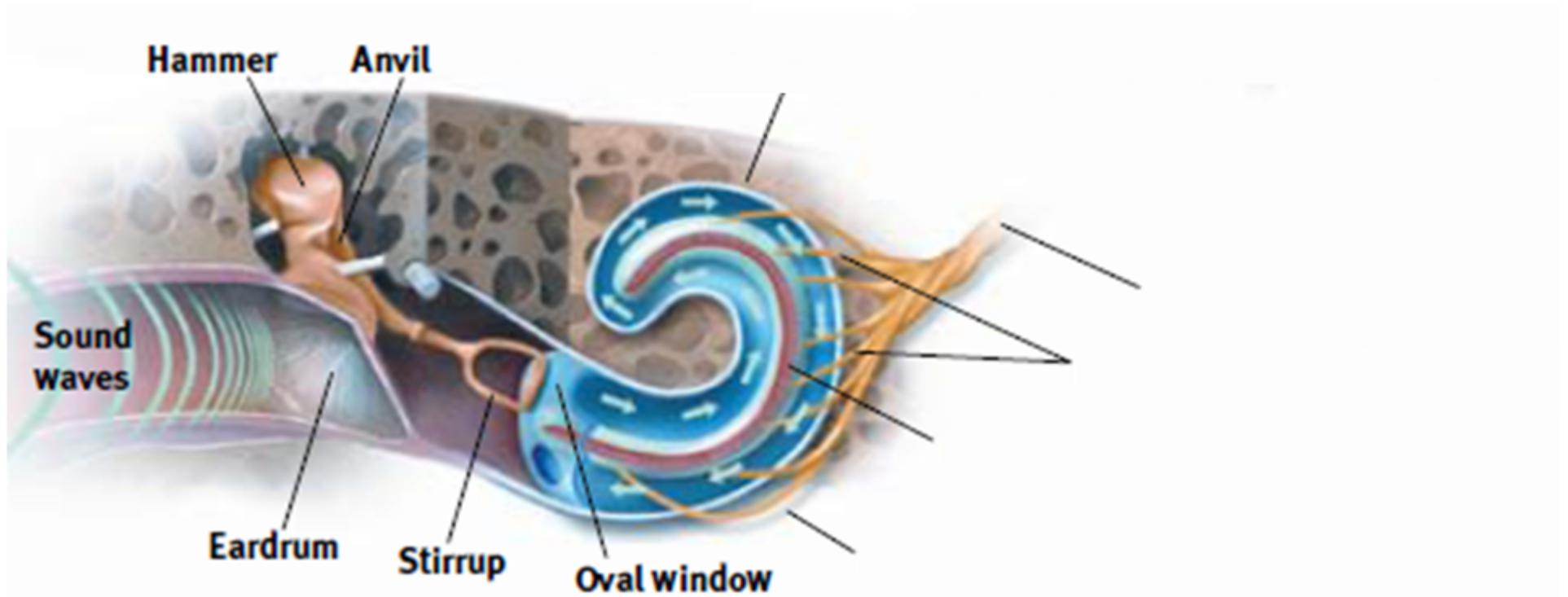
Cochlea = a coiled, bony, fluid-filled tube in the inner ear through which sound waves trigger nerve impulses.

The Ear

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

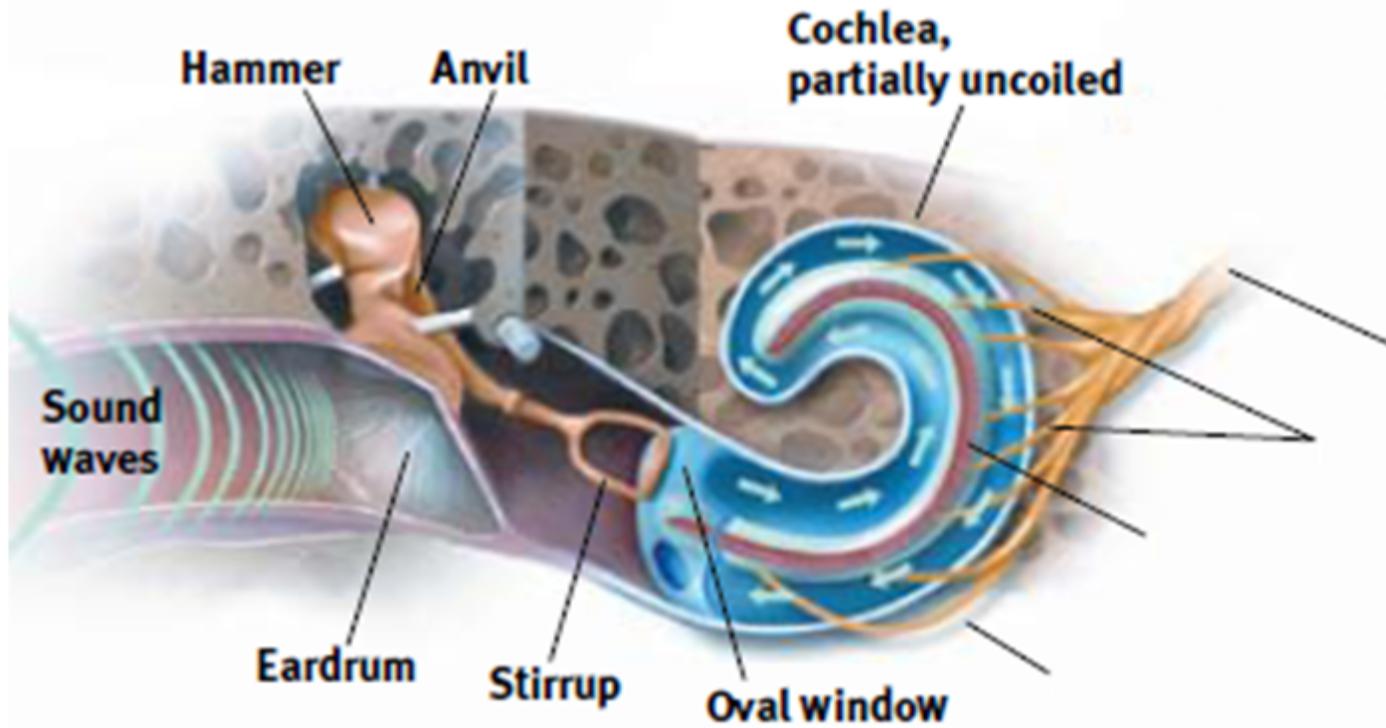


The structure of the ear



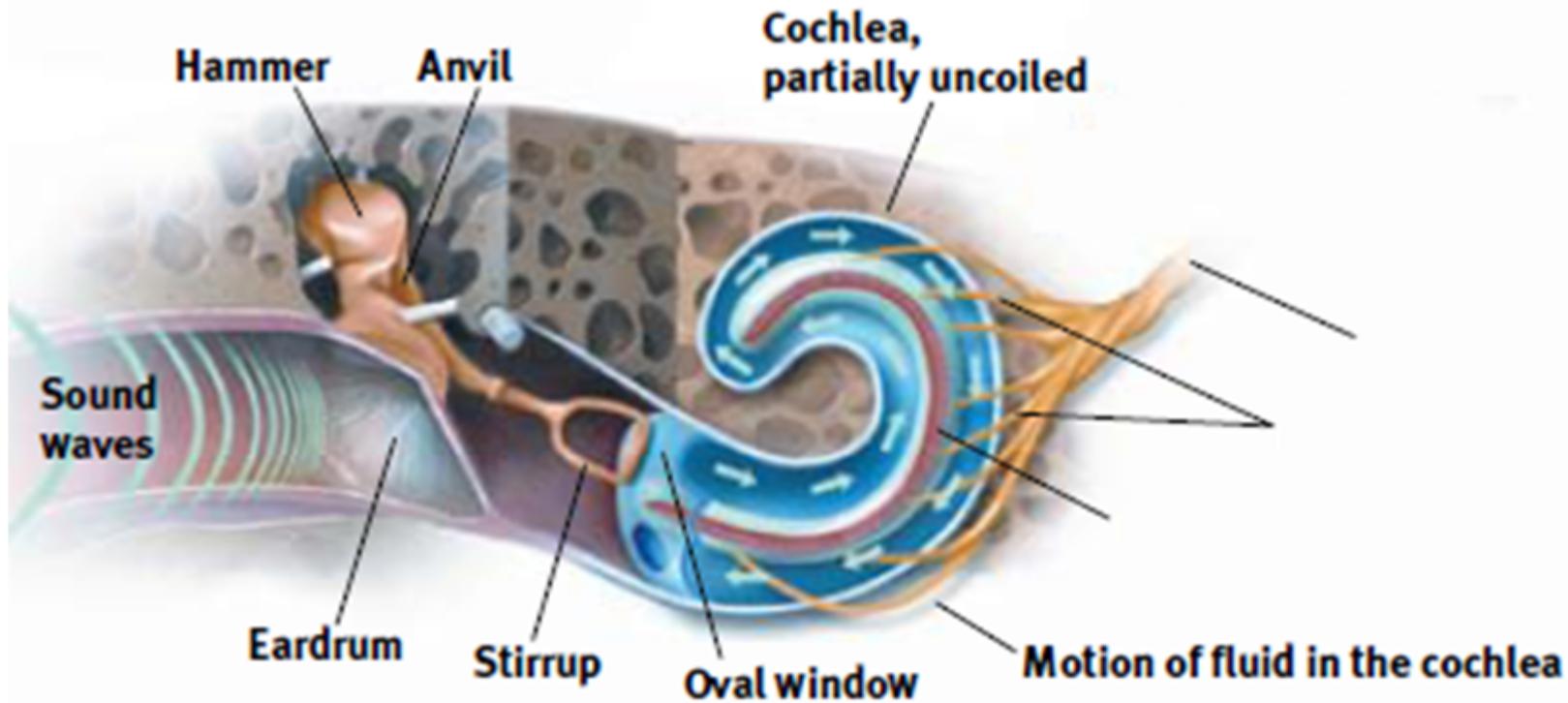
Oval Window

The structure of the ear



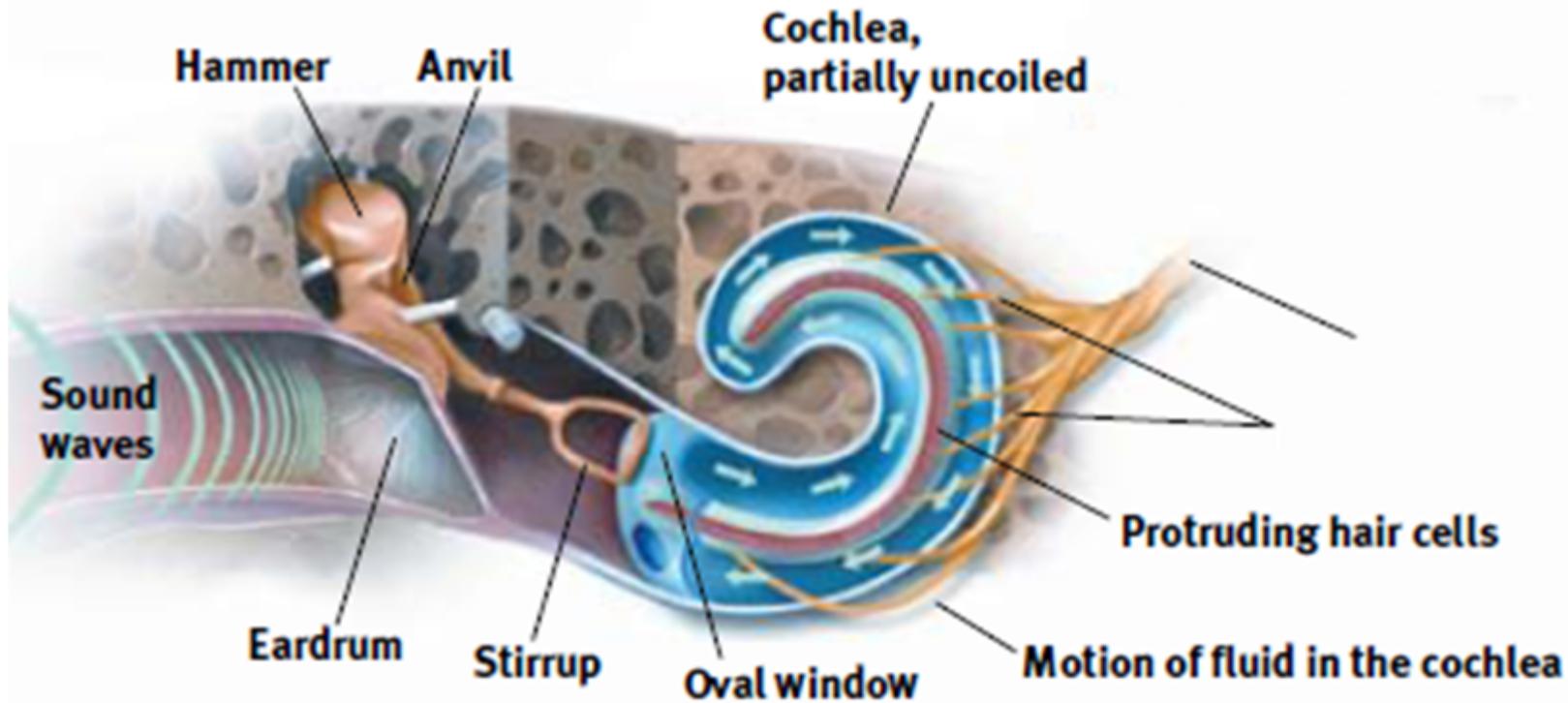
Cochlea

The structure of the ear



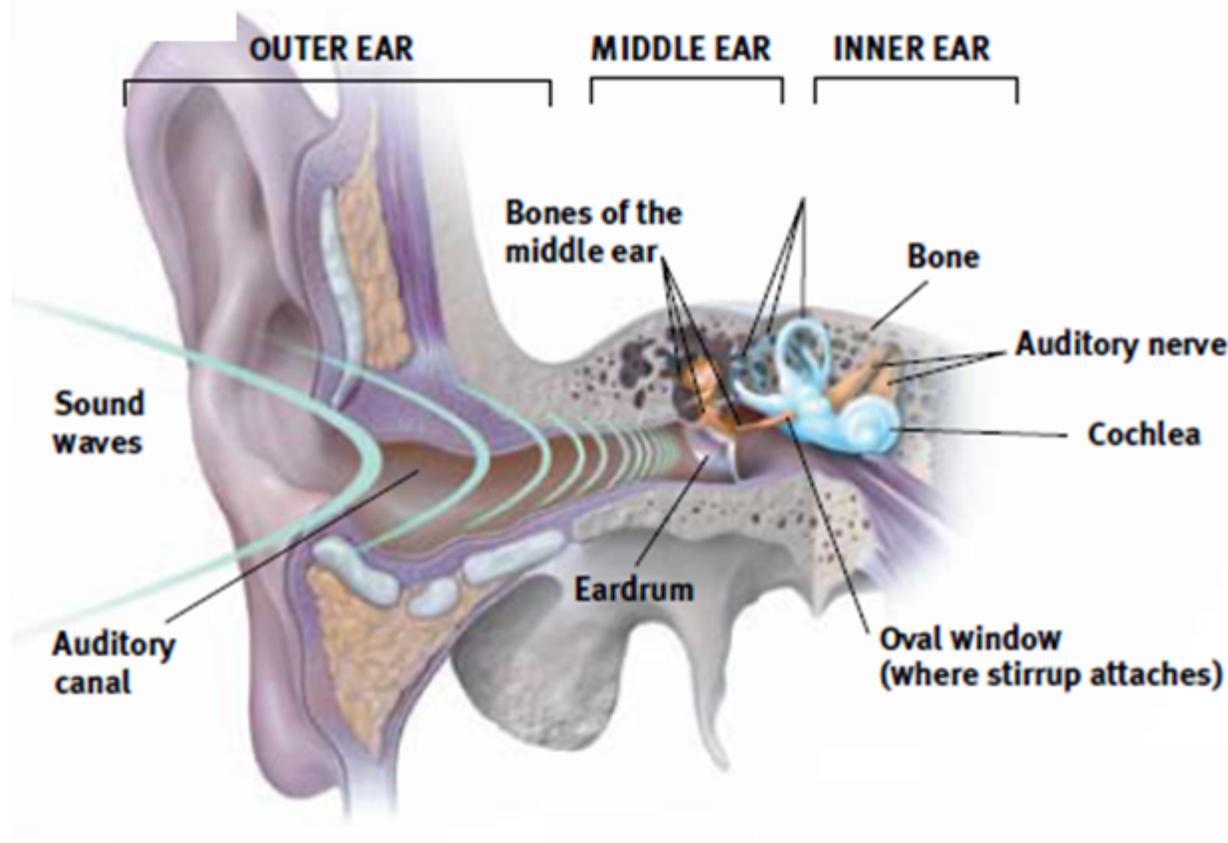
Fluid in the cochlea

The structure of the ear



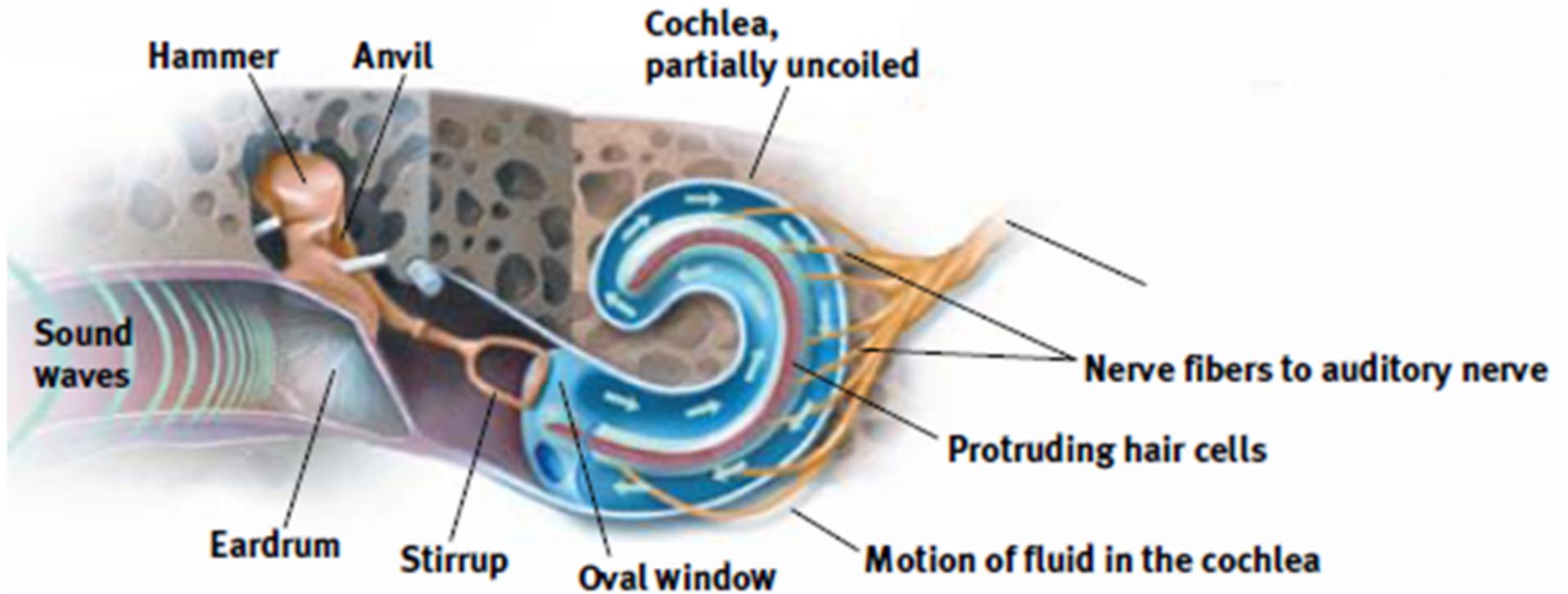
Hair cells in the cochlea

The structure of the ear



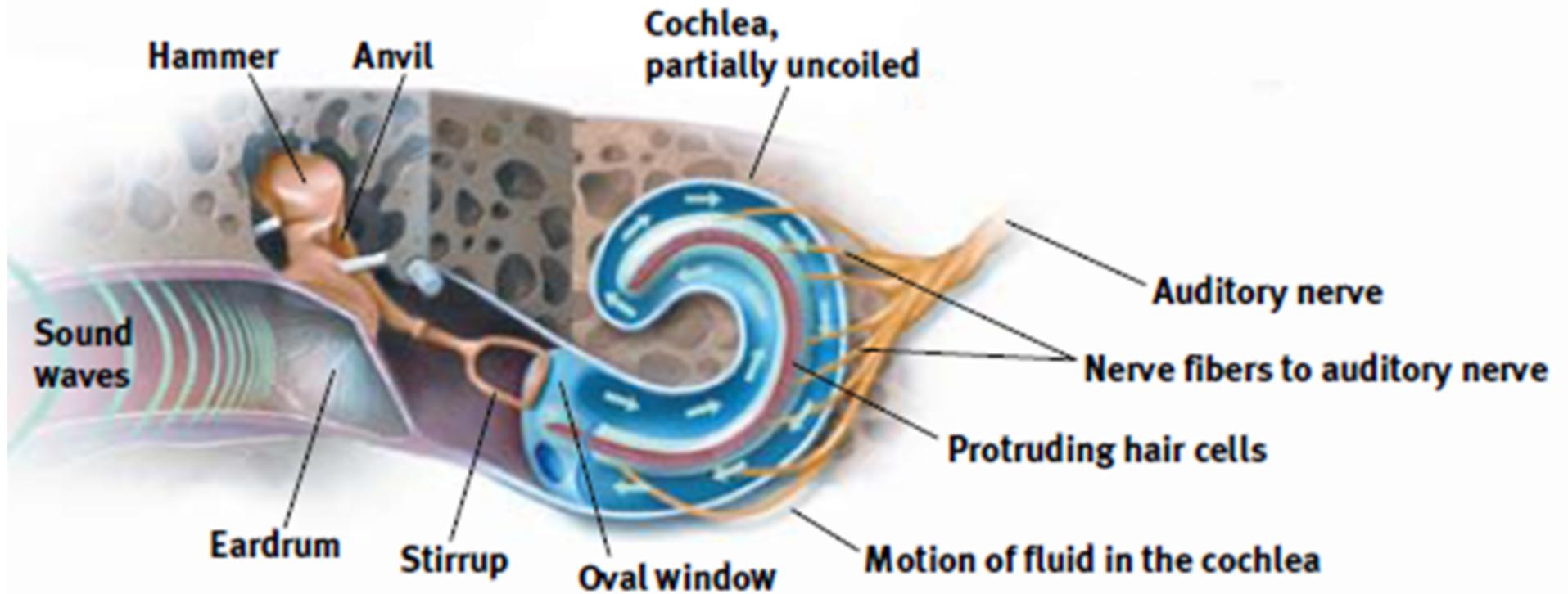
Auditory nerve = nerve which sends the auditory message to the brain via the thalamus.

