Al akhawayn university

PSY 1301
Introduction to Psychology
Fall 2024

Sensation and Perception

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Sensation and Perception

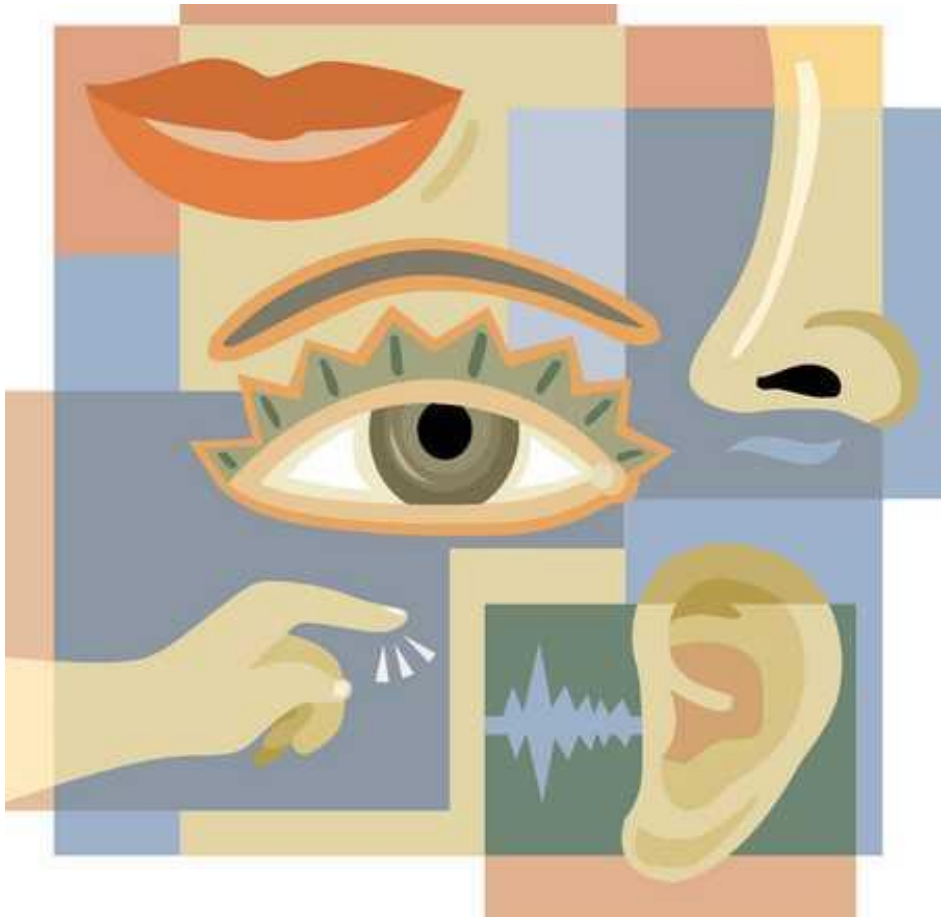
Sensation and Perception

Sensation: your window to the world

Perception: interpreting what comes in your window.

Organs involved in Sensation:

- Eye
- Ear
- Nose
- Tongue
- Skin



Sl. No.	Type of Sensation	Sense Organ	Senses	Knowledge gaining
1.	Visual Sensation	Eye	Sight	83%
2.	Auditory Sensation	Ear	Hear	11%
3.	Olfactory Sensation	Nose	Smell	3.5%
4.	Taste Sensation	Tongue	Taste	1.0%
5.	Tactual Sensation	Skin	Touch	1.5%

Elements of Sensation:

The main elements of the sensation process are given below:

- ***Quality:*** The nature of each sensation is different from other. Every type of sensation has got its own special quality or characteristics. This quality of the sensation helps us to distinguish one from other. For example, green sensation of eye, cold sensation of skin.
- ***Intensity:*** refers to how strong or weak a sensation is. Sensations can vary in intensity even within the same type of sense and also across different senses. For example, two Sounds: If two sounds are played simultaneously, one might be louder (higher intensity) than the other.

Elements...

- ***Extensity:*** Extensity refers the extension in space. Each sensation has its extensity. The vaster the stimulus, the more extensive the sensation. The extensity is not true for all the types of sensation, but restricted to certain.

- ***Duration:*** Every sensation has its duration or lasts for certain time.

- ***Clarity:*** Every sensation has got clarity. The sensation which lasts for longer period becomes clearer than the sensation lasts for shorter period.

Definitions:

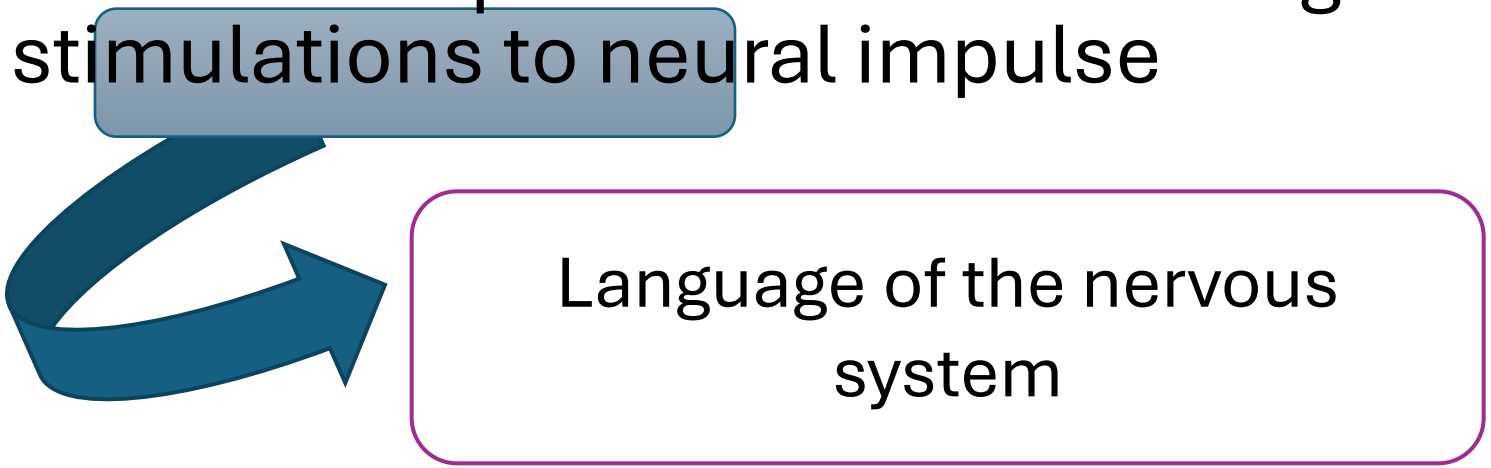
- Perception is the process of getting to know objects and objective facts by use of senses .

- Perception refers to the complex processes which begin with the stimulation of a sense organ and end with an interpretation of the resulting neural activity by the organism.

SENSE ORGANS

-contains **Receptors** (highly sensitive cells)

-responsible for translating stimulations to neural impulse



Sensation

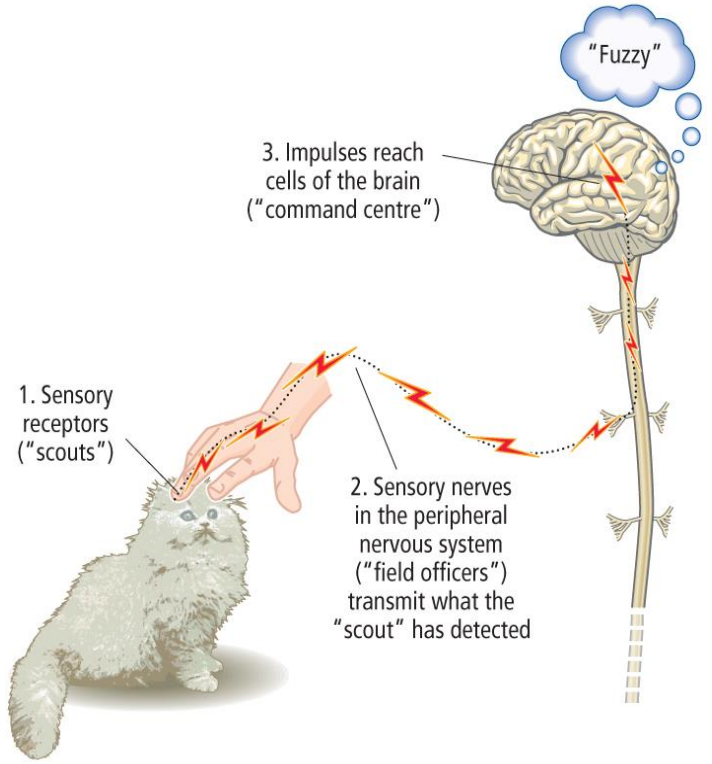
- occurs when energy in the external environment or the body stimulates receptors in the sense organs.