The structure of the ear



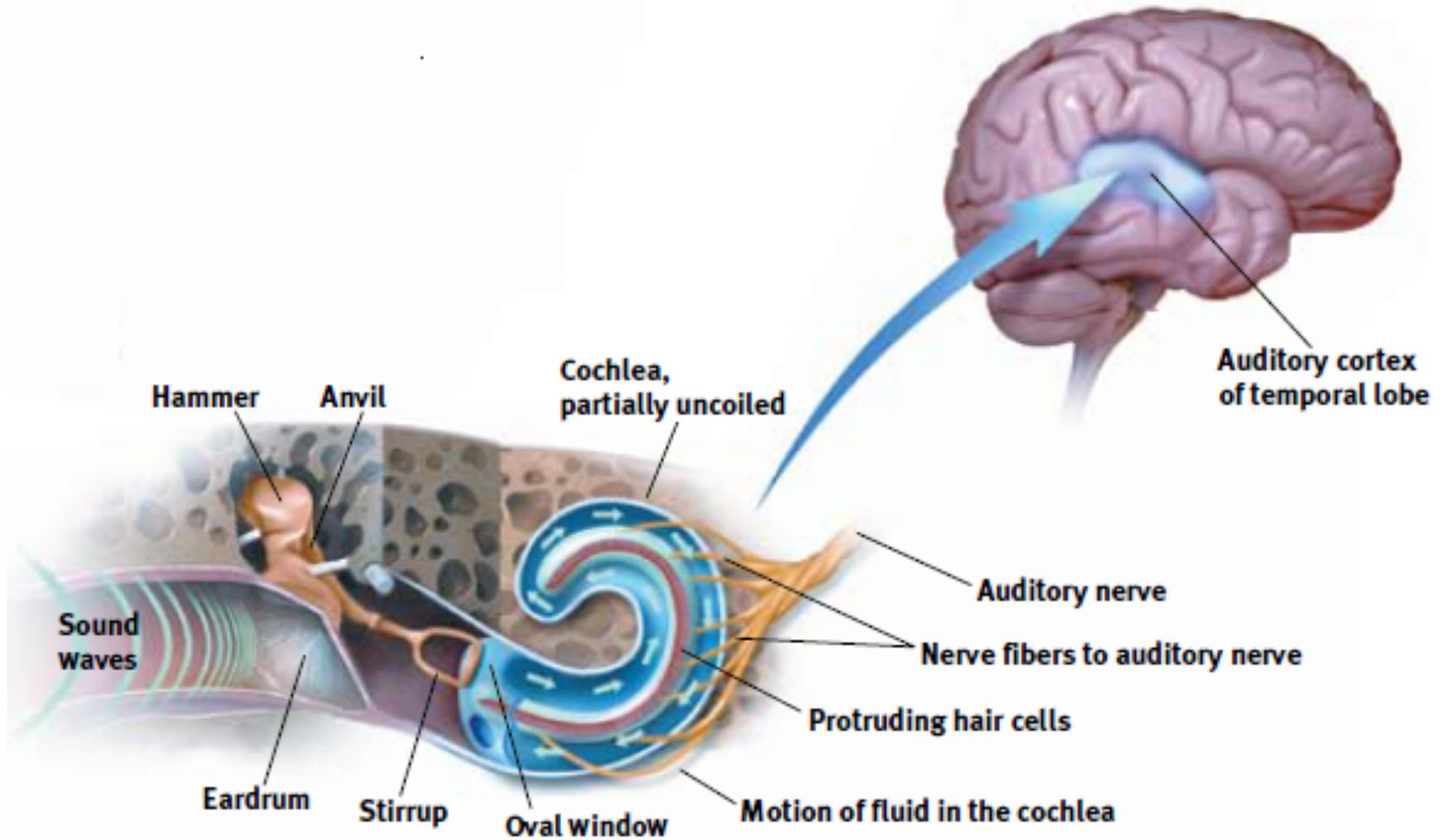
Nerve fibers

The structure of the ear



Auditory nerve

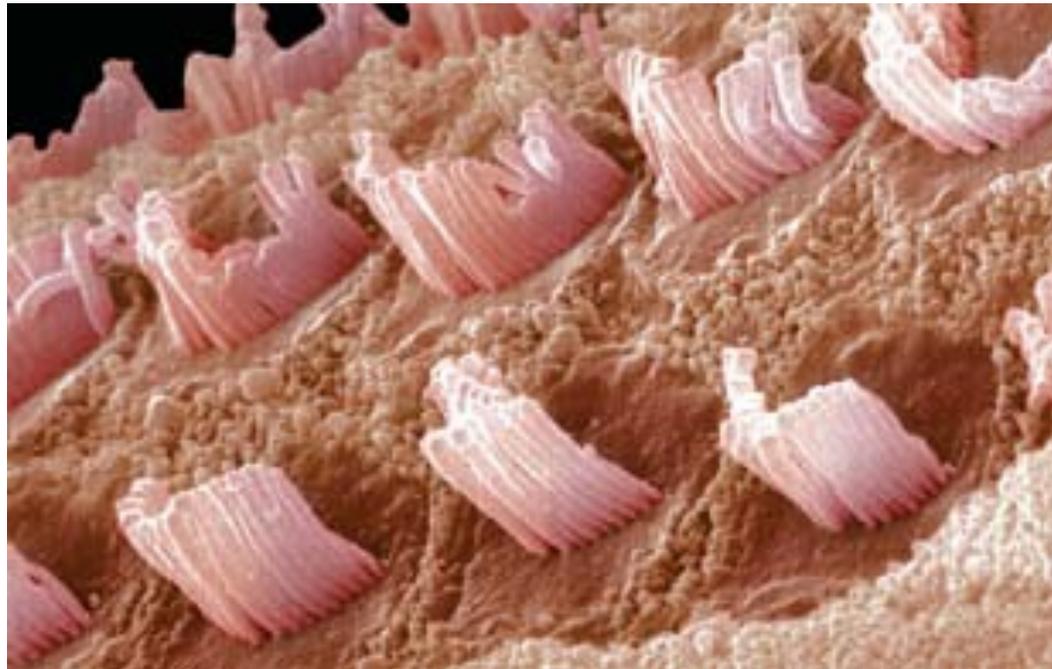
Neural impulse to the brain



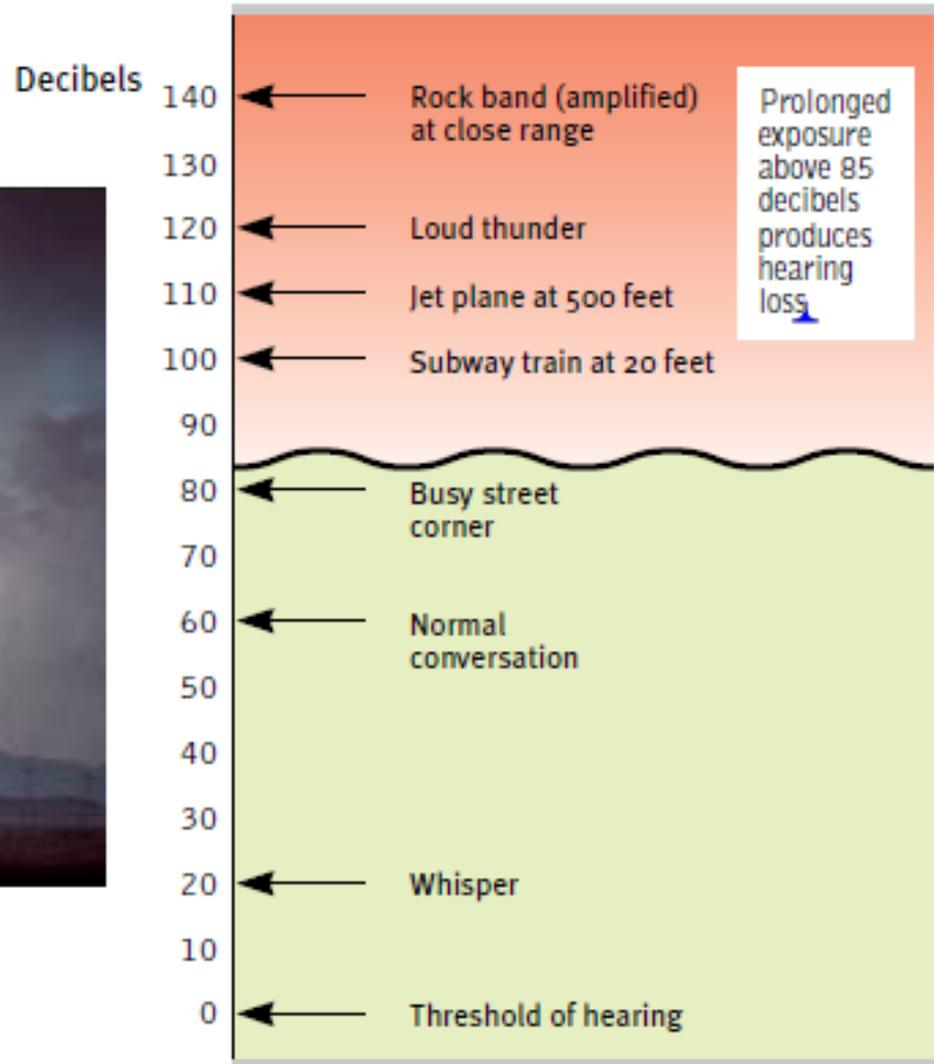
The Ear

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

Audition

- Place Theory

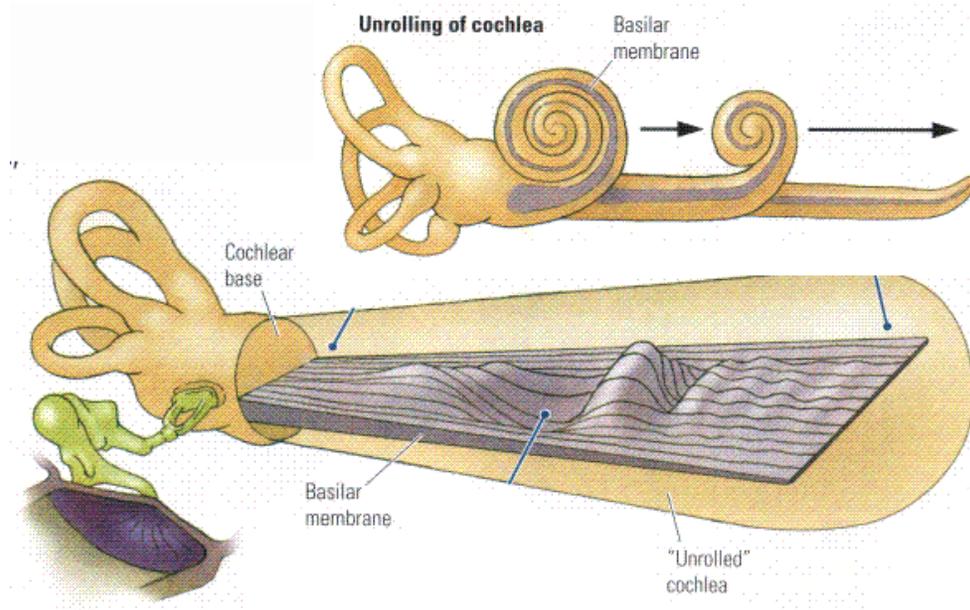
- the theory that links the pitch we hear with the place where the **cochlea's** membrane is stimulated

- Frequency Theory

- 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

Theories of Audition

Place Theory suggests that sound frequencies stimulate the basilar membrane at specific places resulting in perceived pitch.

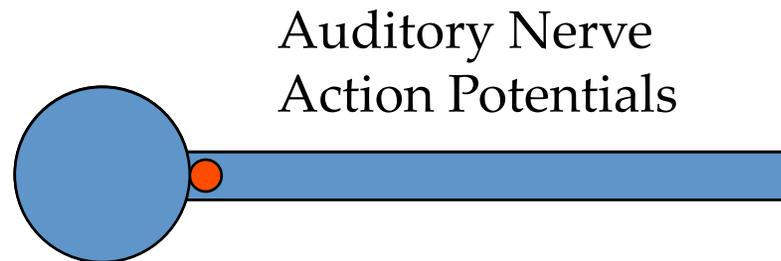


Theories of Audition

Frequency Theory states that the rate of nerve impulses traveling up the auditory nerve matches the frequency of a tone, thus enabling us to sense its pitch.



Sound
Frequency
200 Hz

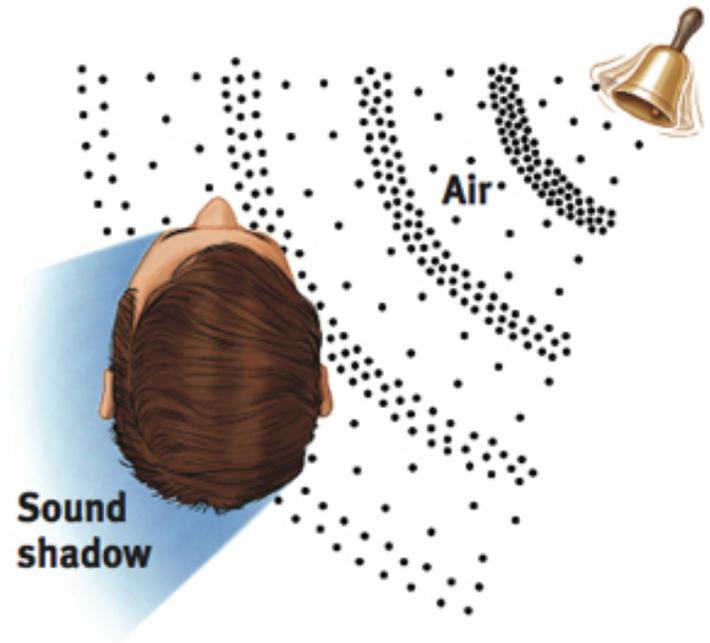


Auditory Nerve
Action Potentials

The Ear

Locating Sounds

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



Localization of Sound

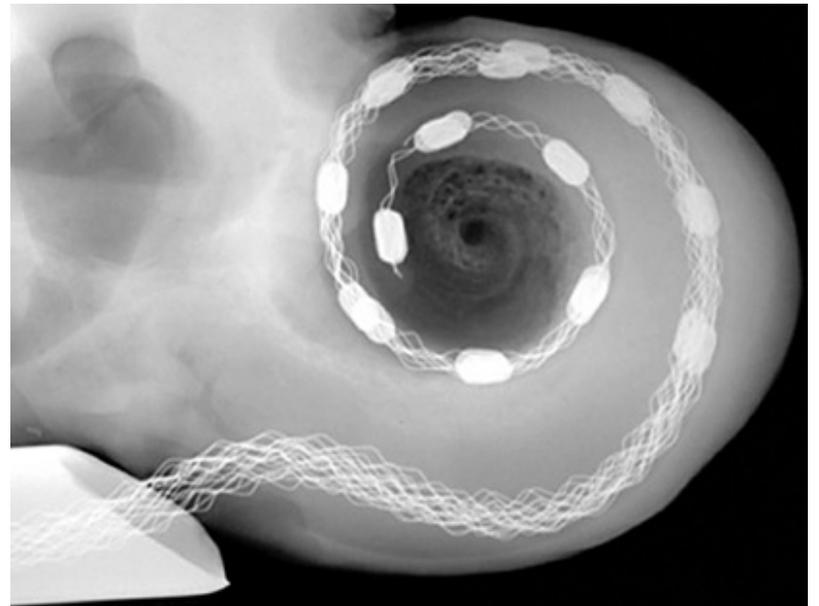
1. Intensity differences
2. Time differences

Time differences as small as $1/100,000$ of a second can cause us to localize sound.

The head acts as a “shadow” or partial sound barrier.

Hearing Loss and Deaf Culture

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



Audition

- Conduction Hearing Loss
 - hearing loss caused by damage to the mechanical system that conducts sound waves to the cochlea
- Nerve Hearing Loss
 - hearing loss caused by damage to the cochlea's receptor cells or to the auditory nerve

Conductive Hearing Loss

- occurs when there is a problem conducting sound waves anywhere along the route:
 - the outer ear
 - tympanic membrane (eardrum)
 - middle ear (ossicles)

Sensorineural Hearing Loss

- gradual deterioration of hearing thresholds occurring over years to decades.
- In some the loss may eventually affect large portions of the frequency range

Sensorineural Hearing Loss

- It may be accompanied by other symptoms
 - ringing in the ears (tinnitus)
 - dizziness or lightheadedness (vertigo).

Sensorineural Hearing Loss

- It can be genetically inherited or acquired as a result from external causes like noise or disease.
- It may be congenital (present at birth) or develop later in life.

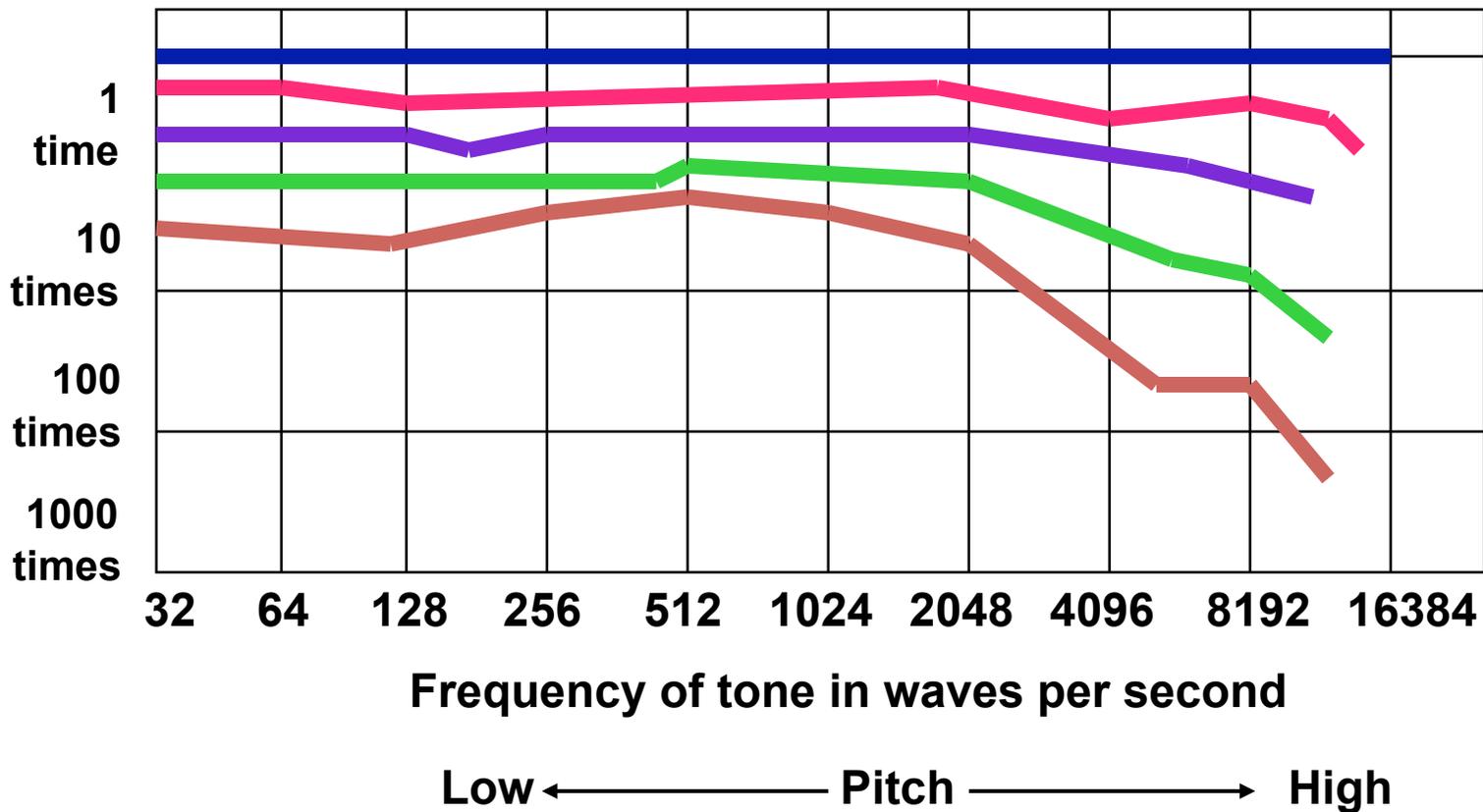
Sensorineural Hearing Loss

- The most common kind of sensorineural hearing loss is age-related (presbycusis), followed by noise-induced hearing loss (NIHL).

Audition

Amplitude required for perception relative to 20-29 year-old group

- Older people tend to hear low frequencies well but suffer hearing loss for high frequencies



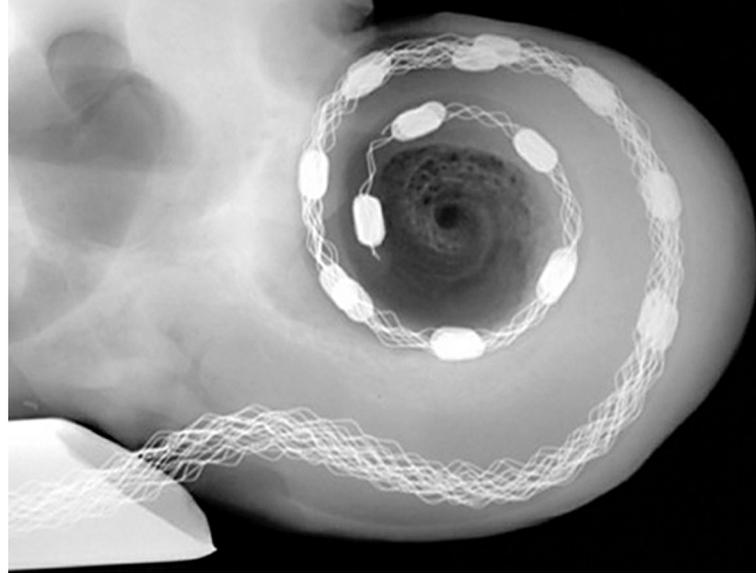
Deaf Culture

Cochlear implants are electronic devices that enable the brain to hear sounds.