Sufficient stimulation of the sense organs to produce neural impulse to be sent to the nervous system

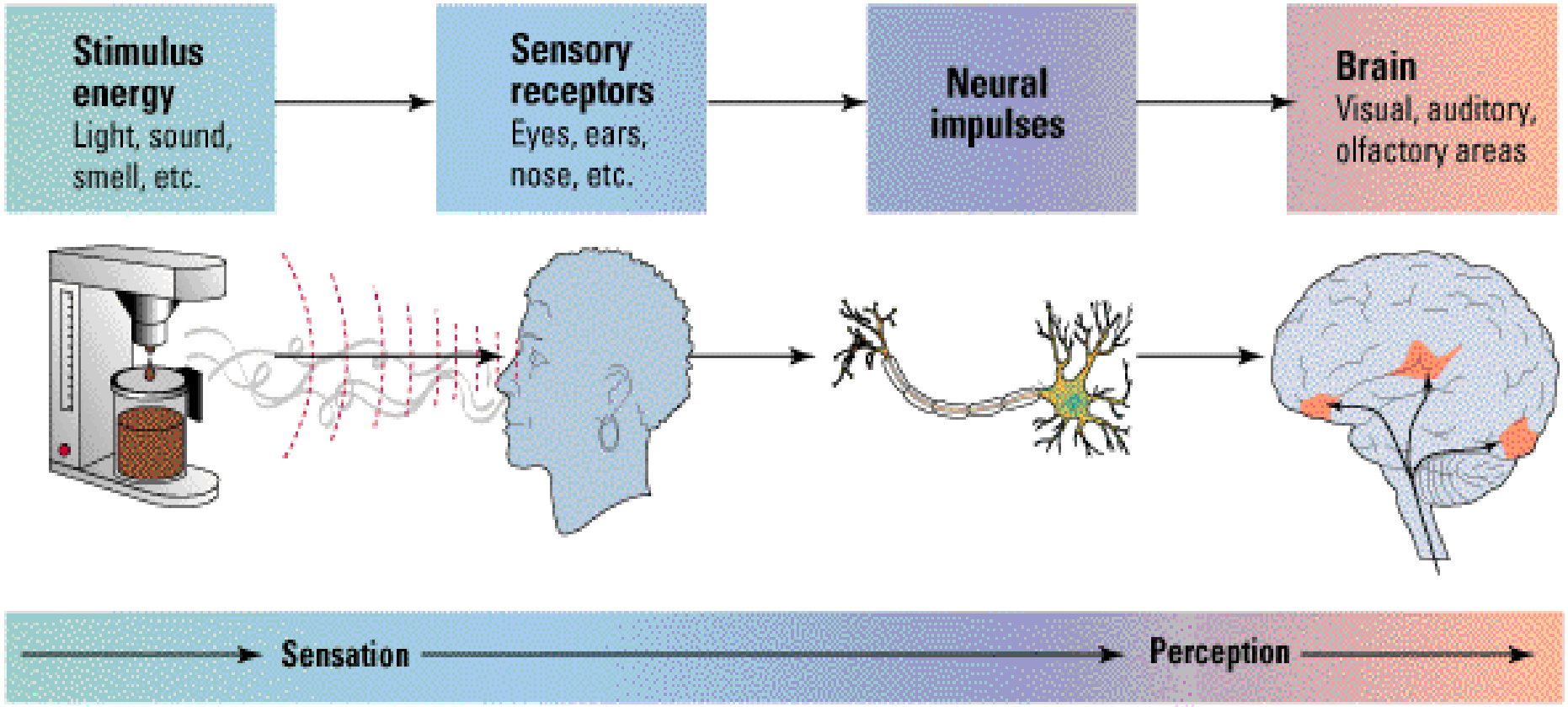
Perception

- Refers to the way in which sensory inputs from the sense organs are organized, analyzed, and interpreted in a meaningful way.

Refers to the meaningful interpretation of Sensation



PERCEPTION


Stimulus energy
Light, sound, smell, etc.
Sensory receptors
Eyes, ears, nose, etc.
Neural impulses
Brain
Visual, auditory, olfactory areas
Sensation
Perception

Case of Sensation vs perception

“I have perfect vision but the problem is with my perception.

“In college, I went to the bathroom during a date at the Spaghetti Station and accidentally sat at the wrong table with the wrong guy, not realizing it wasn’t my date. I struggle to tell actors apart in movies and TV. I don’t recognize myself in photos or videos. I’ve even mixed up my stepsons at soccer practice and couldn’t figure out which man was my husband at a party, the mall, or the grocery store.’’

She cannot recognize faces-prosopagnosia (face blindness)

This curious mix of “perfect” vision and face blindness illustrates the distinction between sensation and perception.

SENSATION

For a stimulus to cause an action potential, it first has to be strong enough to be detected.

Absolute threshold – minimum amount of stimulus energy that must be present for the stimulus to be detected 50% of the time.

- On a clear night, the most sensitive sensory cells in the eye can detect a candle flame 50km away.
- The stimulus causes an action potential but we are not consciously aware of it.

Just noticeable difference (JND) –the minimum difference in stimuli required to detect a change or a difference between stimuli.

- Can change depending on the stimulus intensity.
- A cell phone lighting up in a dark movie theatre is more likely to be noticed than if it lights up in a brightly lit shopping mall. The brightness of the cell phone does not change, but the ability to detect the change in illumination does.
- The JND would be the minimum increase in brightness required for the change to be detected.

Sensory Adaptation

- Adaptation (sometimes called *habituation*) is a part of everyday experience. It's a decreased responsiveness to stimuli due to constant stimulation.

- We are able to respond to the changes in our environment because our senses have the ability to adapt, or adjust themselves, to a constant level of stimulation.

- Once your senses get used to a new level of stimulation, they respond only to deviations from it.

Examples of Adaptation

- 1. Your eyes eventually adjust to a darkened movie theatre. At first you see blackness, but eventually, you can see what is going on around you.

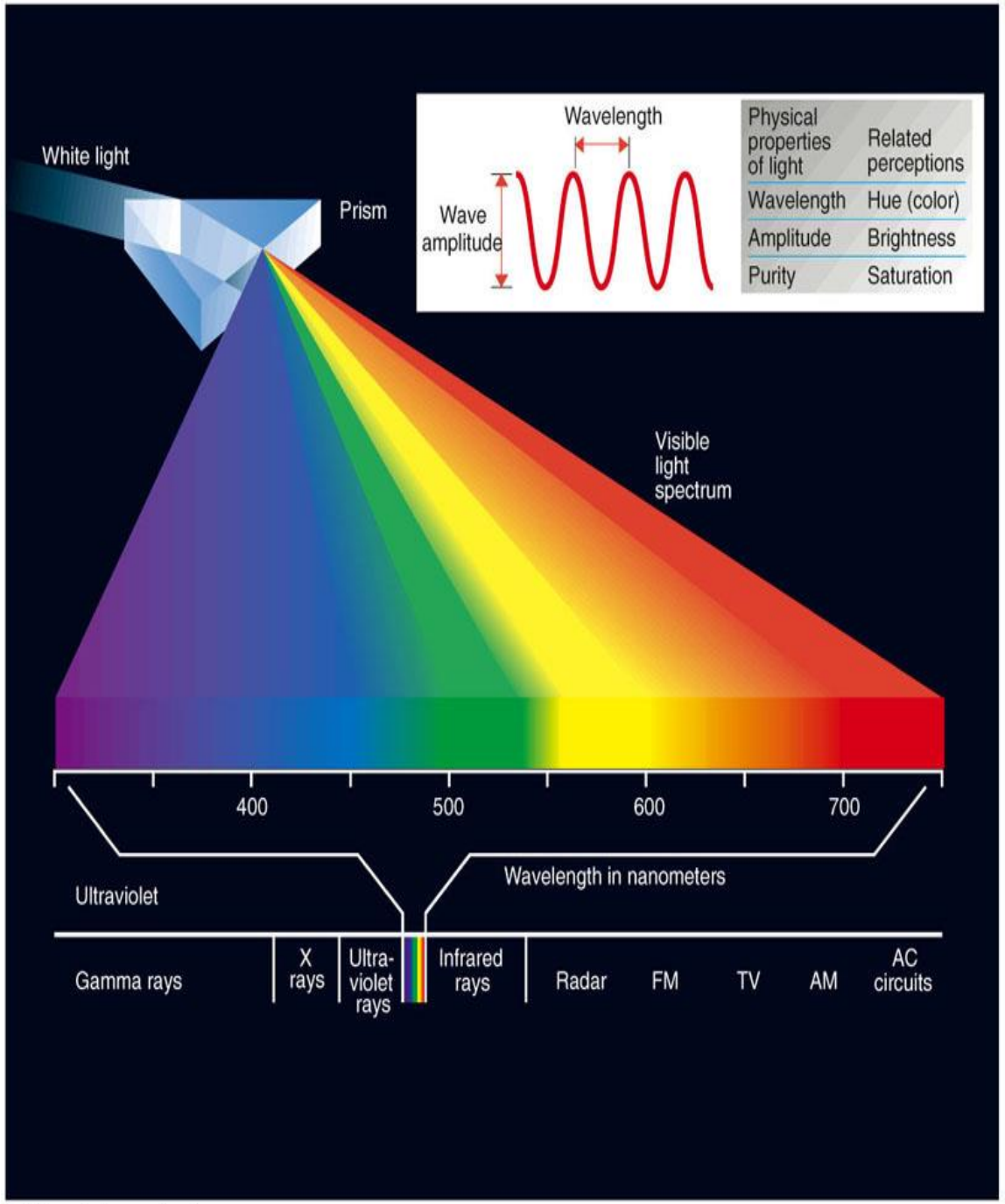
- 2. When you first jump into a pool that “feels cold” your body reacts to the stimulus. Eventually, your body adapts to the sensation and you become “comfortable.”

- 3. When you first enter a room with a strong smell, you notice it right away, but after a while, you stop noticing it unless the smell changes.