Deaf Musician

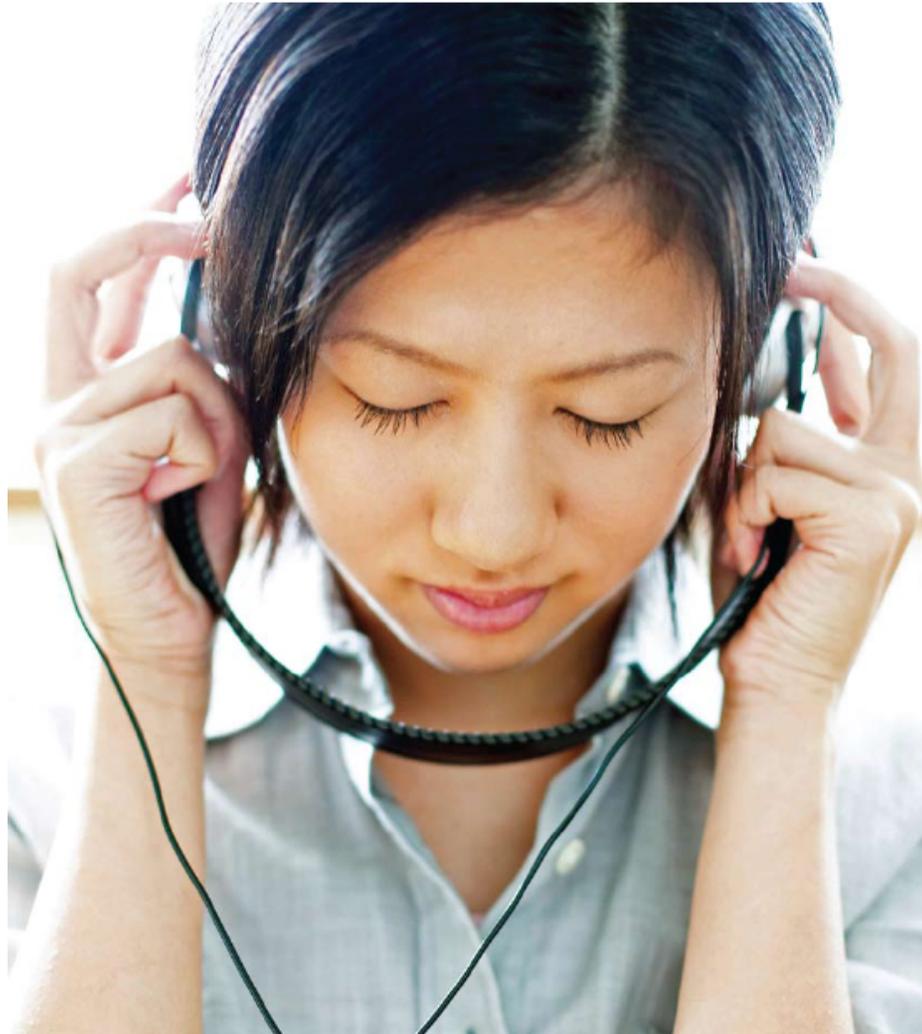
EG Images/ J.S. Wilson ©



Cochlear Implant

Wolfgang Gstotter. (2004) *American Scientist*, Vol. 92, Number 5, (p. 437)

Other Senses

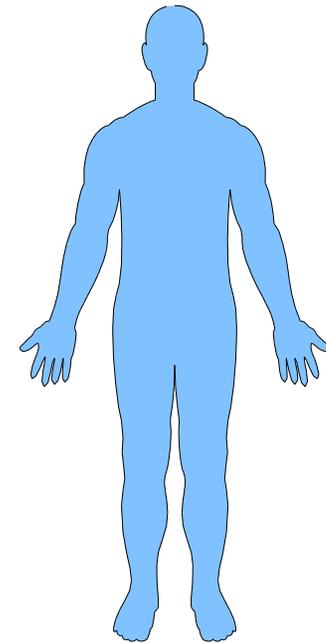


Chemical and Body Senses

- Olfaction (smell)
- Gustation (taste)
- Touch and temperature
- Pain
- Kinesthetic (location of body)
- Vestibular (balance)

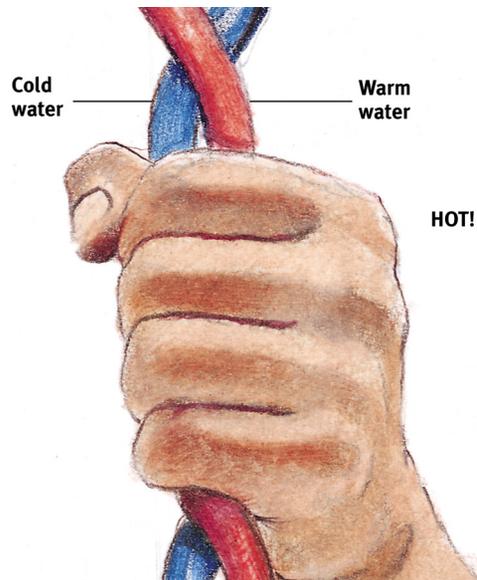
Other Important Senses

The sense of touch is a mix of four distinct skin senses—pressure, warmth, cold, and pain.

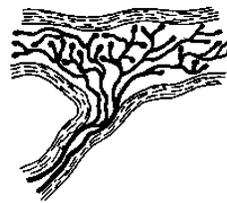


Skin Senses

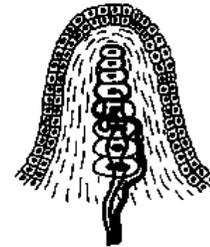
Only pressure has identifiable receptors. All other skin sensations are variations of pressure, warmth, cold and pain.



Burning hot



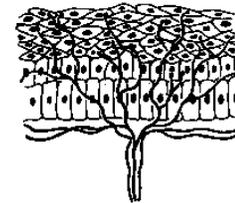
Pressure



Vibration



Vibration



Cold, warmth and pain

Pain

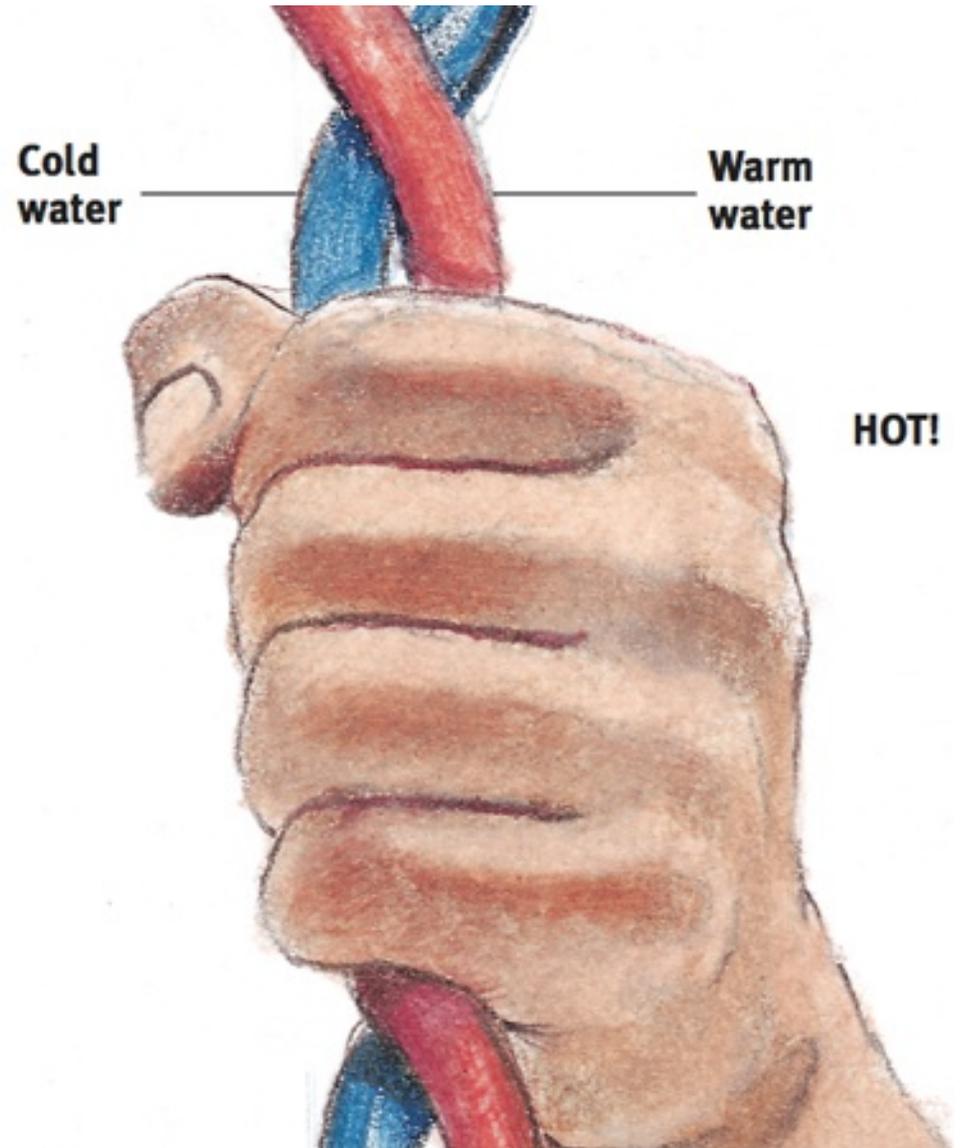
Pain tells the body that something has gone wrong. Usually pain results from damage to the skin and other tissues. A rare disease exists in which the afflicted person feels no pain.



Ashley Blocker (right) feels neither pain nor extreme hot or cold.

Touch

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



Touch

- Rubber hand illusion

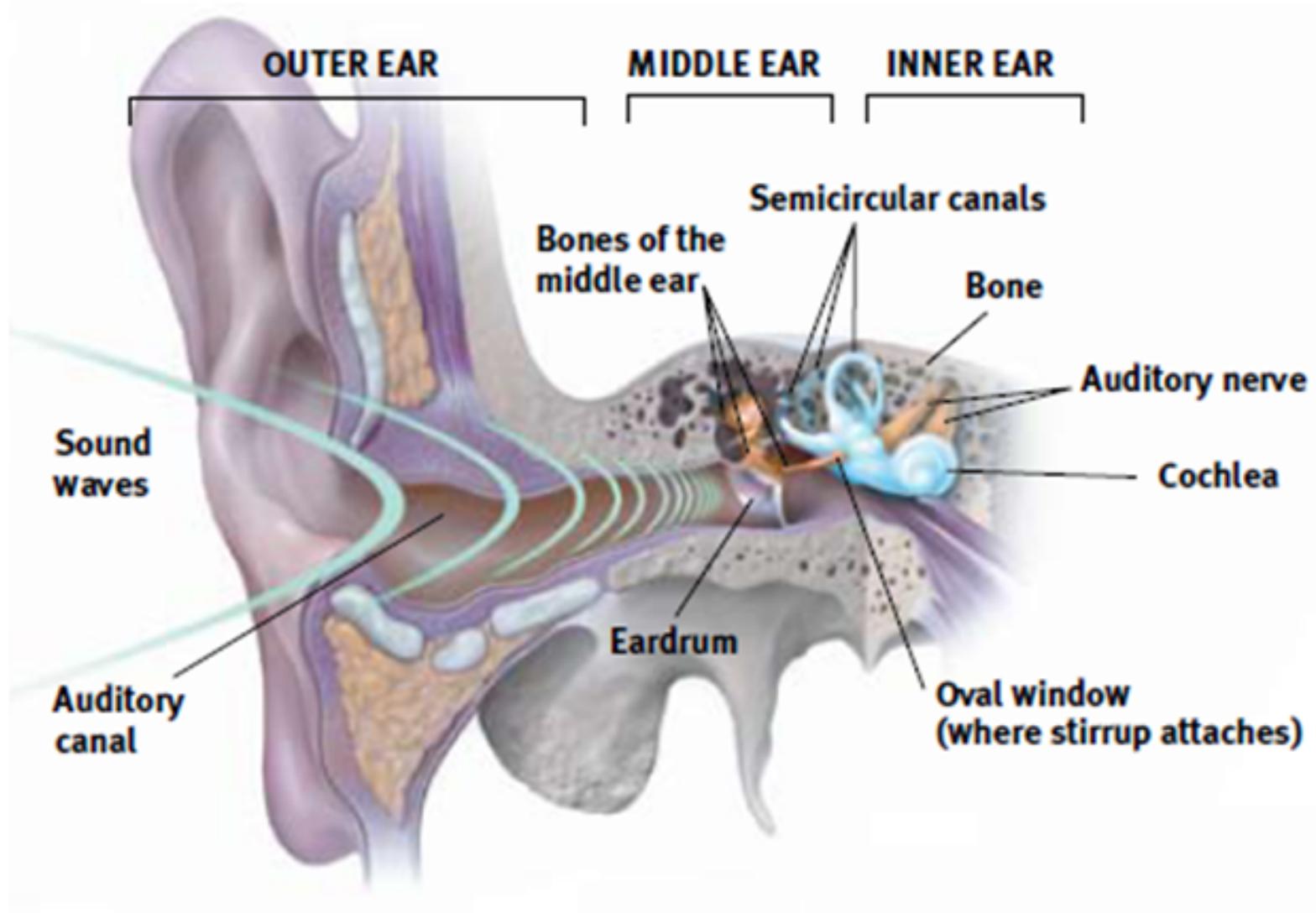


Touch

- Kinesthesia
- Vestibular sense
 - Semicircular canals



Semicircular Canals



Pain

Understanding Pain

- Biological Influences
 - Noiceptors
 - [Gate-control theory](#)
 - Endorphins
 - Phantom limb sensations
 - Tinnitus



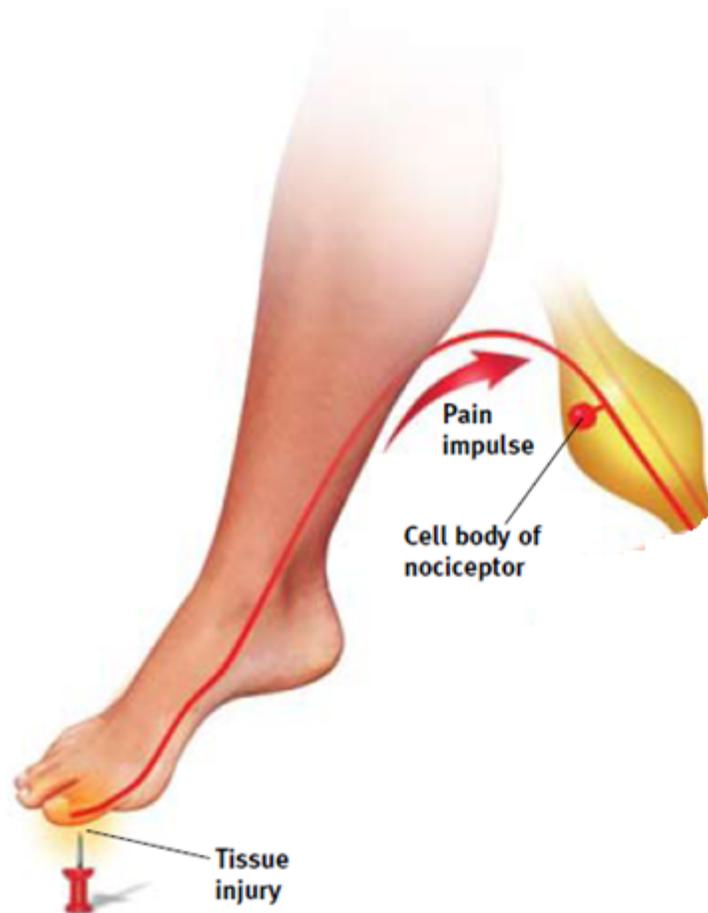
The pain circuit



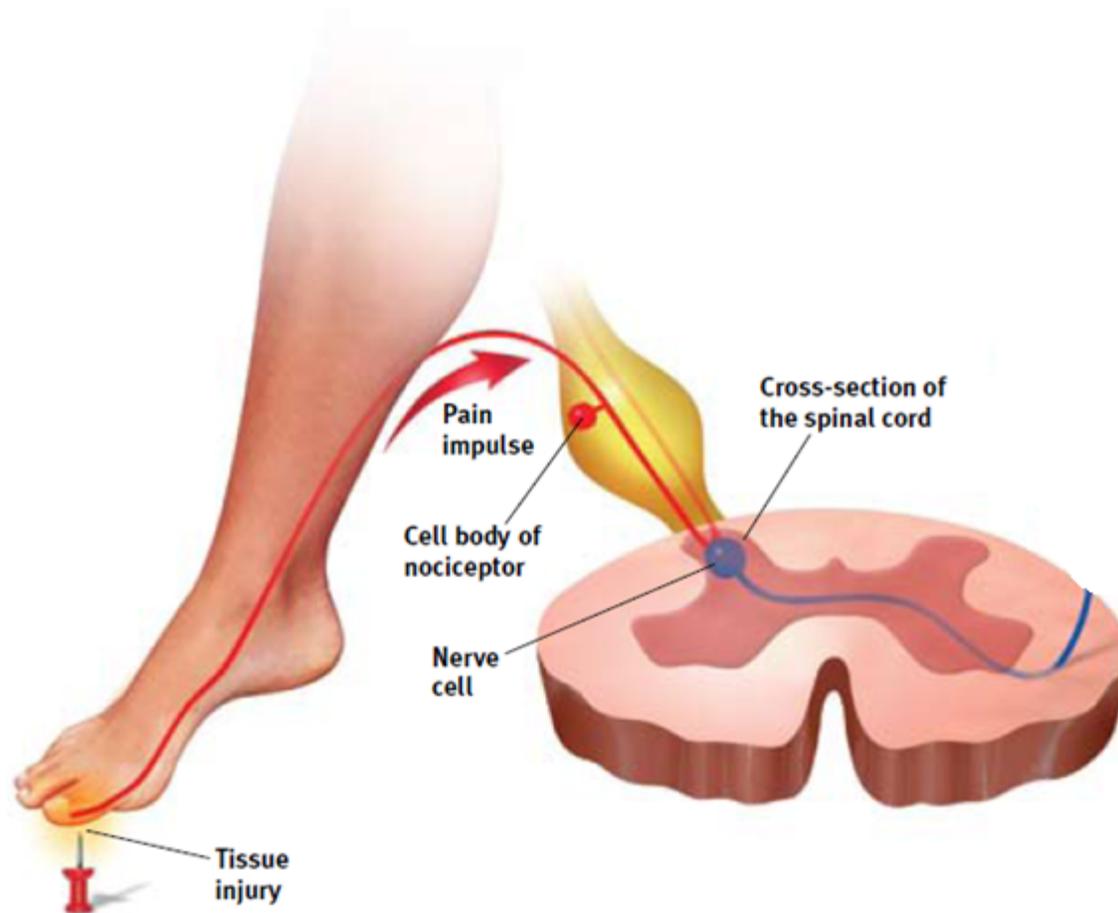
The pain circuit



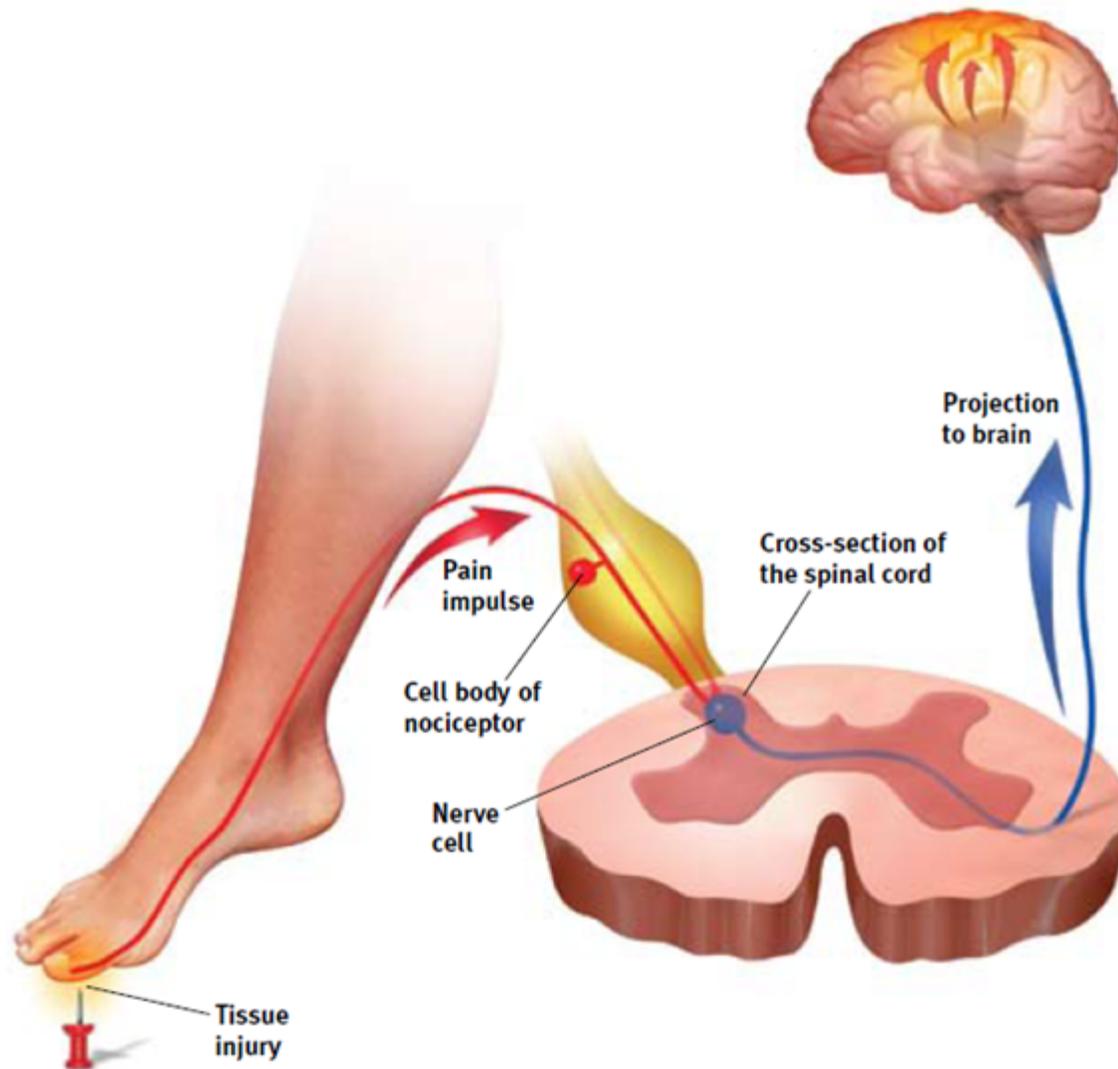
The pain circuit



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

Biological influences:

- activity in spinal cord's large and small fibers
- genetic differences in endorphin production
- the brain's interpretation of CNS activity



Biopsychosocial approach to pain

Biological influences:

- activity in spinal cord's large and small fibers
- genetic differences in endorphin production
- the brain's interpretation of CNS activity



Psychological influences:

- attention to pain
- learning based on experience
- expectations



Biopsychosocial approach to pain

Biological influences:

- activity in spinal cord's large and small fibers
- genetic differences in endorphin production
- the brain's interpretation of CNS activity



Psychological influences:

- attention to pain
- learning based on experience
- expectations

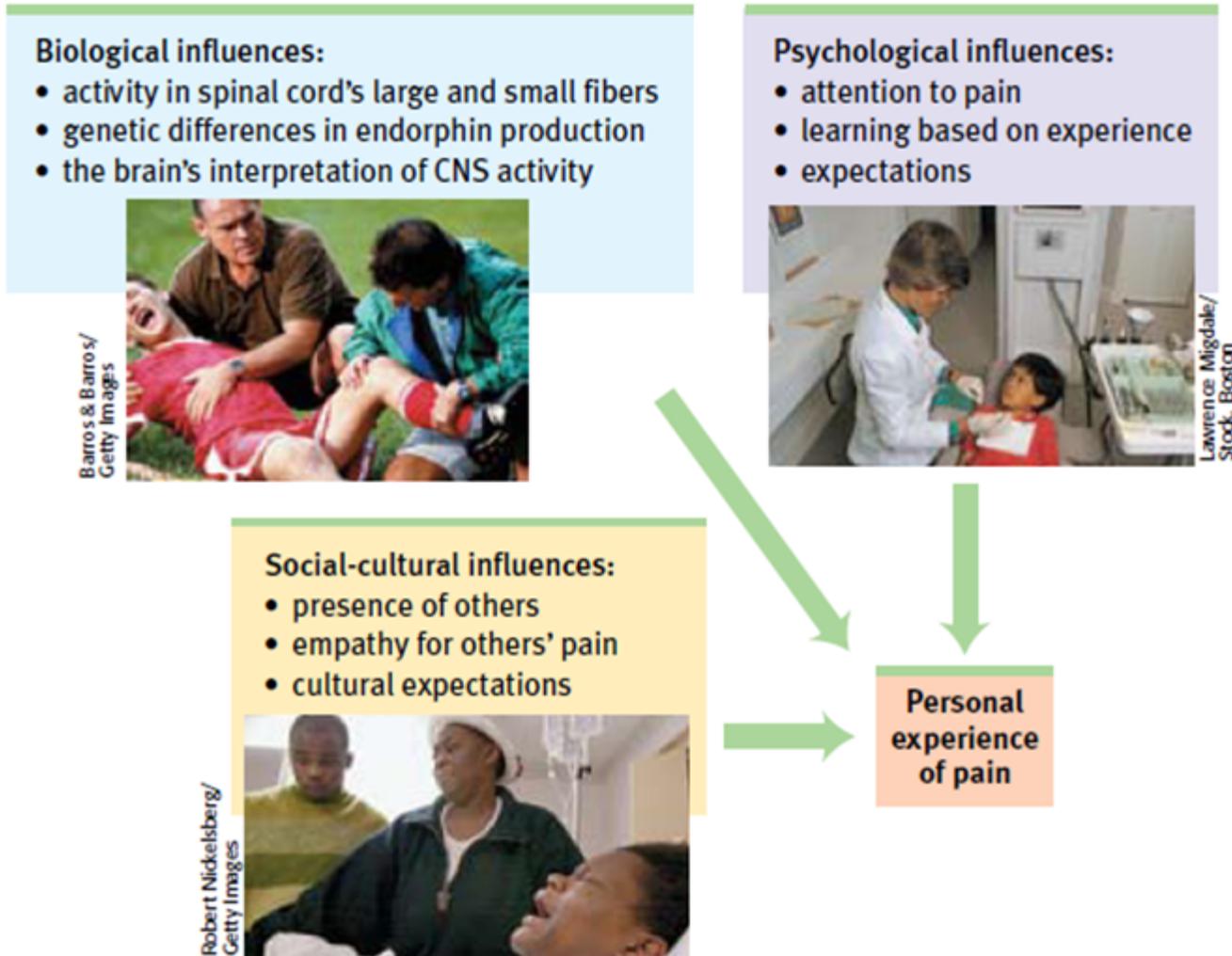


Social-cultural influences:

- presence of others
- empathy for others' pain
- cultural expectations



Biopsychosocial approach to pain



Pain

Controlling Pain

- Physical methods
- Psychological methods



Taste

Traditionally, taste sensations consisted of sweet, salty, sour, and bitter tastes. Recently, receptors for a fifth taste have been discovered called "*Umami*".



Sweet



Sour



Salty



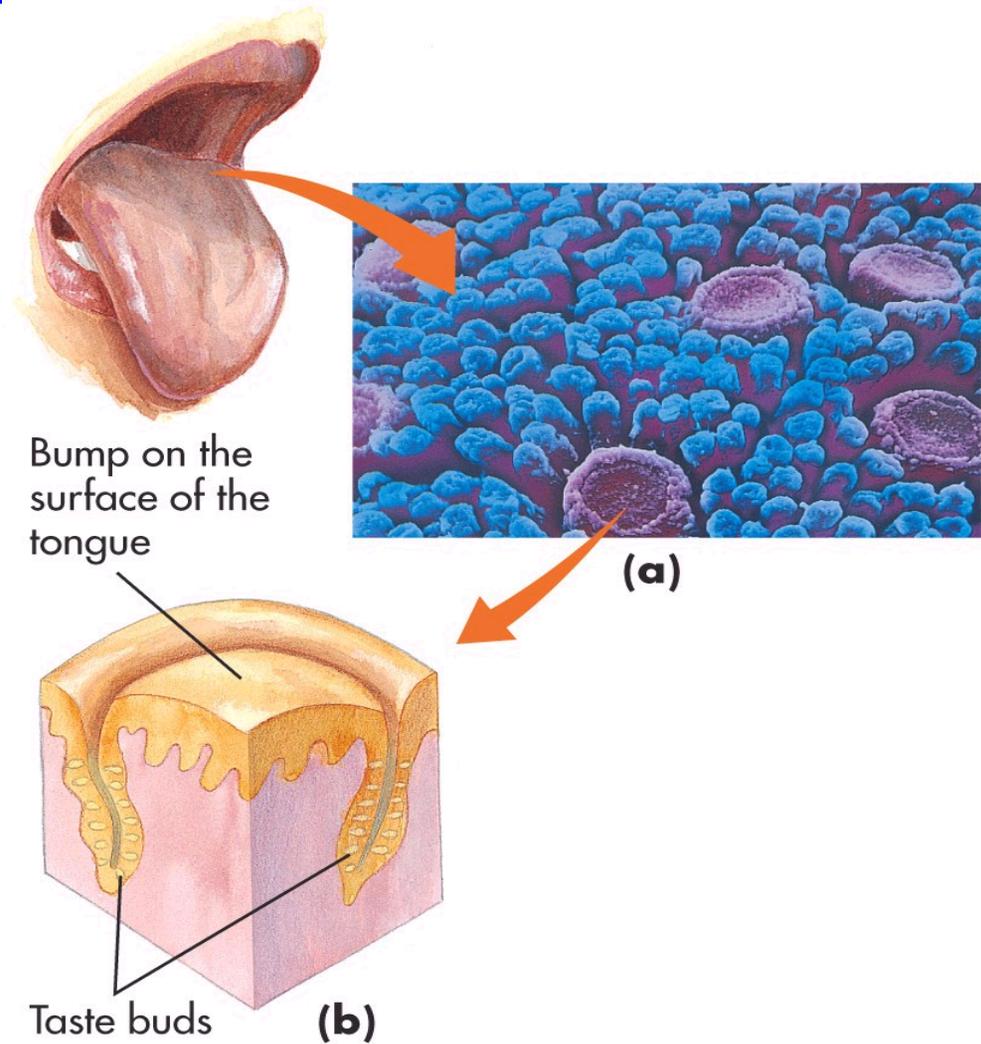
Bitter



**Umami
(Fresh
Chicken)**

■ Taste Sensations

- sweet
- sour
- salty
- bitter



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

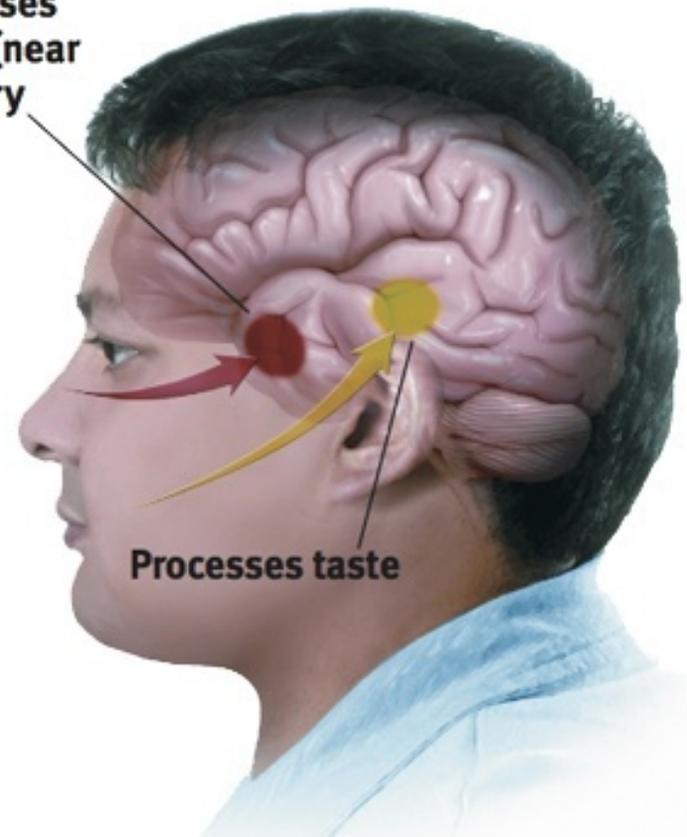
- Sensory interaction
- Interaction of smell and taste
 - McGurk Effect
- Interaction of other senses



Smell

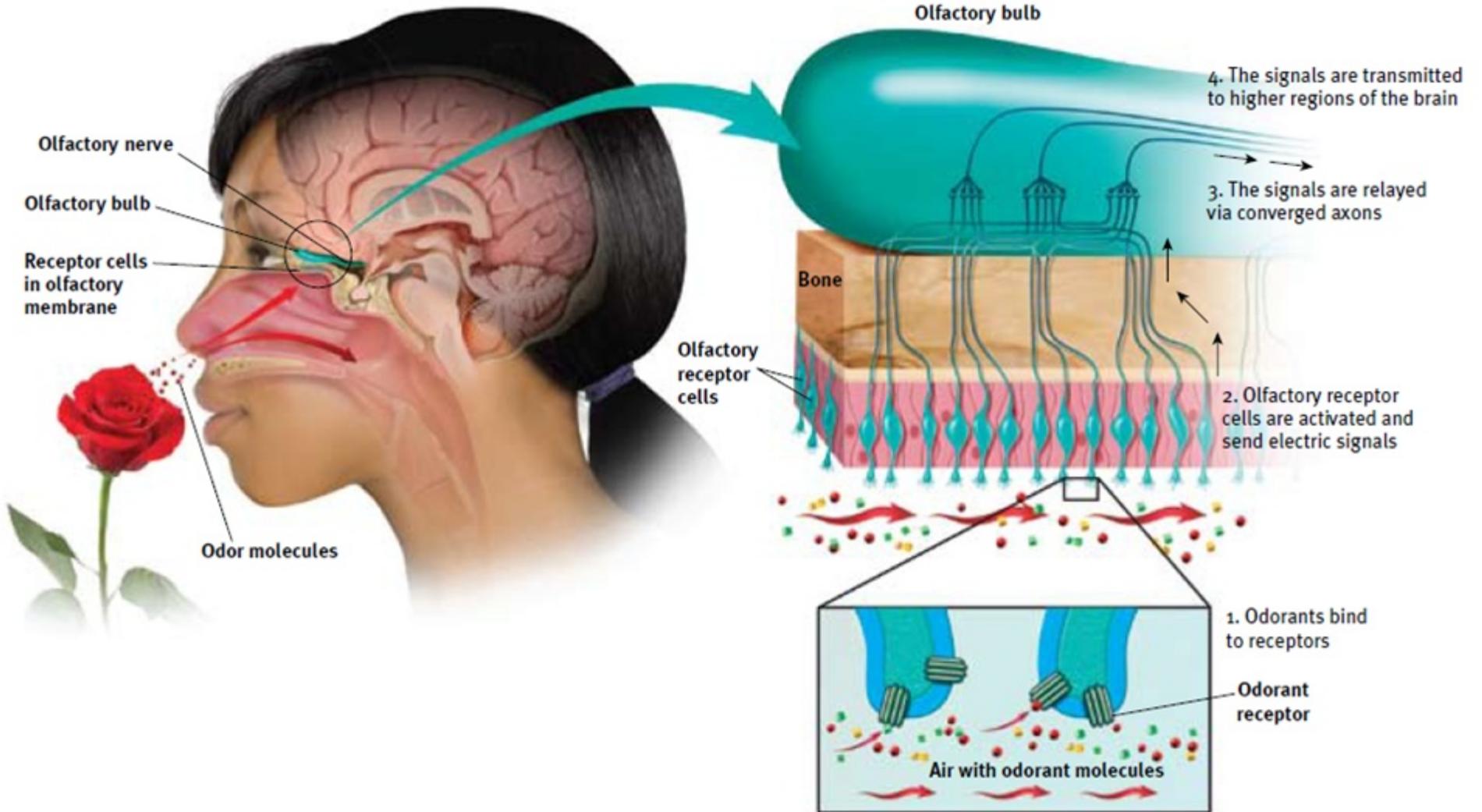
- Olfaction
 - Chemical sense
 - Odor molecules
 - Olfactory bulb
 - Olfactory nerve

Processes
smell (near
memory
area)

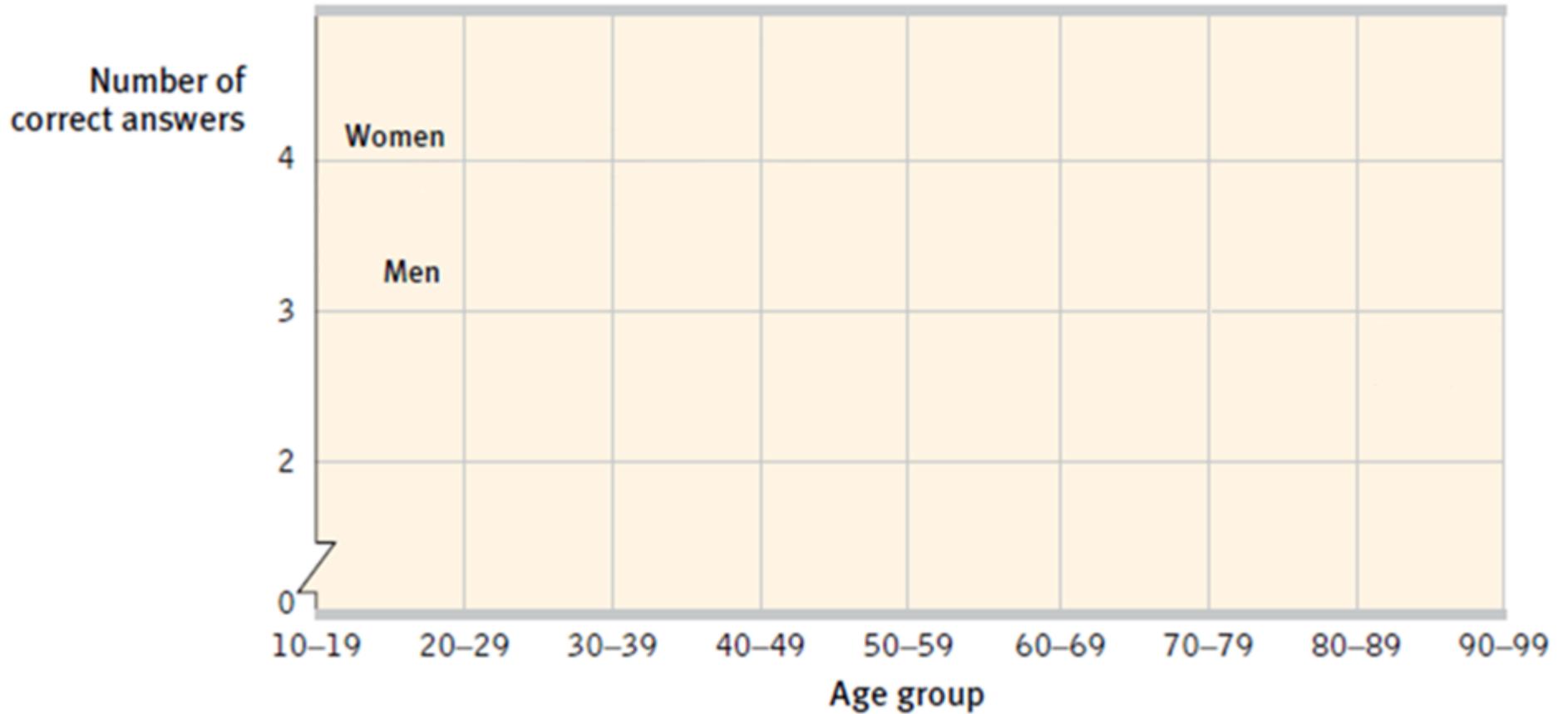


Processes taste

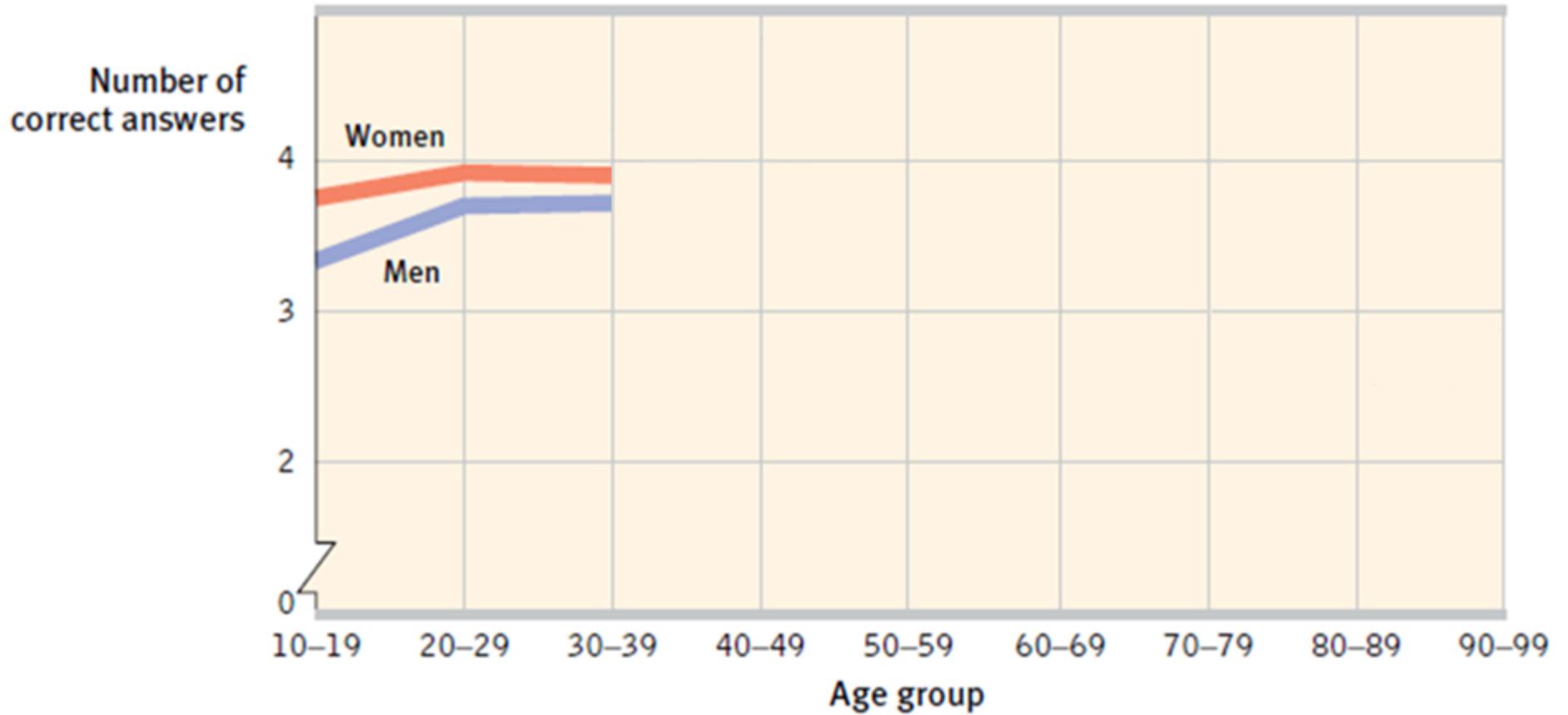
Smell (olfaction)