Visual Sensation

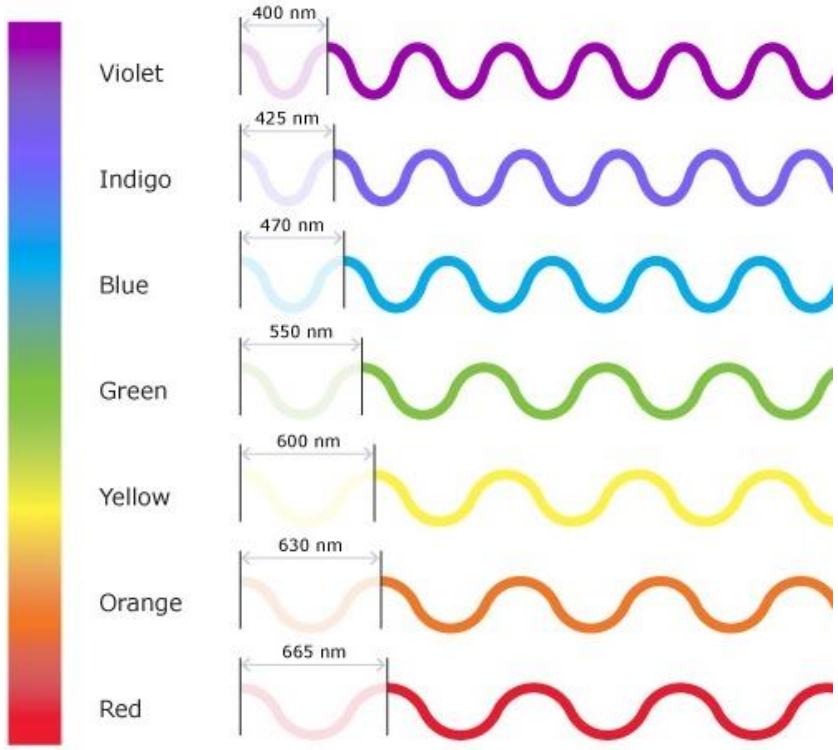
- Vision is the most studied of all of the senses! Our most dominating sense.
- There are many parts of an eye but the basic ones are the cornea, iris, retina, optic nerve and pupil.
- Our eye is stimulated by various wavelengths of light. The different wavelengths are responsible for the diversity of colors we see. There are many other types of waves that our eye cannot detect.
- **Light** is electromagnetic radiation that travels in the form of waves. Light is emitted from the sun, stars, fire, and lightbulbs. Most other objects just reflect light.

- Seeing begins when light waves enter the eyes.
- Spectrum of electromagnetic energy
  - Vary in wavelength
    - Human eyes can perceive only a very thin band of electromagnetic waves, known as the visible spectrum (400 – 700Thz
    - Within visible light, color is determined by wavelength



People experience light in three ways: color, brightness, and saturation.

- **Color (hue)** comes from the **wavelength** of light. Different wavelengths give us different colors.
- **Brightness** is how intense the light is, which depends on the **amplitude** (height) of the light waves. Higher waves mean brighter light. Some colors, like yellow, naturally seem brighter than others like red or blue.
- **Saturation** is how pure or colorful the light is. If light has just one wavelength, it's a pure color (fully saturated). Most light is a mix of wavelengths, making it look less vibrant or duller.



ANATOMY OF THE VISUAL SYSTEM

1. Light waves are transmitted across the cornea and enter through the pupil.

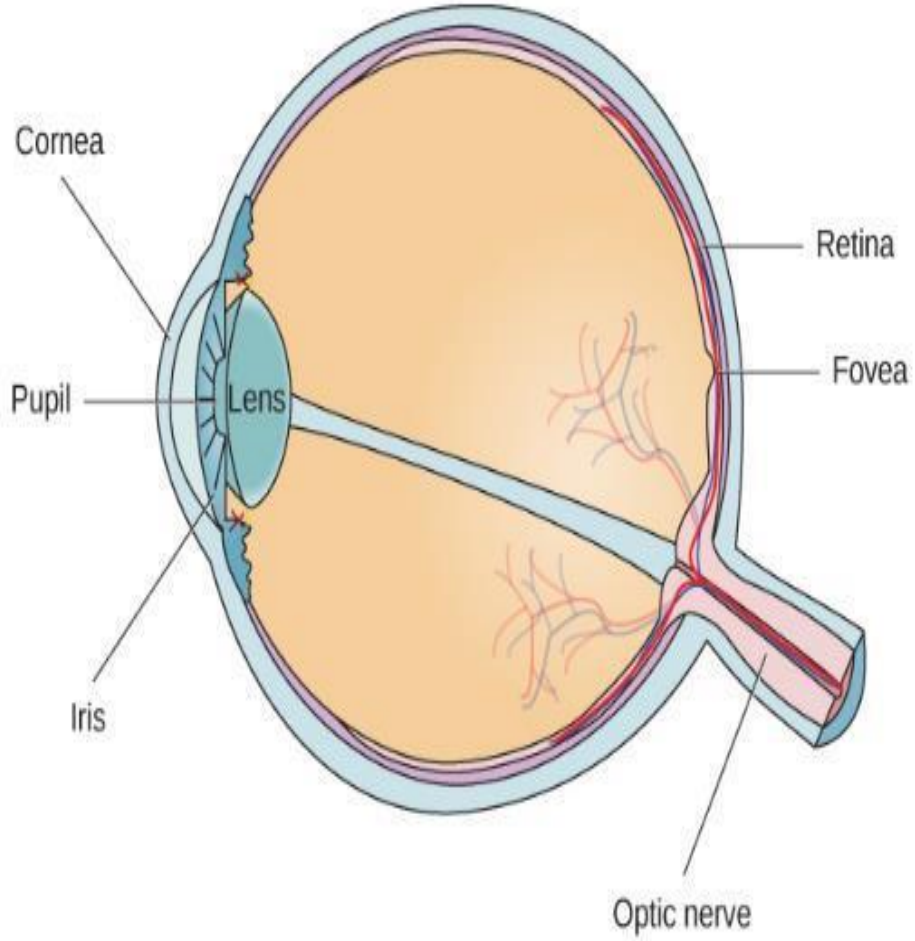
- The pupil's size is controlled by muscles that are connected to the iris (the colored part of the eye).