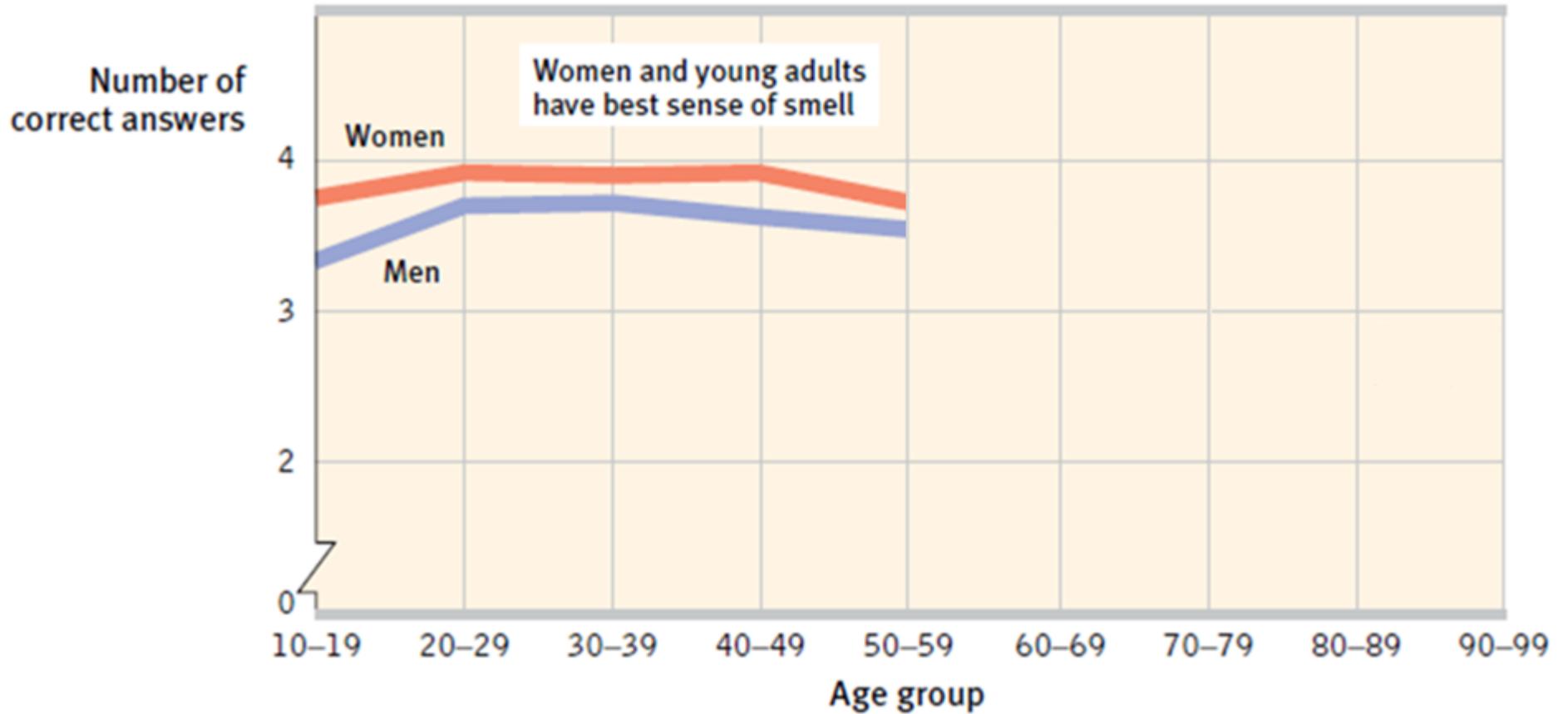
Smell and age



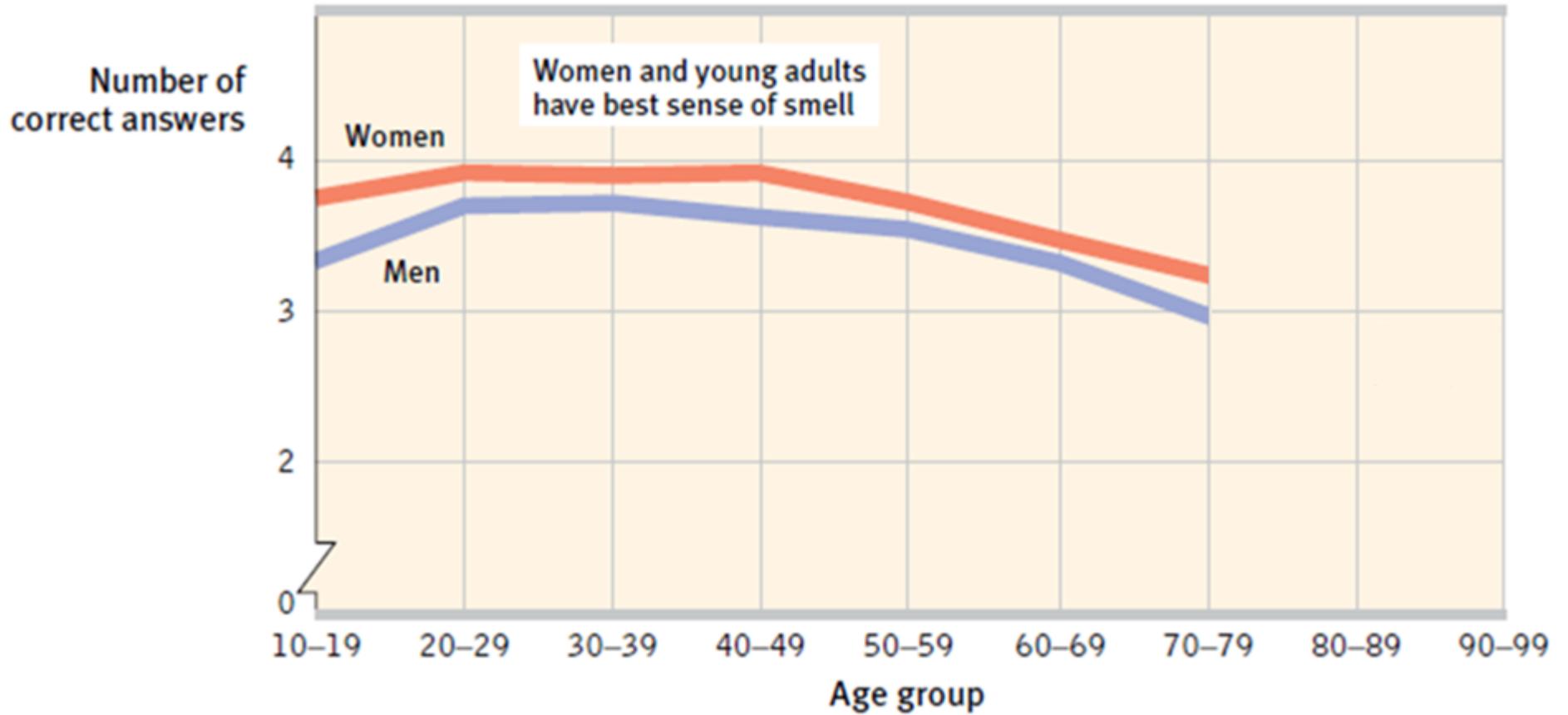
Smell and age



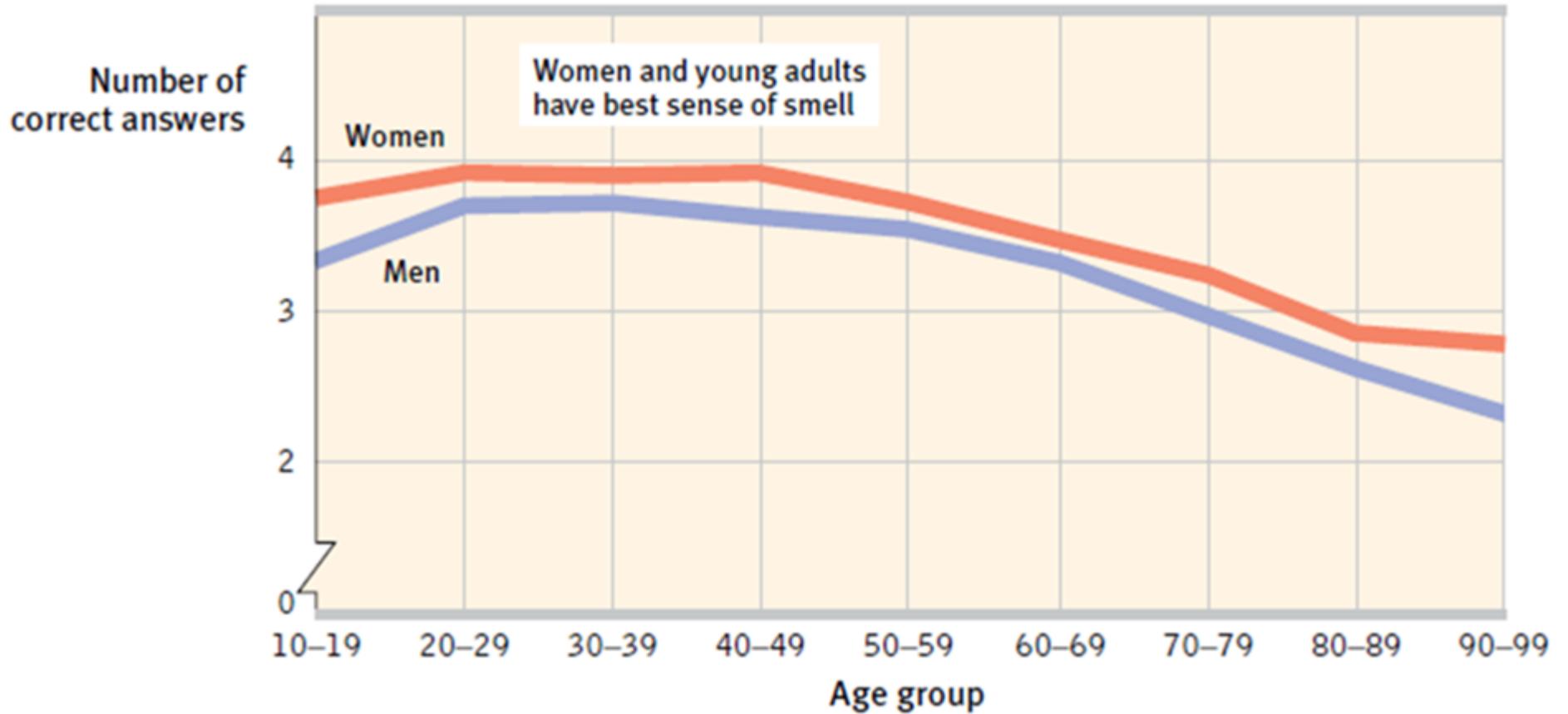
Smell and age



Smell and age

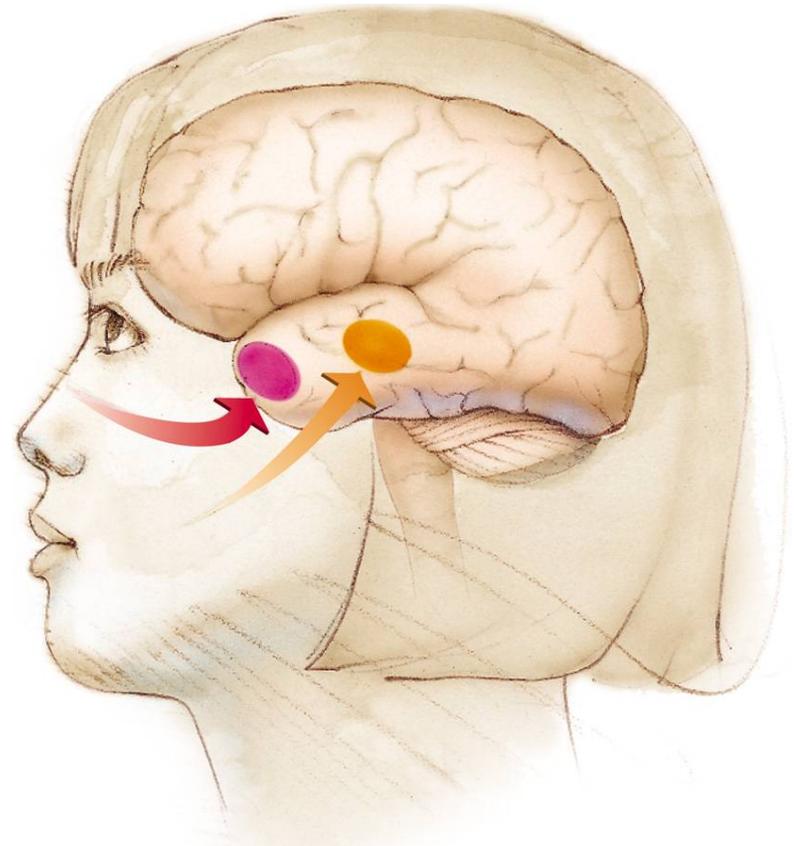


Smell and age



Smell and Memories

The brain region for smell (in red) is closely connected with the brain regions involved with memory (limbic system). That is why strong memories are made through the sense of smell.



Taste

- Your sensitivity to taste will decline if you:
 - Smoke heavily
 - Consume large amounts of alcohol
 - Grow older

Perceptual Organization



Introduction

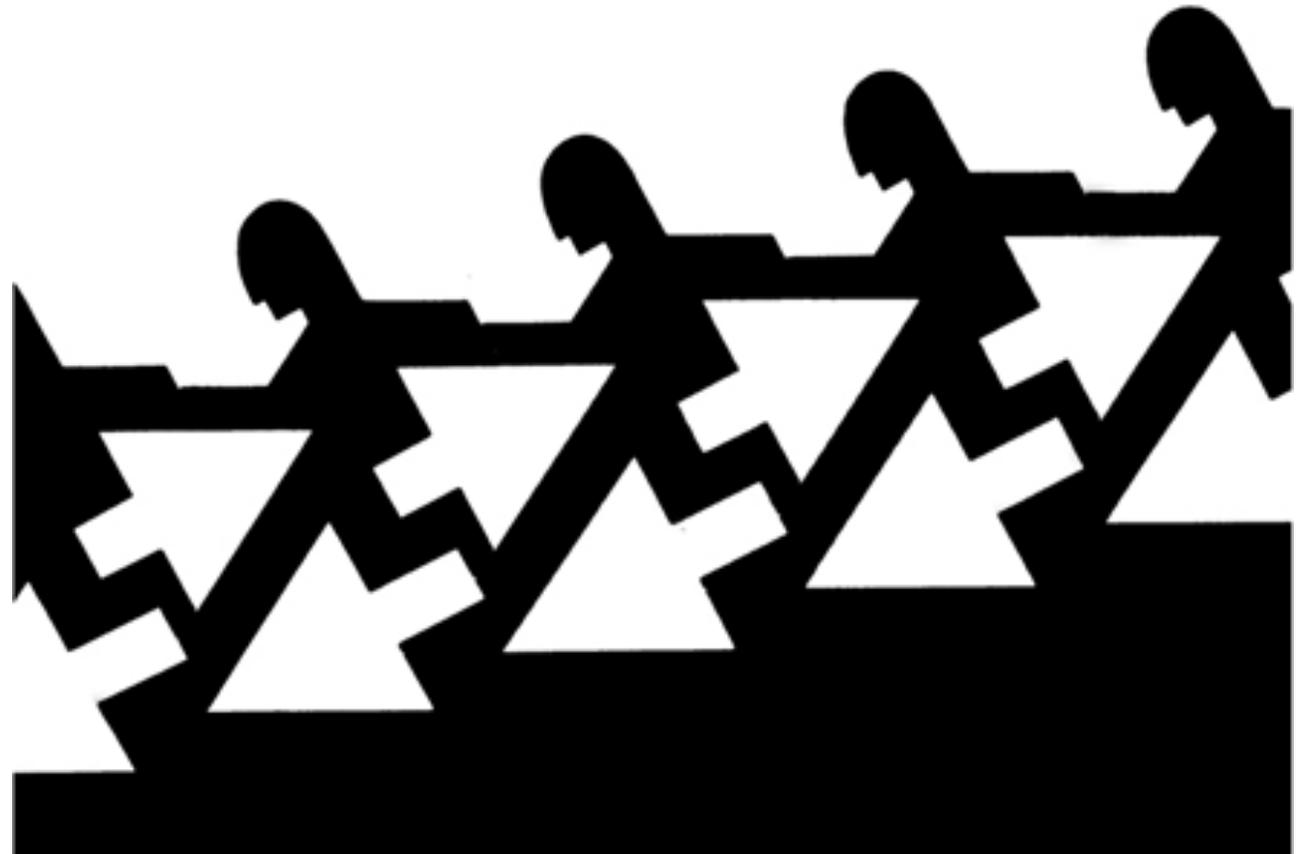
- Gestalt (form or whole)



Form Perception

Figure and Ground

- [Figure-ground](#)



Form Perception

Grouping

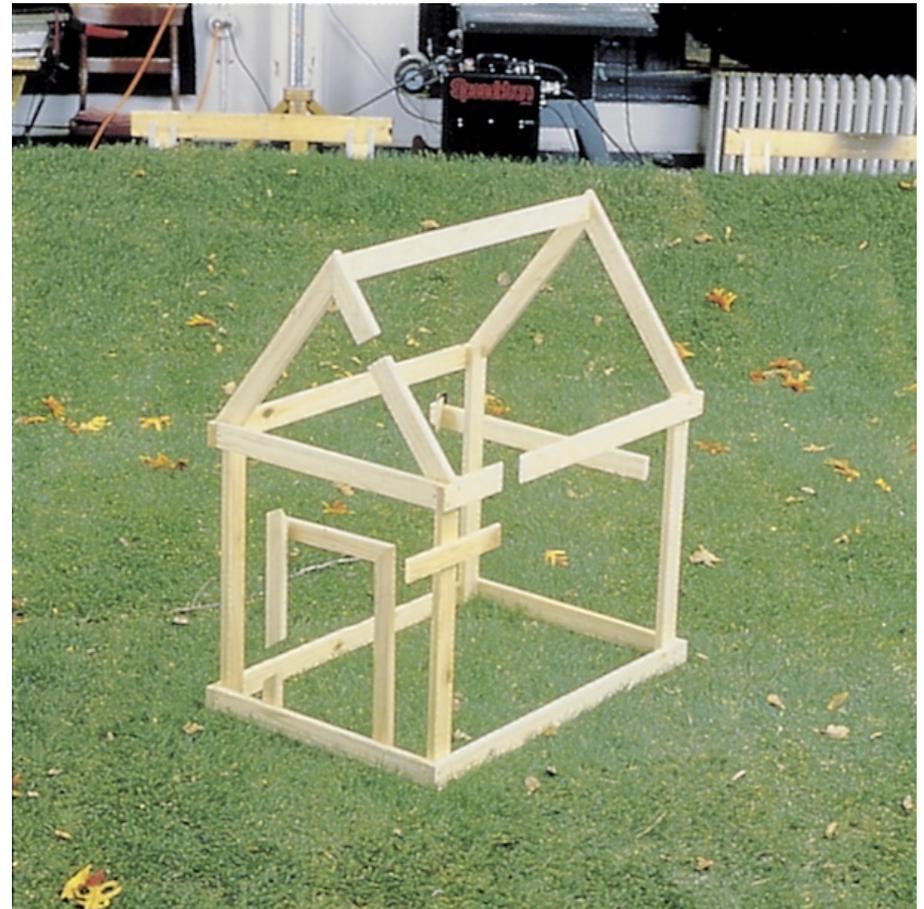
- Grouping
 - Proximity
 - Similarity
 - Continuity
 - Connectedness
 - Closure



Form Perception

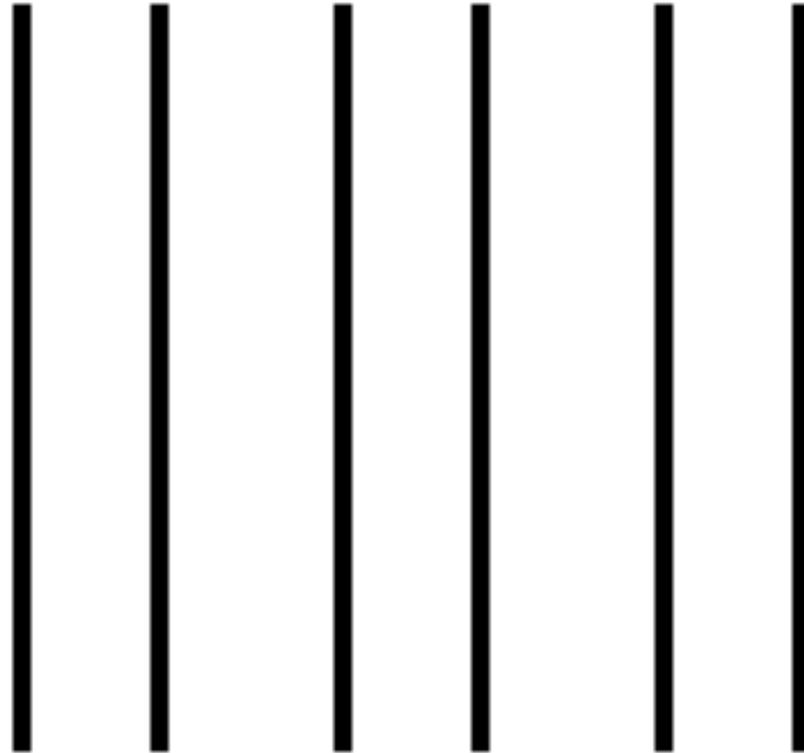
Grouping

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



Form Perception

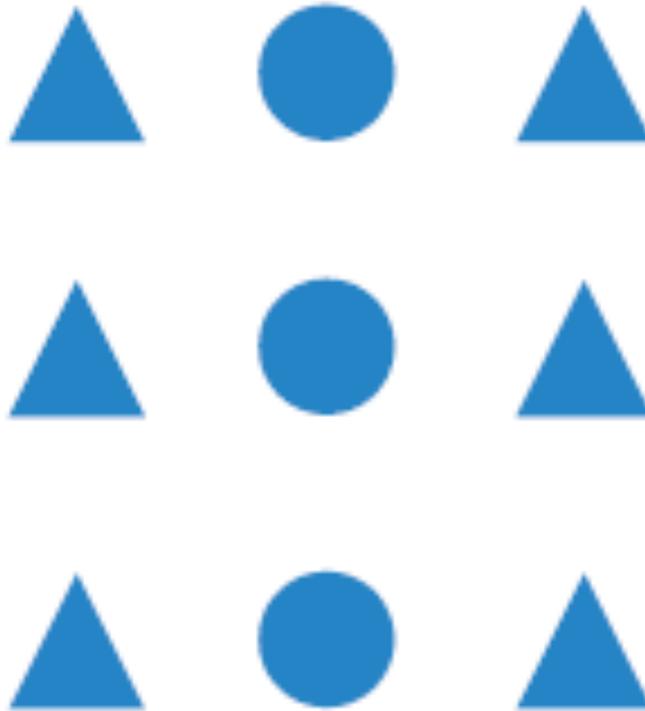
Grouping - Proximity



Proximity

Form Perception

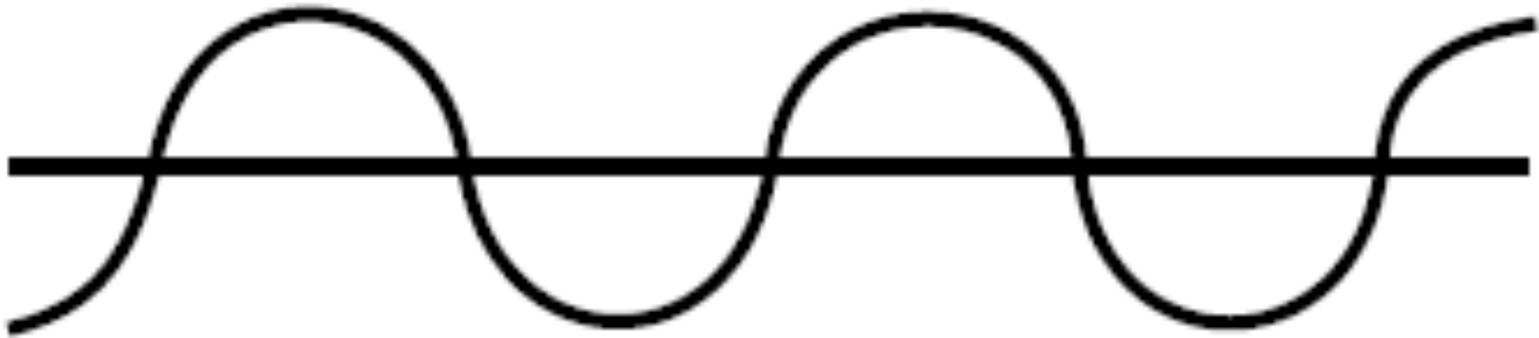
Grouping - Similarity



Similarity

Form Perception

Grouping - Continuity



Continuity

Form Perception

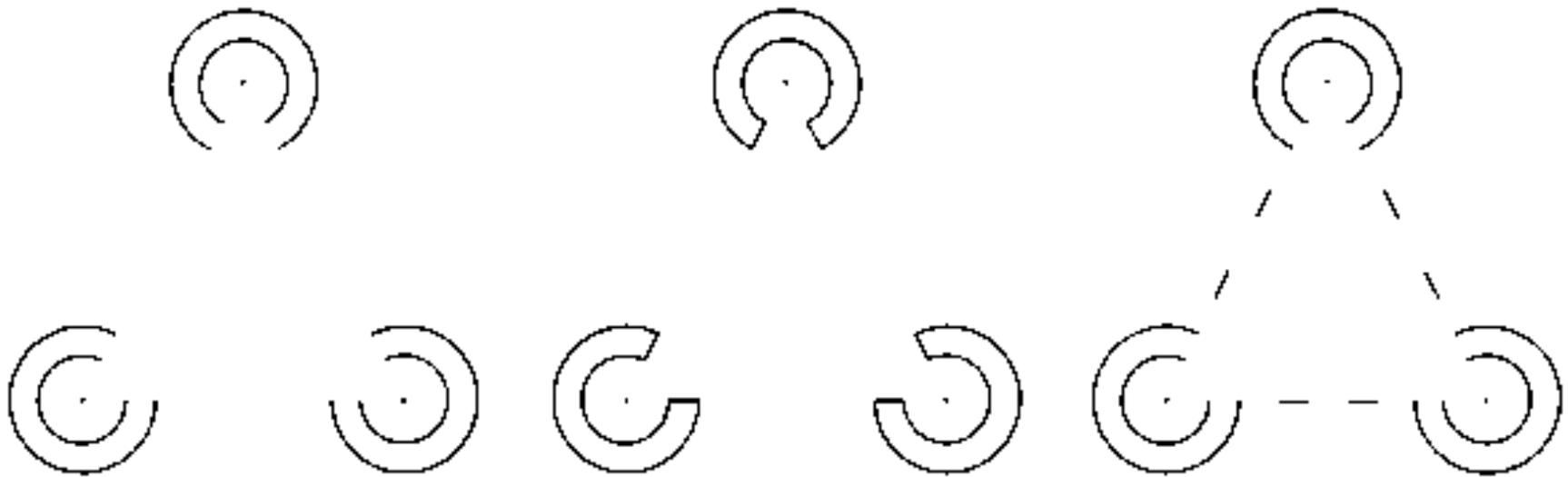
Grouping - Connectedness



Connectedness

Form Perception

Grouping - Closure



Depth Perception

- Depth perception
 - Visual-cliff



Depth Perception

Binocular Cues

- Binocular cues
 - Retinal disparity



Depth Perception

Monocular Cues

- Monocular cues
 - Horizontal-vertical illusion



Depth Perception

Monocular Cues

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

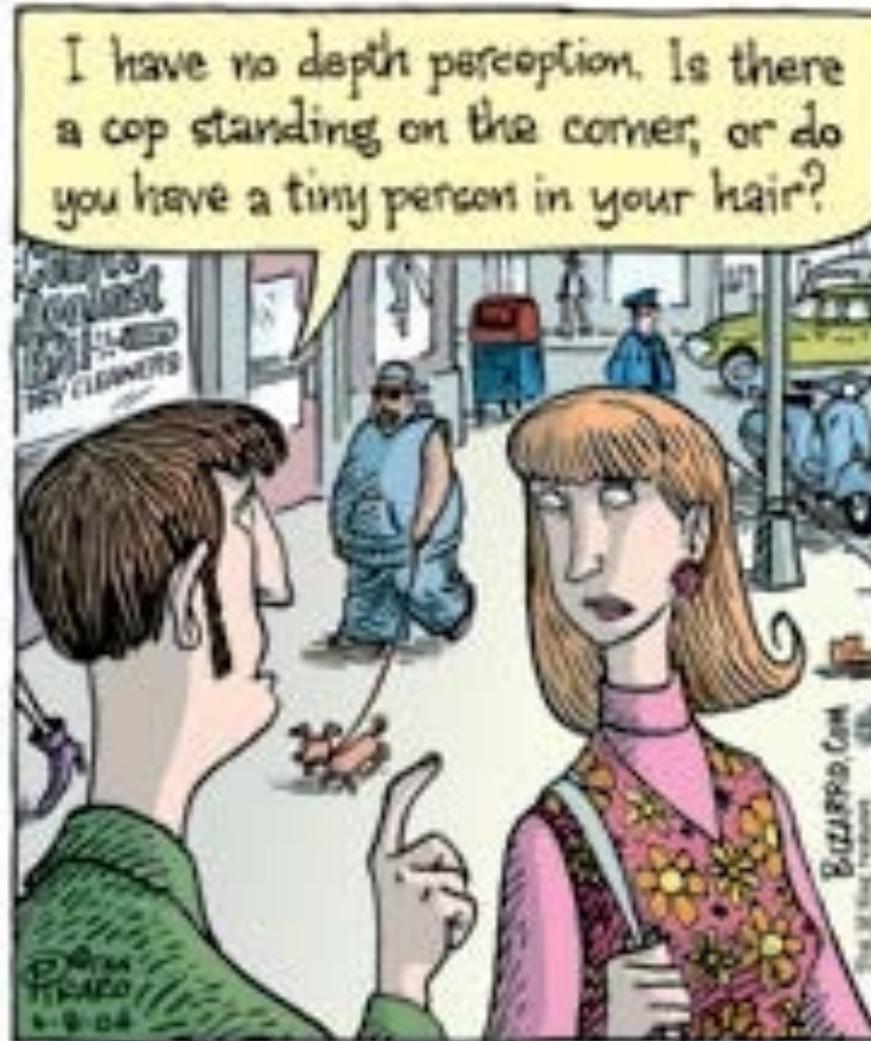
Depth Perception

Monocular Cues – Relative Height



Depth Perception

Monocular Cues – Relative Size



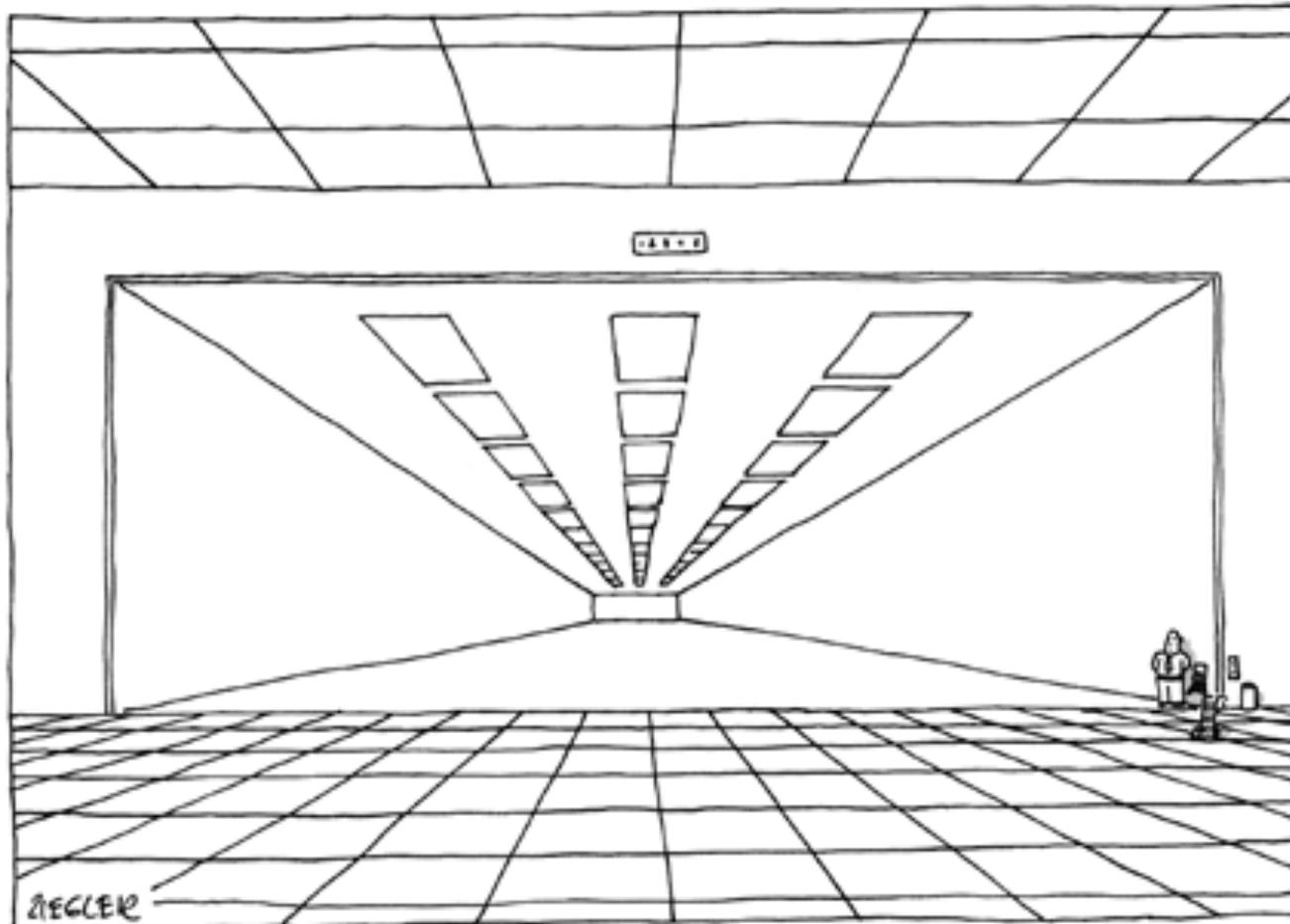
Depth Perception

Monocular Cues - Interposition



Depth Perception

Monocular Cues – Linear Perspective



THE FREIGHT ELEVATOR FOR THE MAN WHO HAS EVERYTHING

Depth Perception

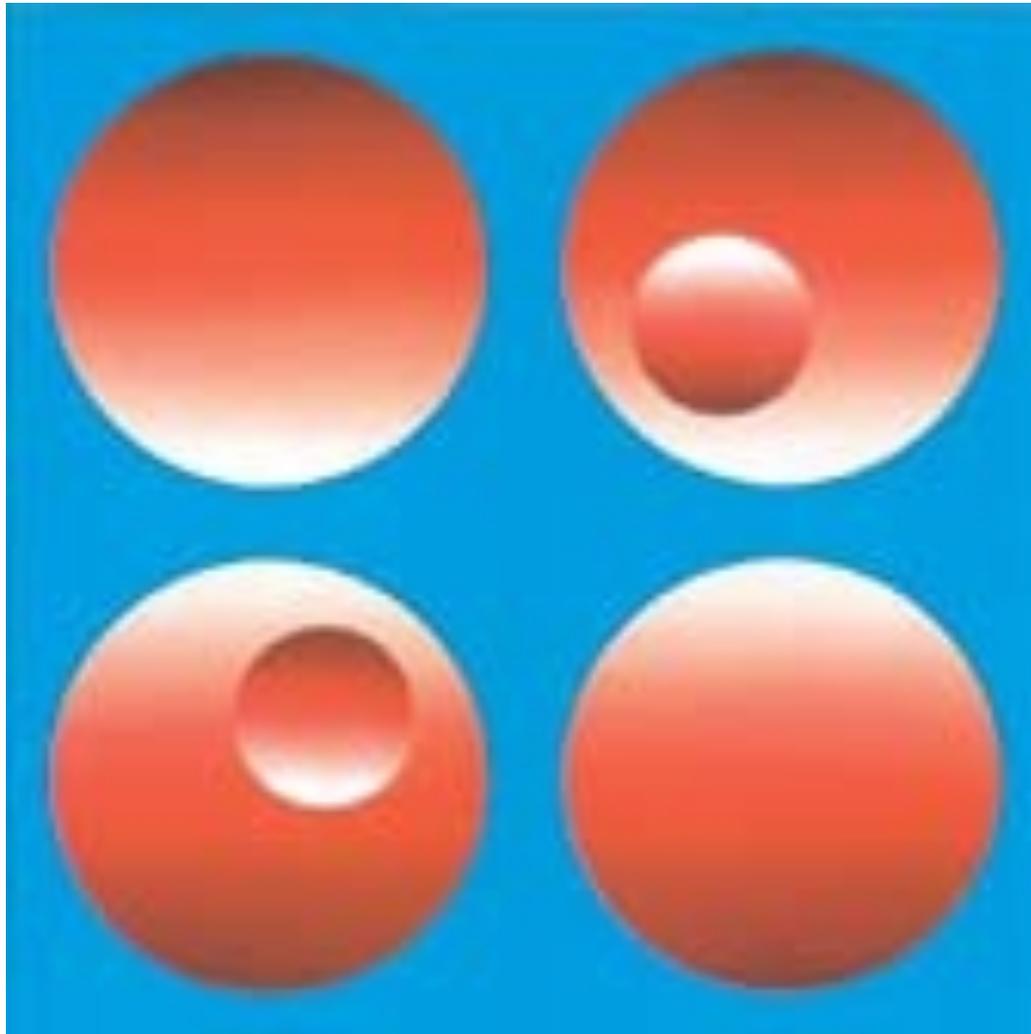
Monocular Cues – Relative Motion



Direction of passenger's motion →

Depth Perception

Monocular Cues – Light and Shadow

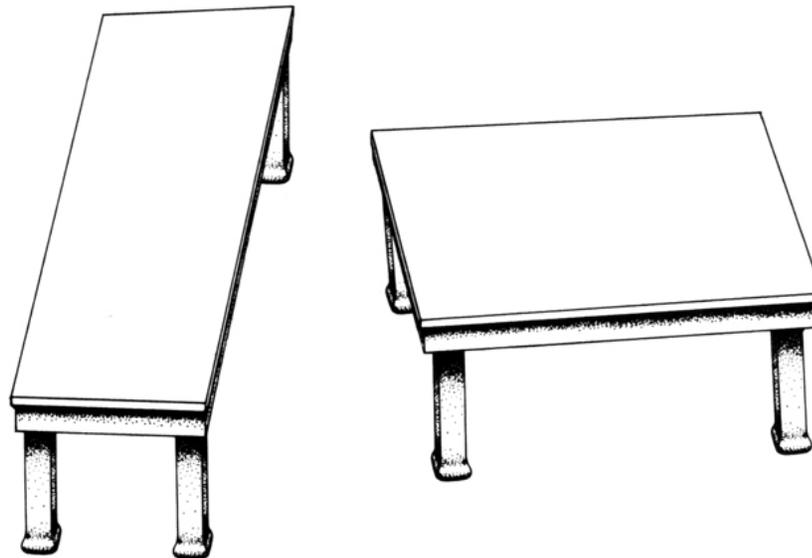


Motion Perception

- Stroboscopic movement
- [Phi phenomenon](#)

Perceptual Constancy

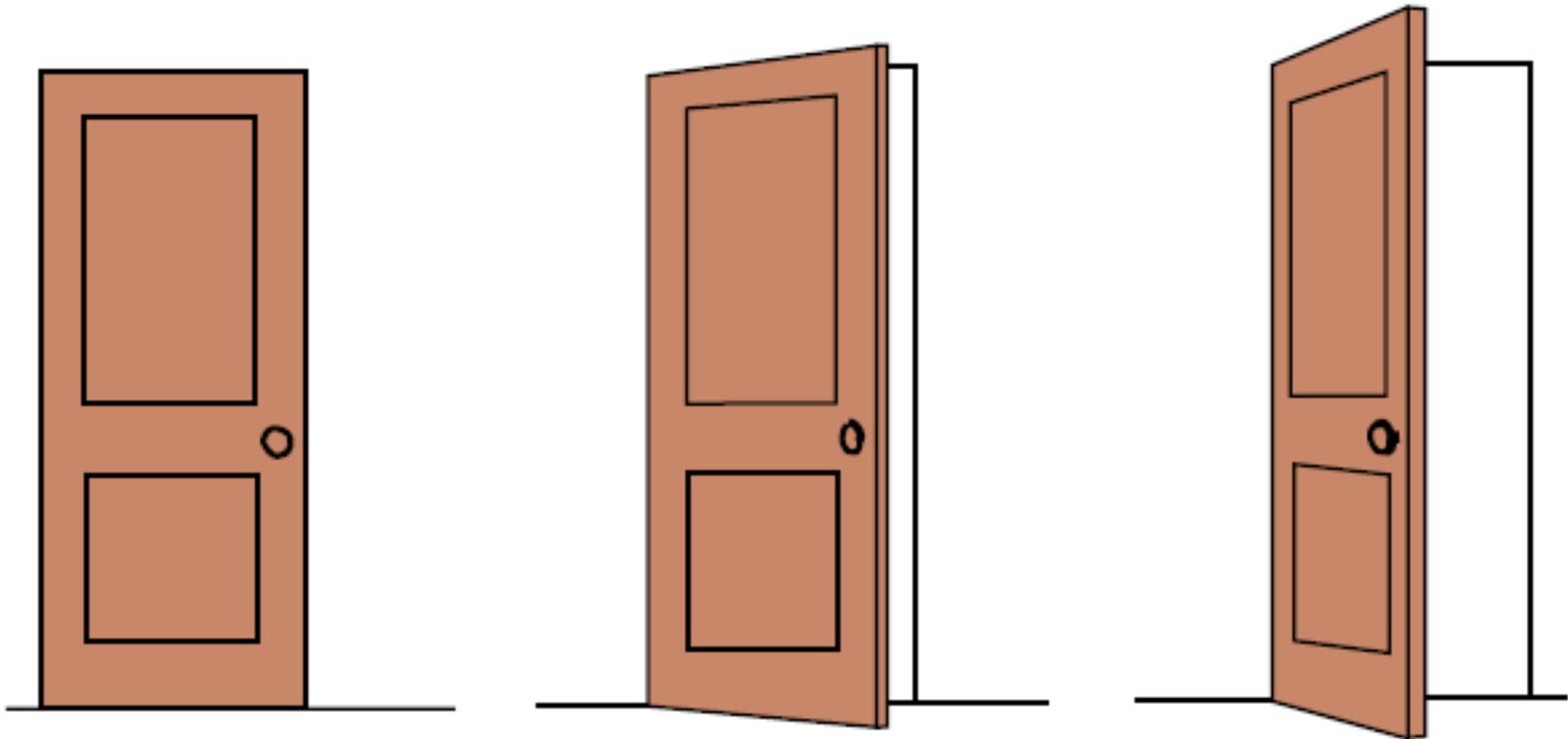
- Perceptual Constancy



Perceptual Constancy

Shape and Size Constancies

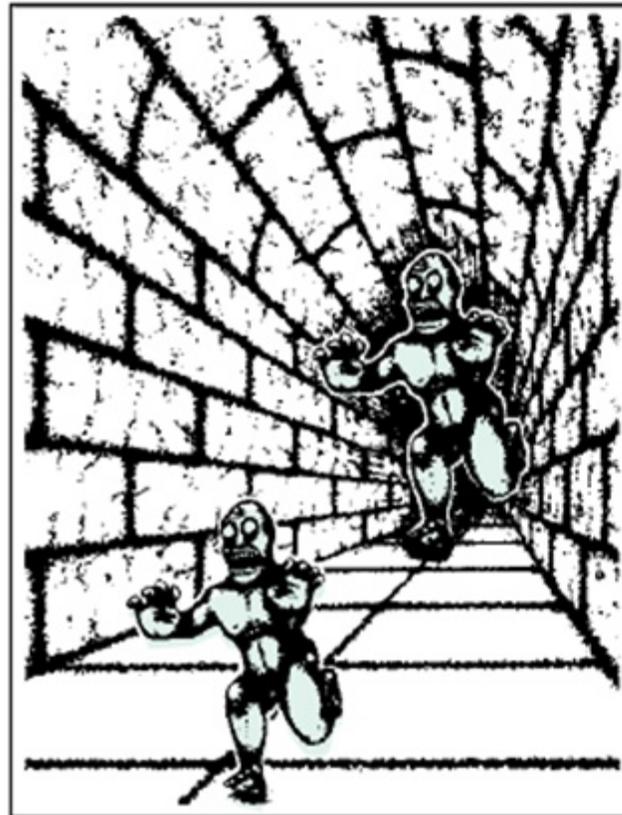
- Shape constancy



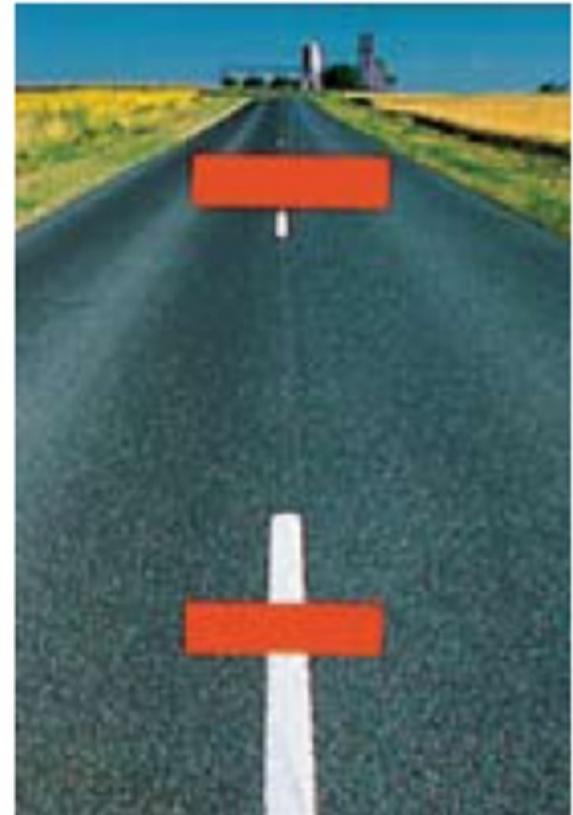
Perceptual Constancy

Shape and Size Constancies

- Size constancy
- Moon illusion
- Ponzo illusion



From Shepard (1990)



Alan Choisnet/The Image Bank

Ames Room

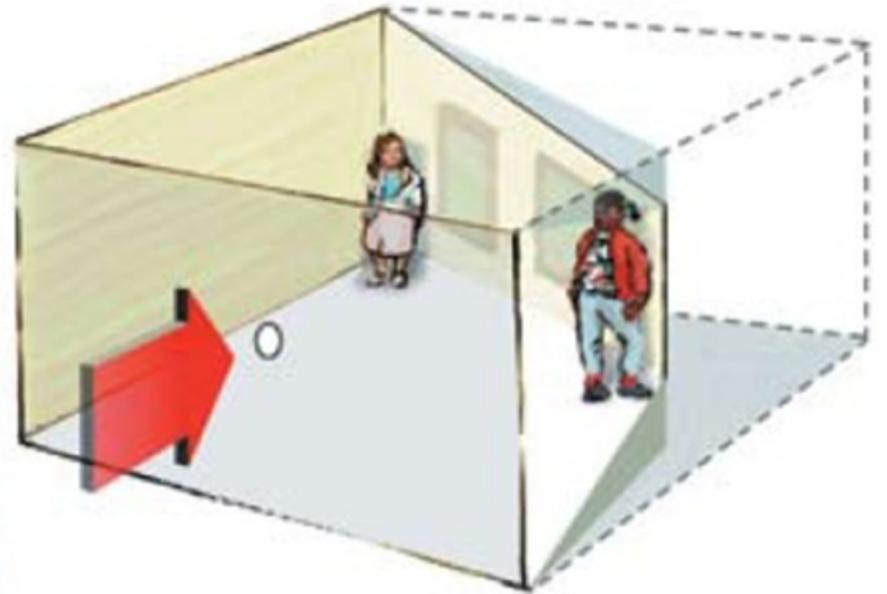


S. Schwartzberg/The Exploratorium

Ames Room



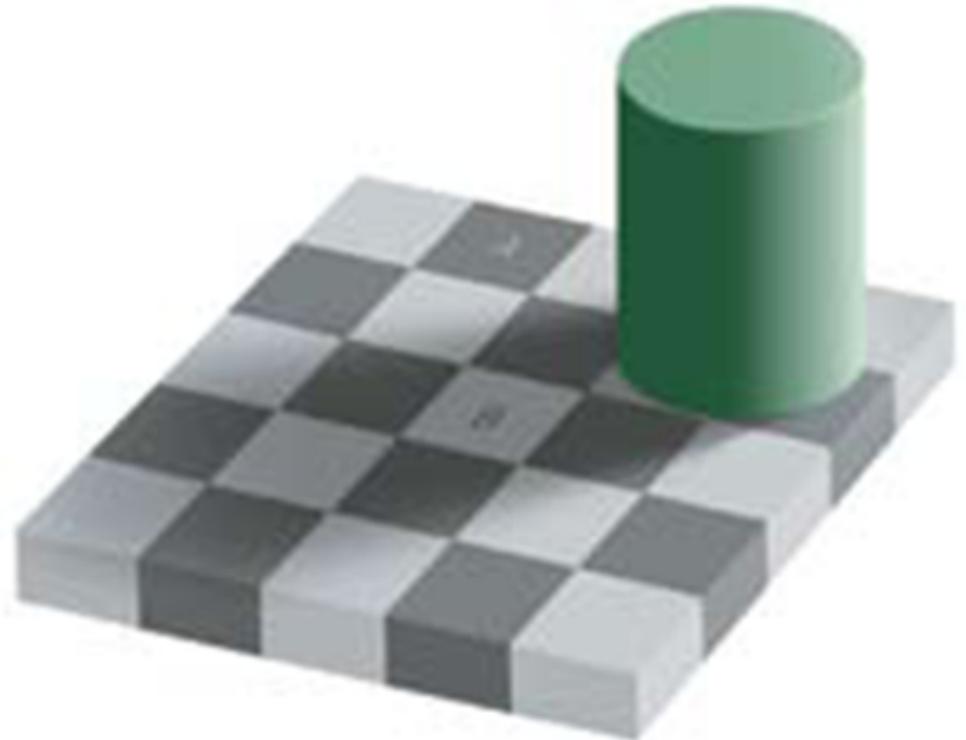
S. Schwartzberg/The Exploratorium



Perceptual Constancy

Lightness Constancy

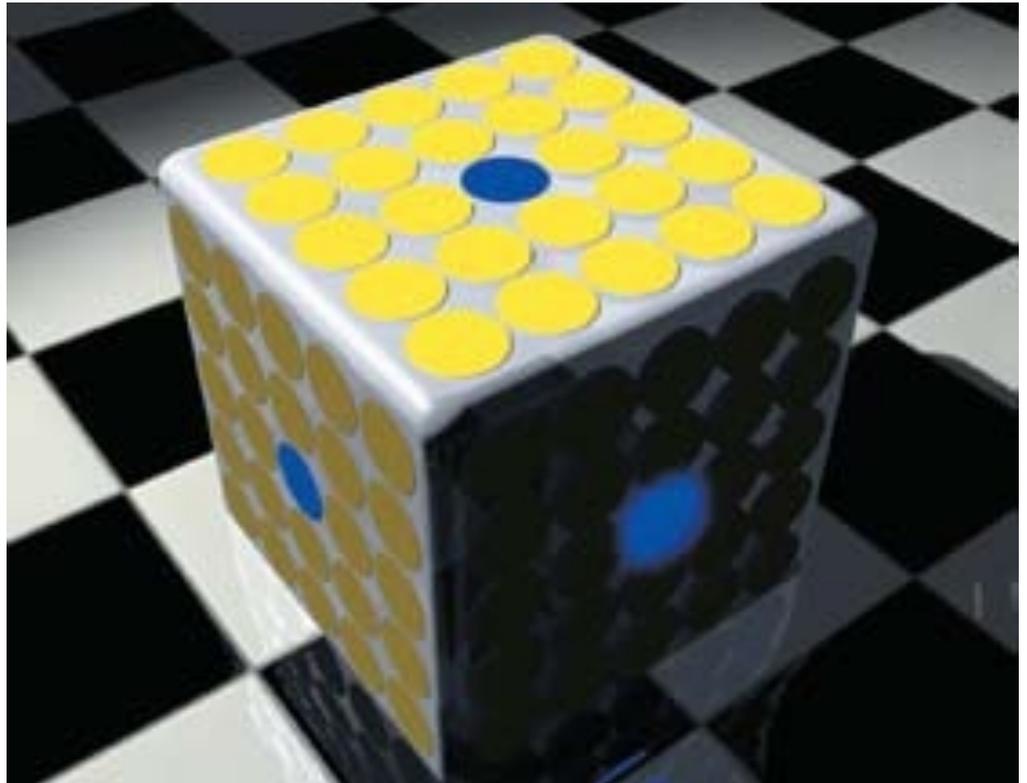
- Lightness constancy
 - Brightness constancy
 - Relative luminance



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



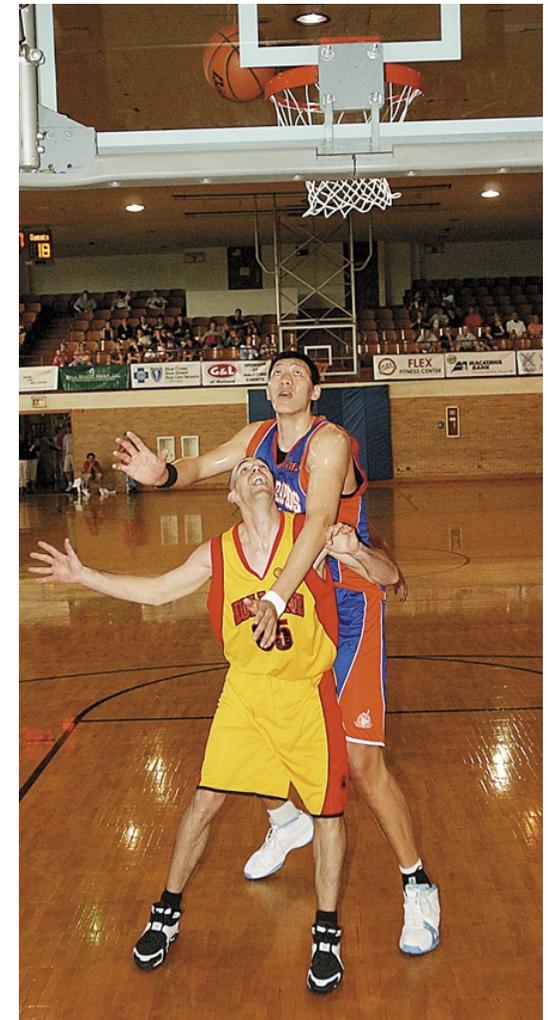
Perceptual Set

Context Effects

- Context effects

cathy®

by **Cathy Guisewite**



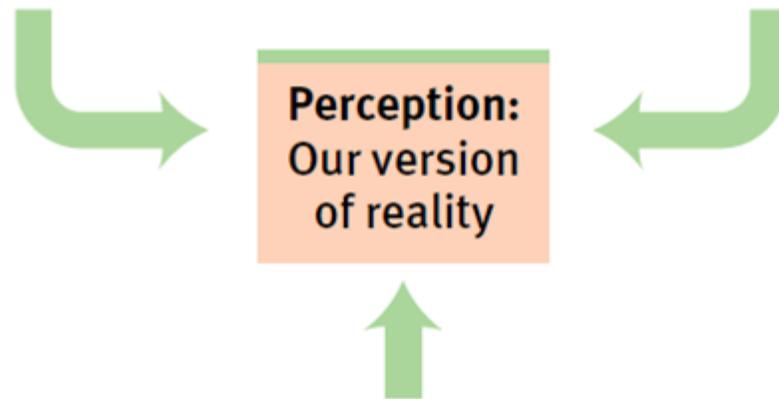
Perceptual Set

Emotion and Motivation

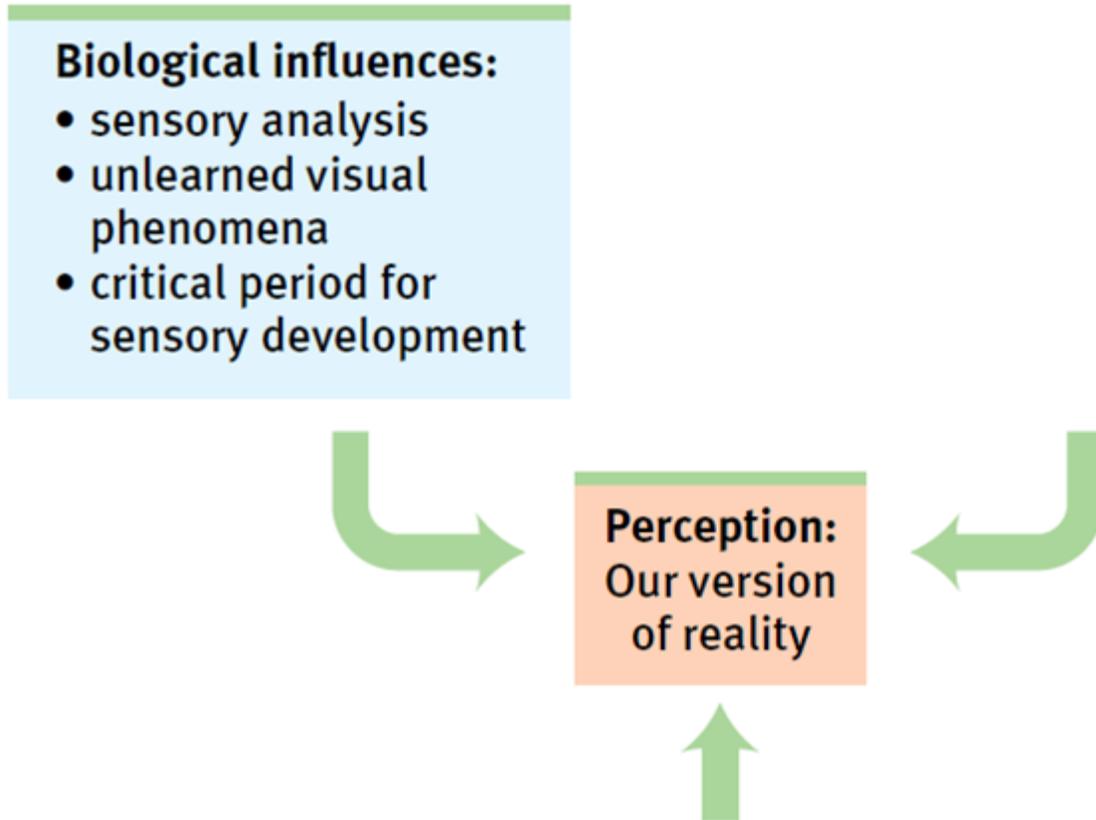
- Motivation on perception
- Emotions on perception



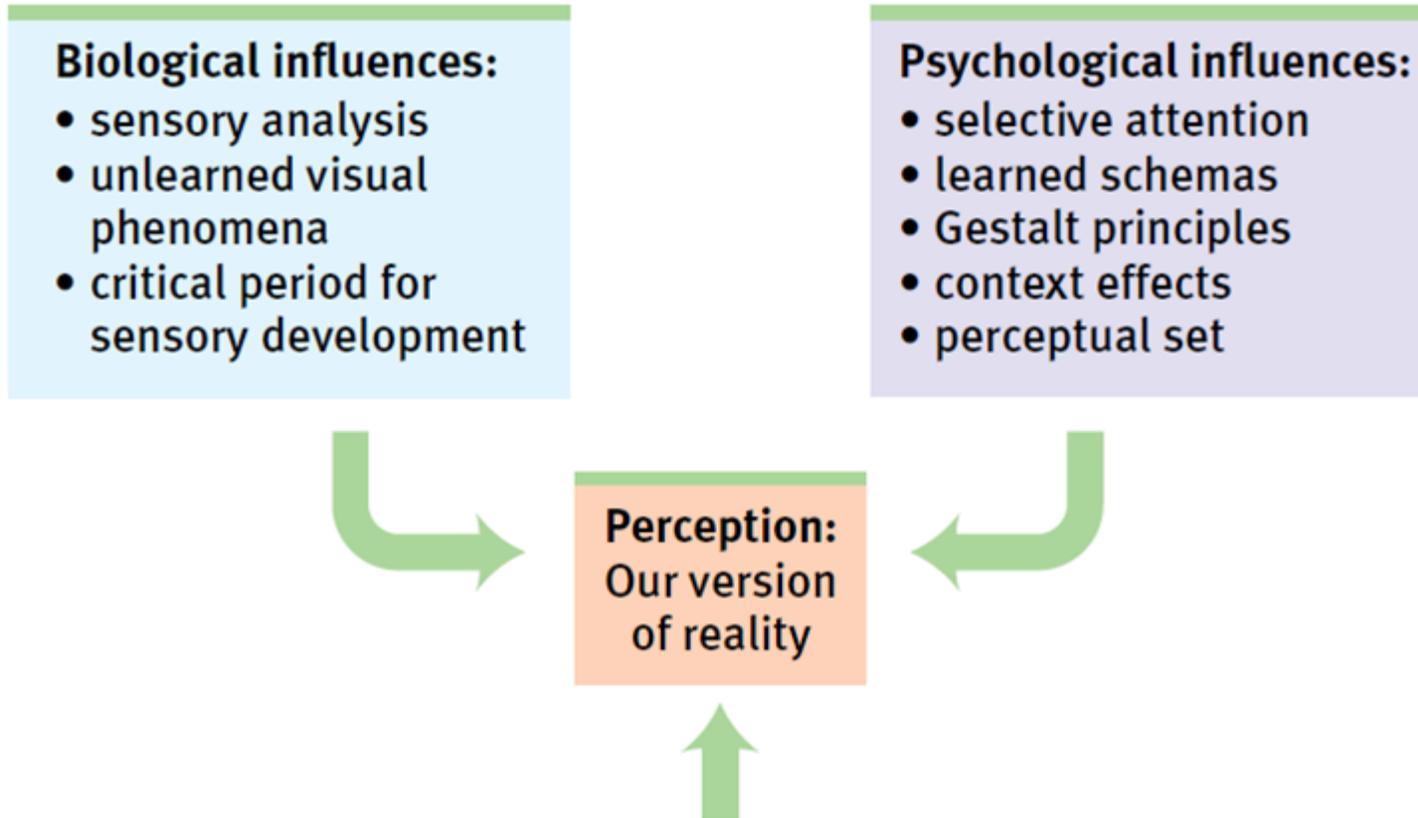
Perception is a Biopsychosocial Phenomenon



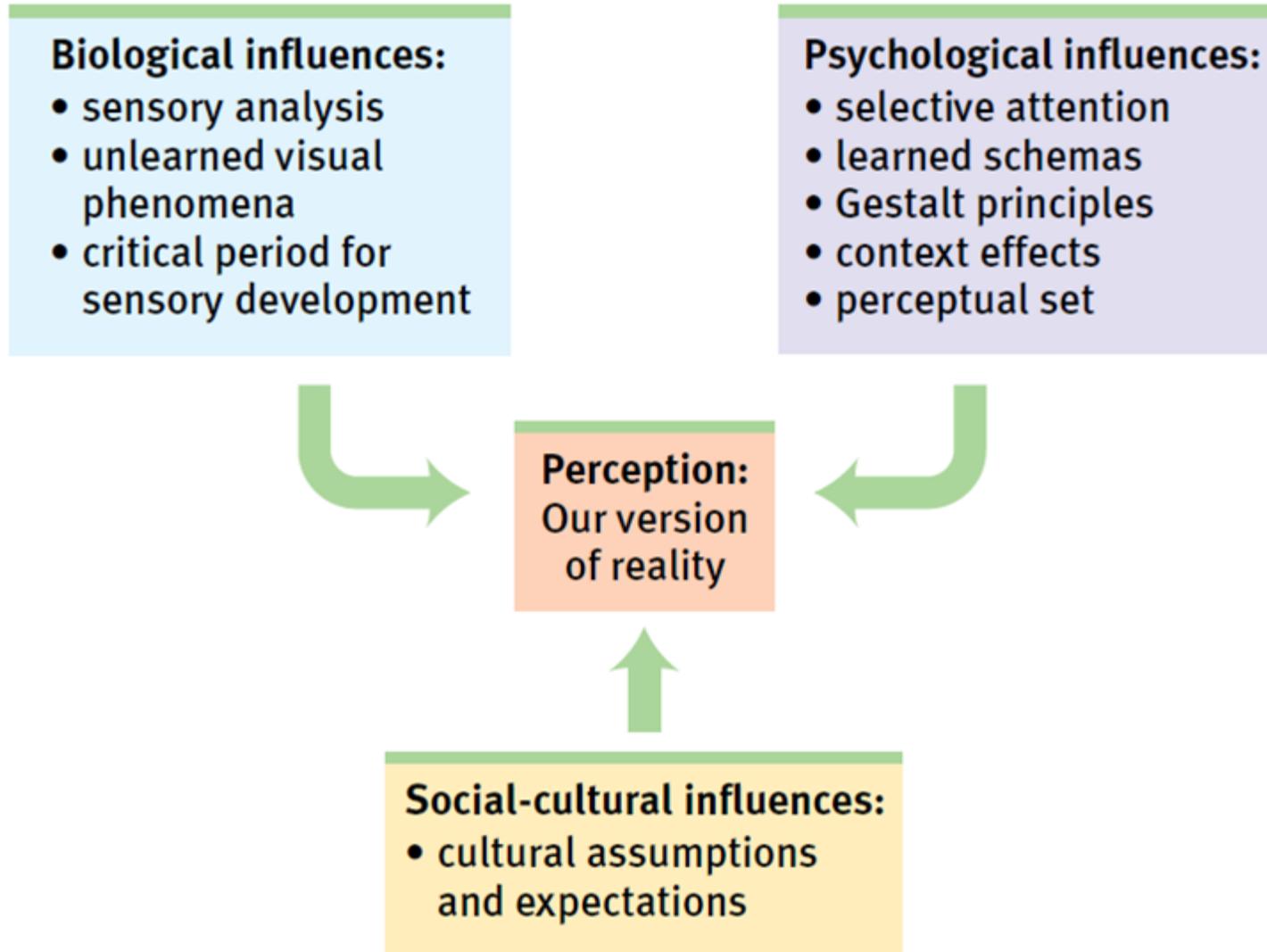
Perception is a Biopsychosocial Phenomenon



Perception is a Biopsychosocial Phenomenon



Perception is a Biopsychosocial Phenomenon



Is There Extrasensory Perception?

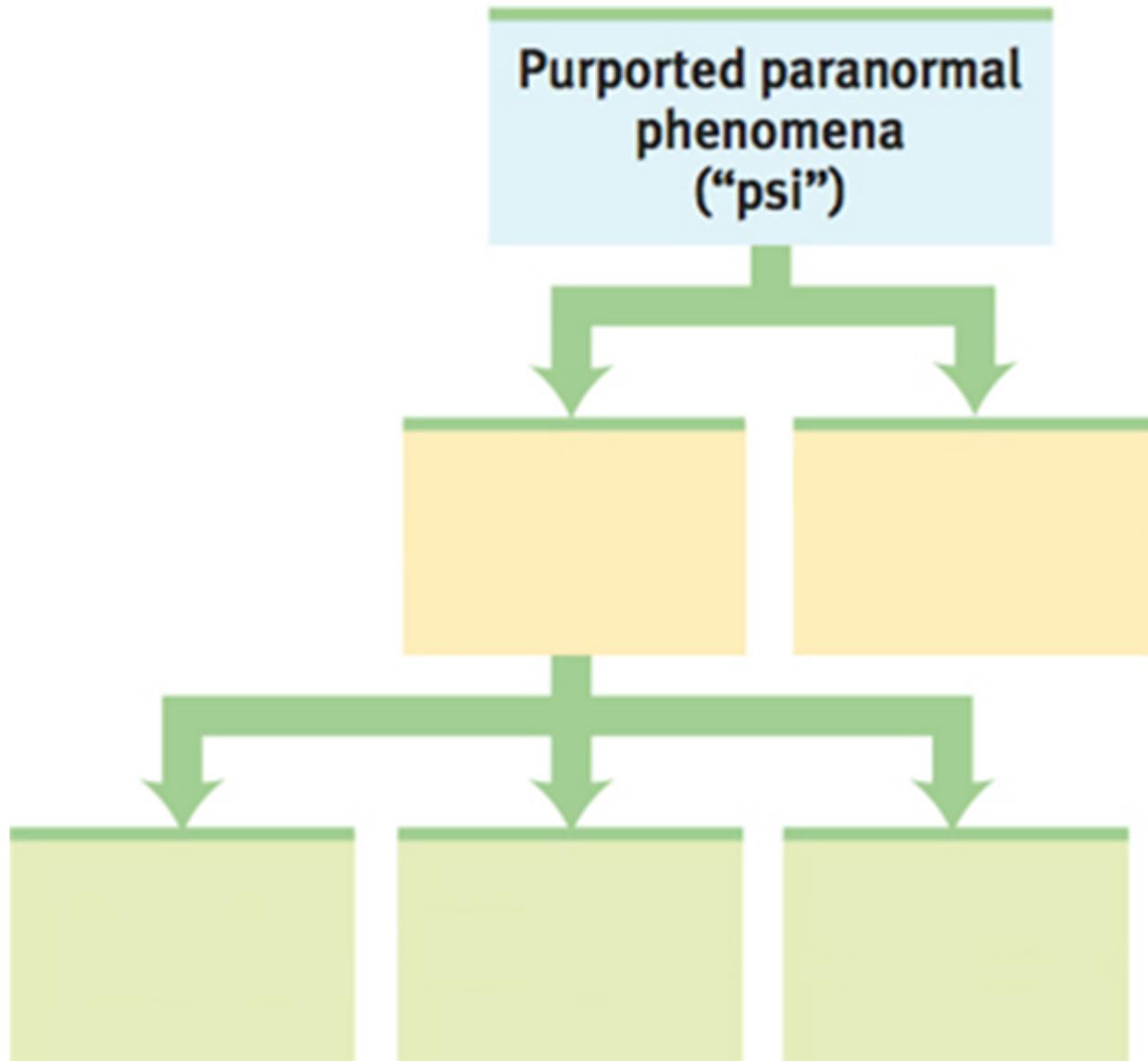


Claims of ESP

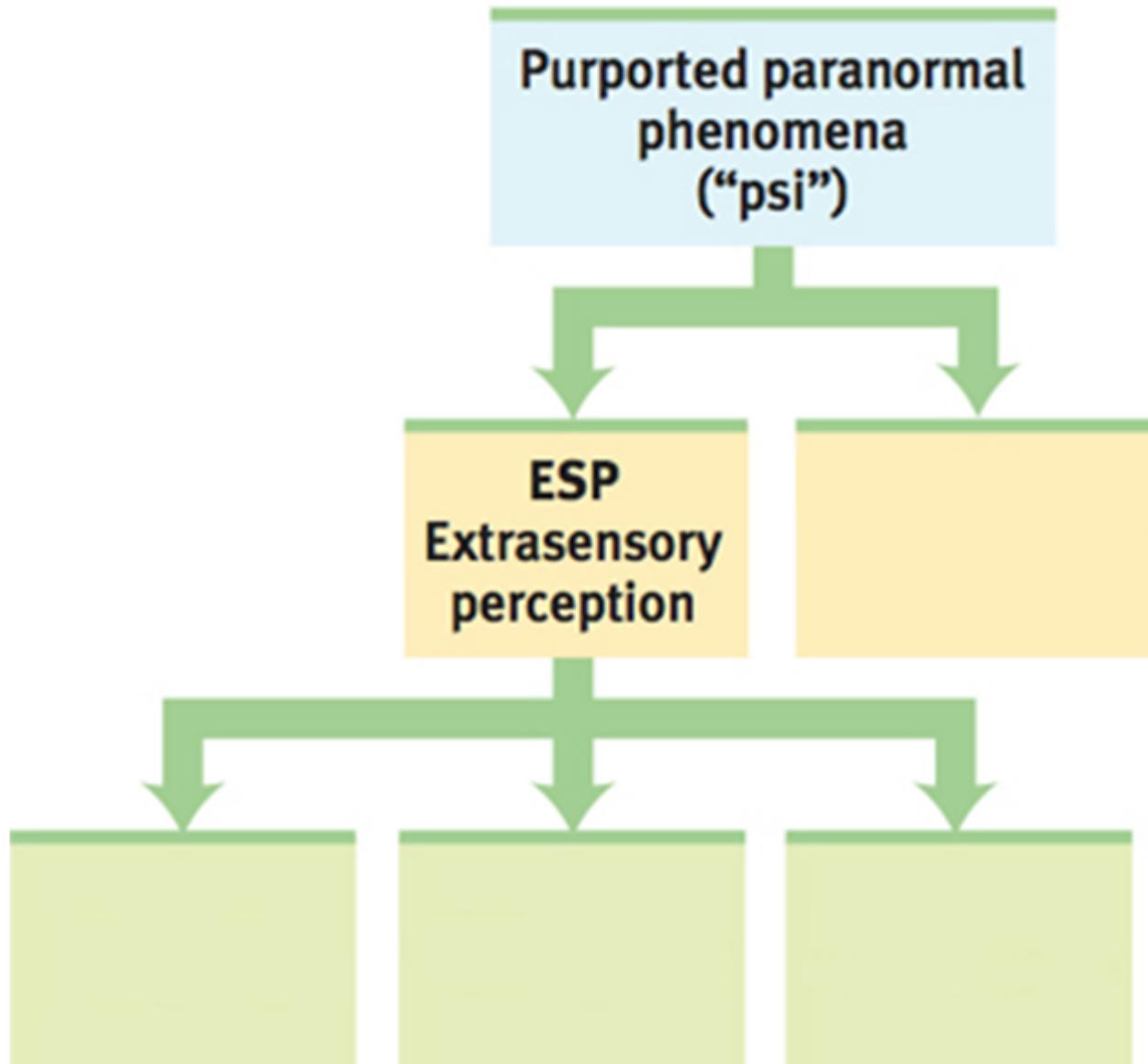
- Parapsychology
- Extrasensory Perception
 - Telepathy
 - Clairvoyance
 - Precognition
- Psychokinesis (PK)



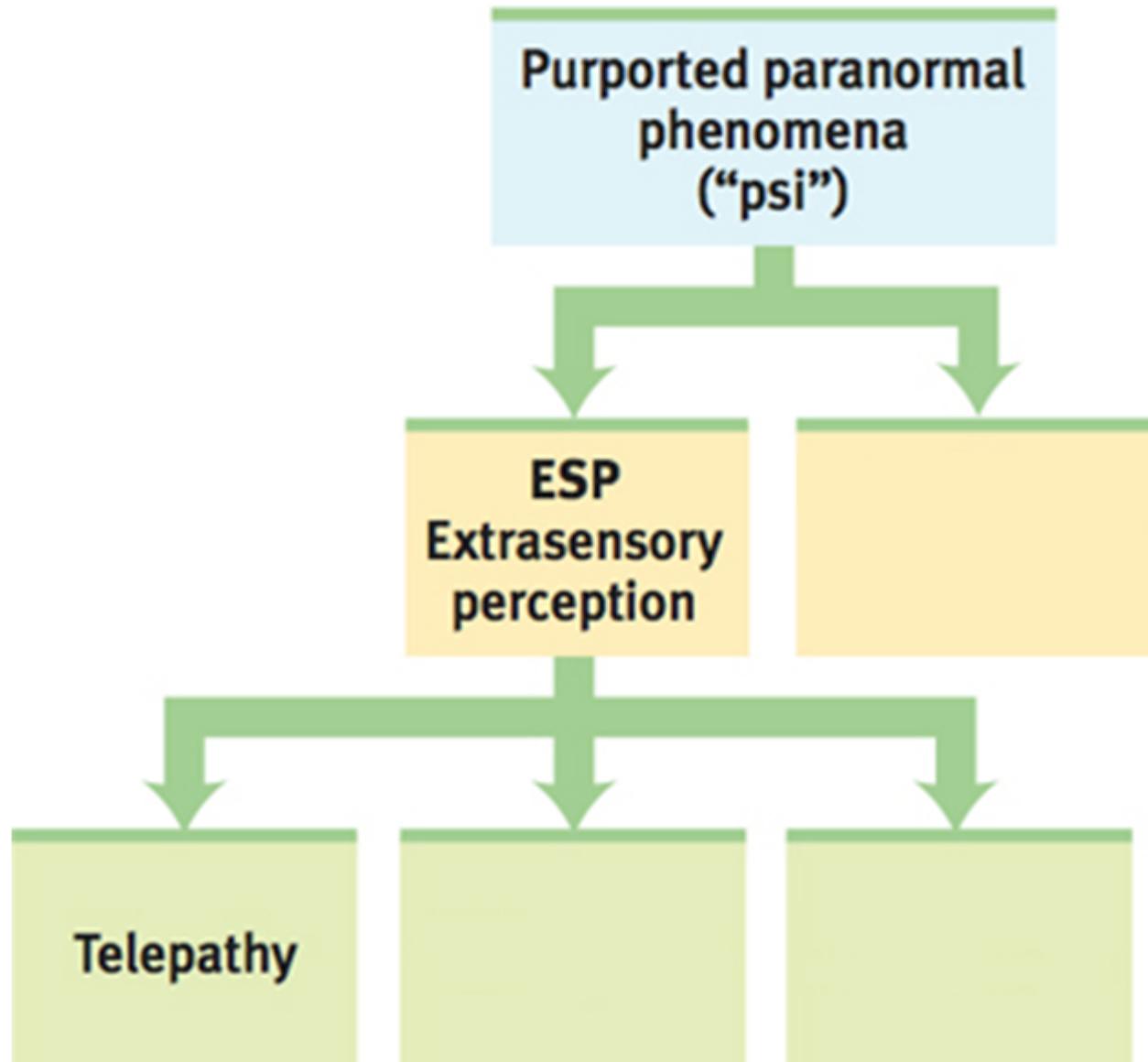
Parapsychology



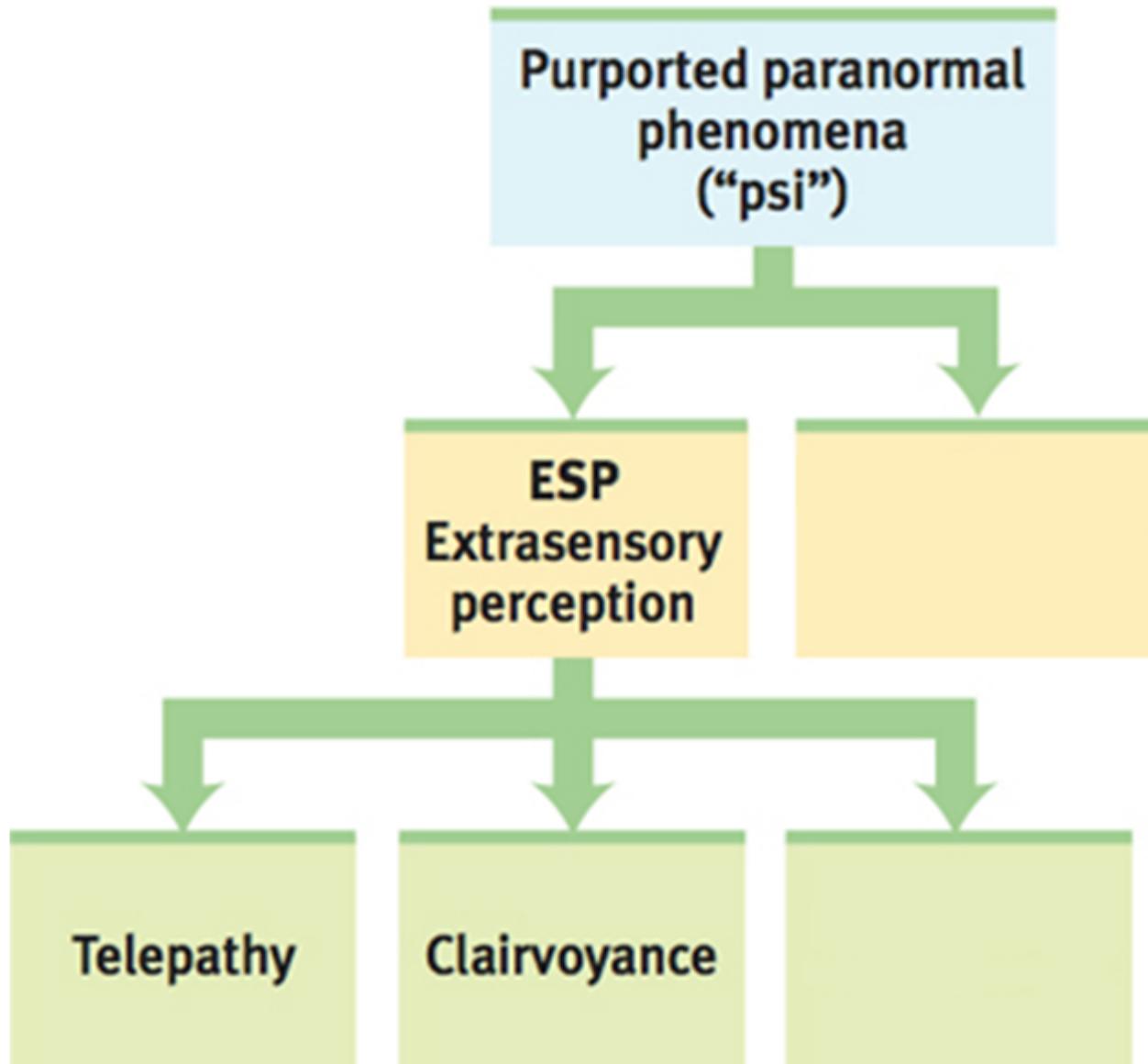
Parapsychology



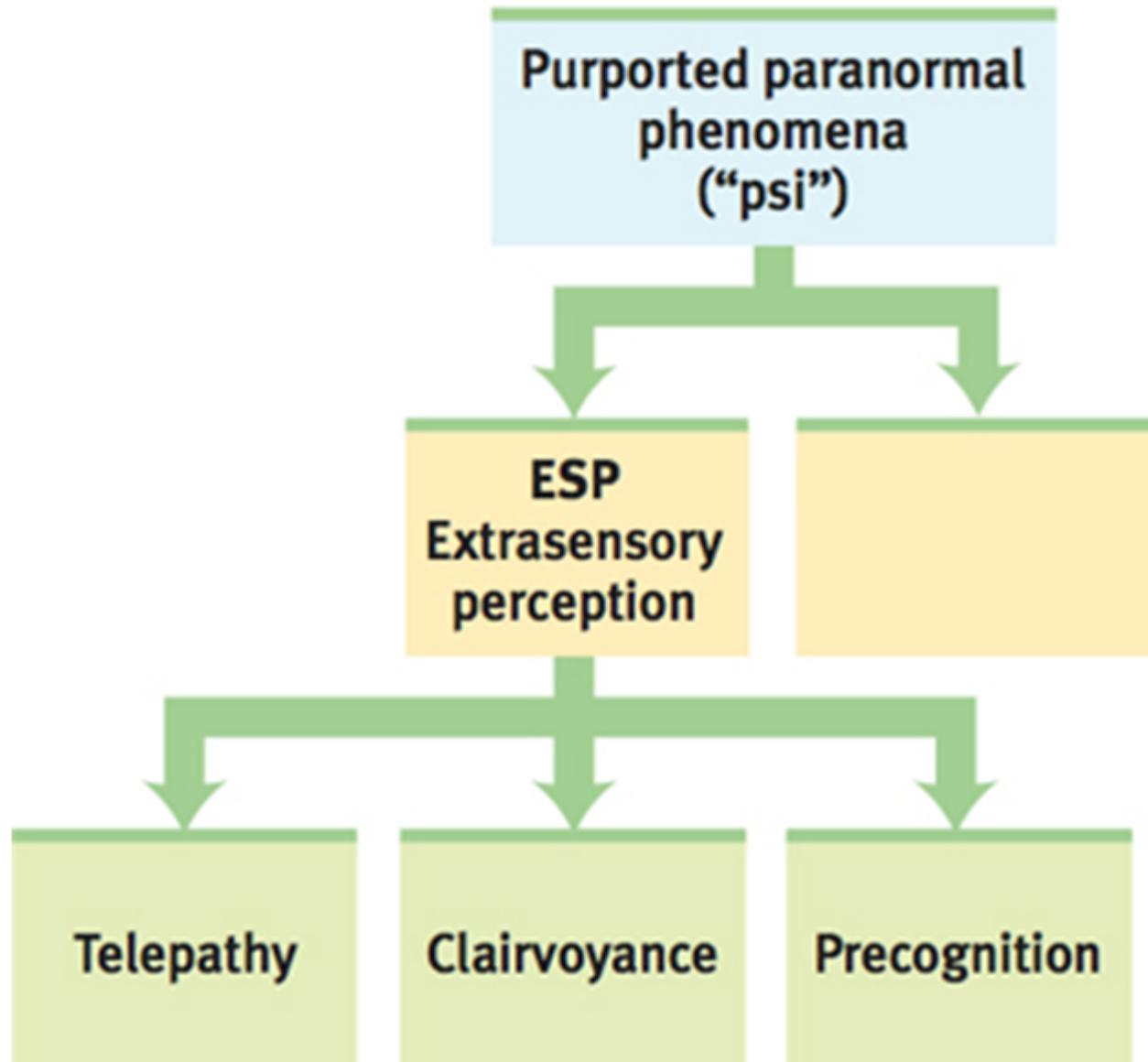
Parapsychology



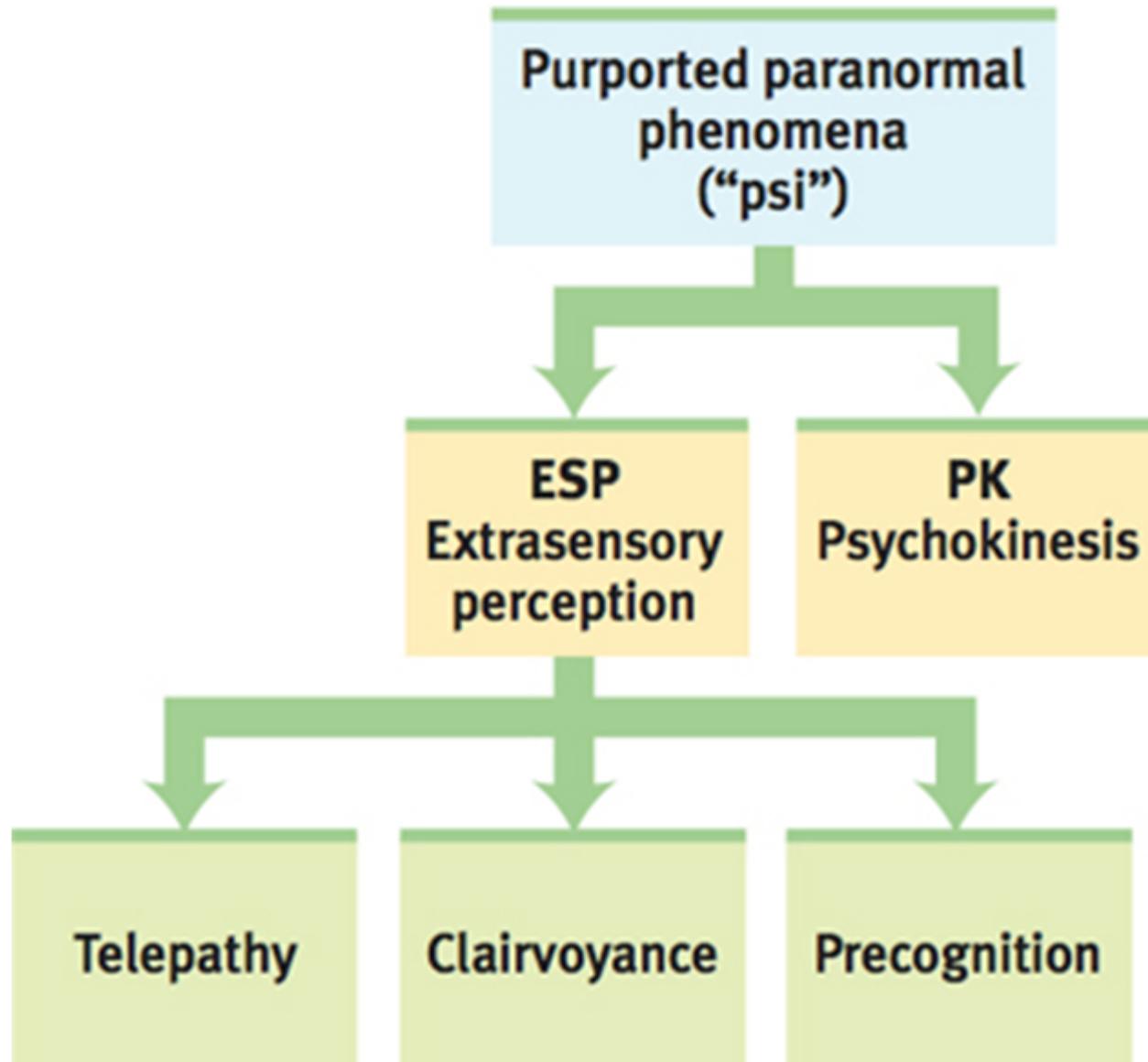
Parapsychology



Parapsychology



Parapsychology



Premonitions or Pretensions?

- Psychic predictions
 - Nostradamus

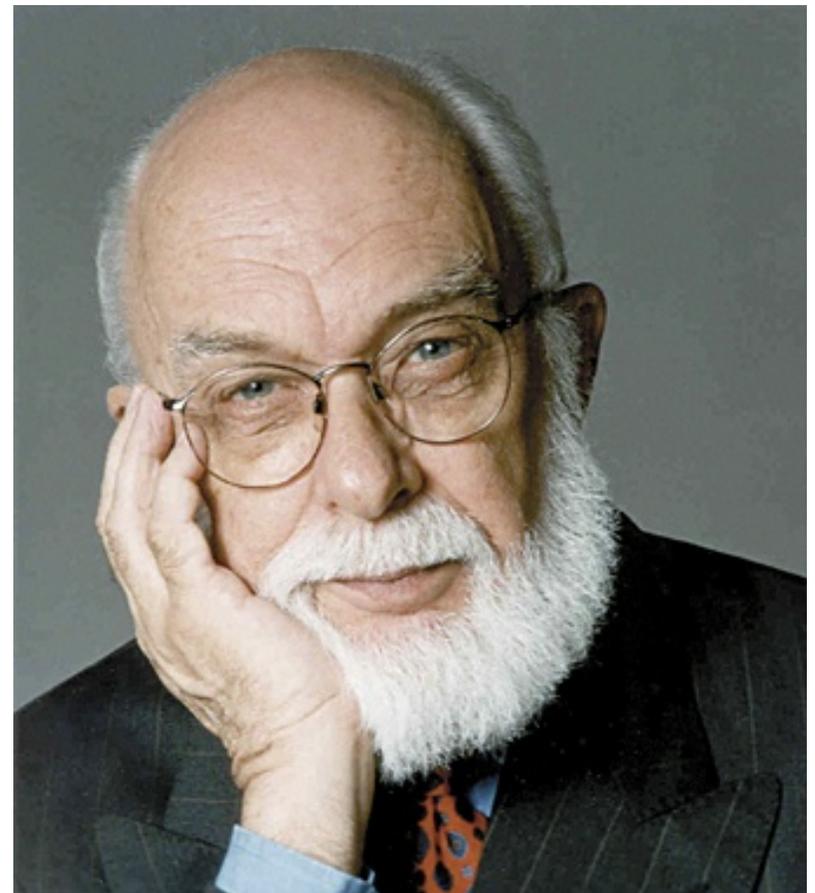
BIZARRO

By DAN PIRARO



Putting ESP to Experimental Test

- ESP Experiments



The End