2. The light crosses the lens and is focused on the fovea, which is part of the retina.

- The fovea contains **photoreceptors**.

3. Photoreceptors are connected to retinal **ganglion cells**. Axons from these cells exit through the back of the eye where they form the optic nerve.

4. The optic nerve then carries the visual information to the brain.



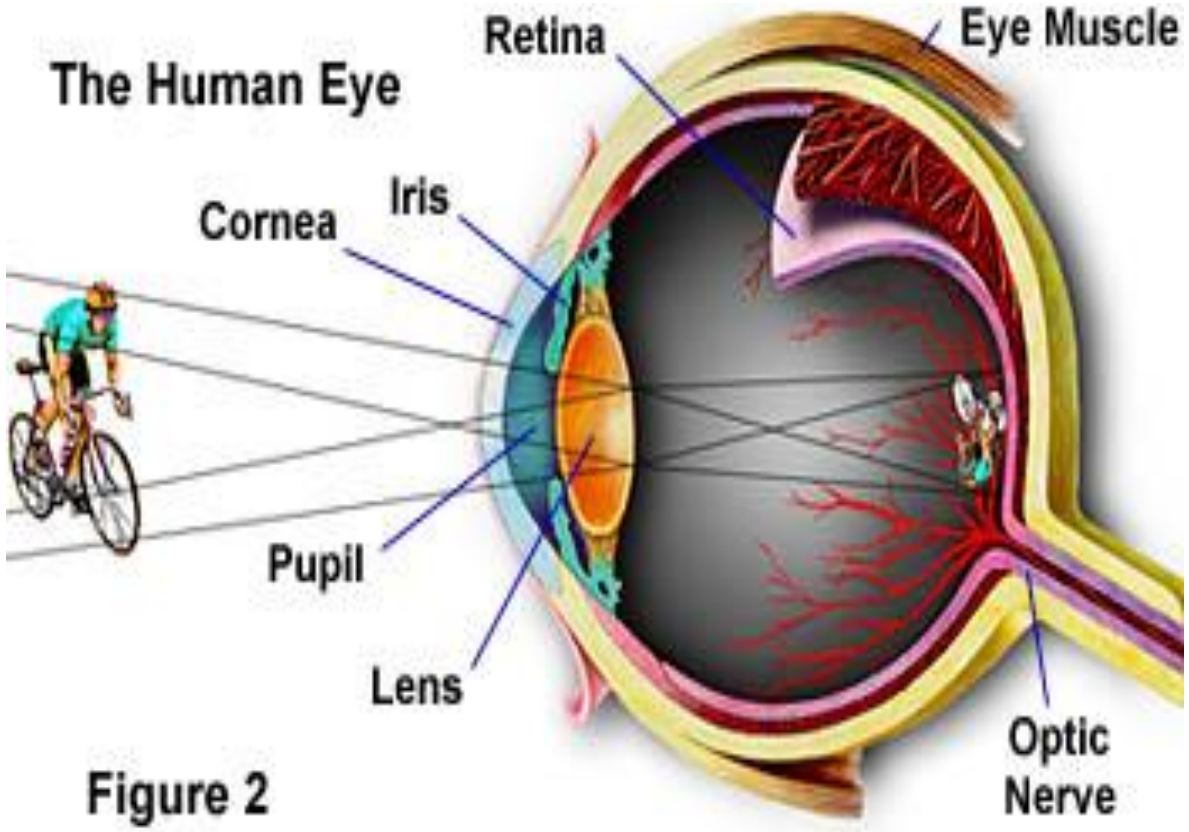
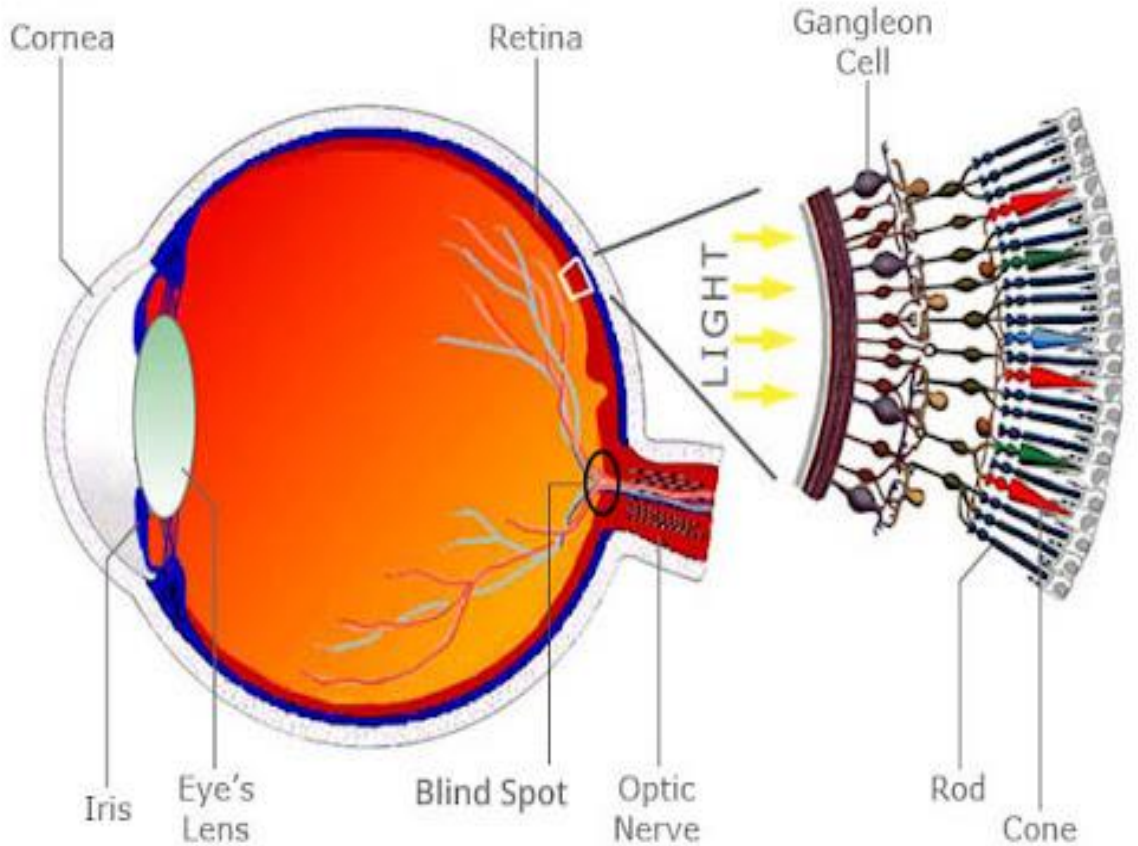


Figure 2

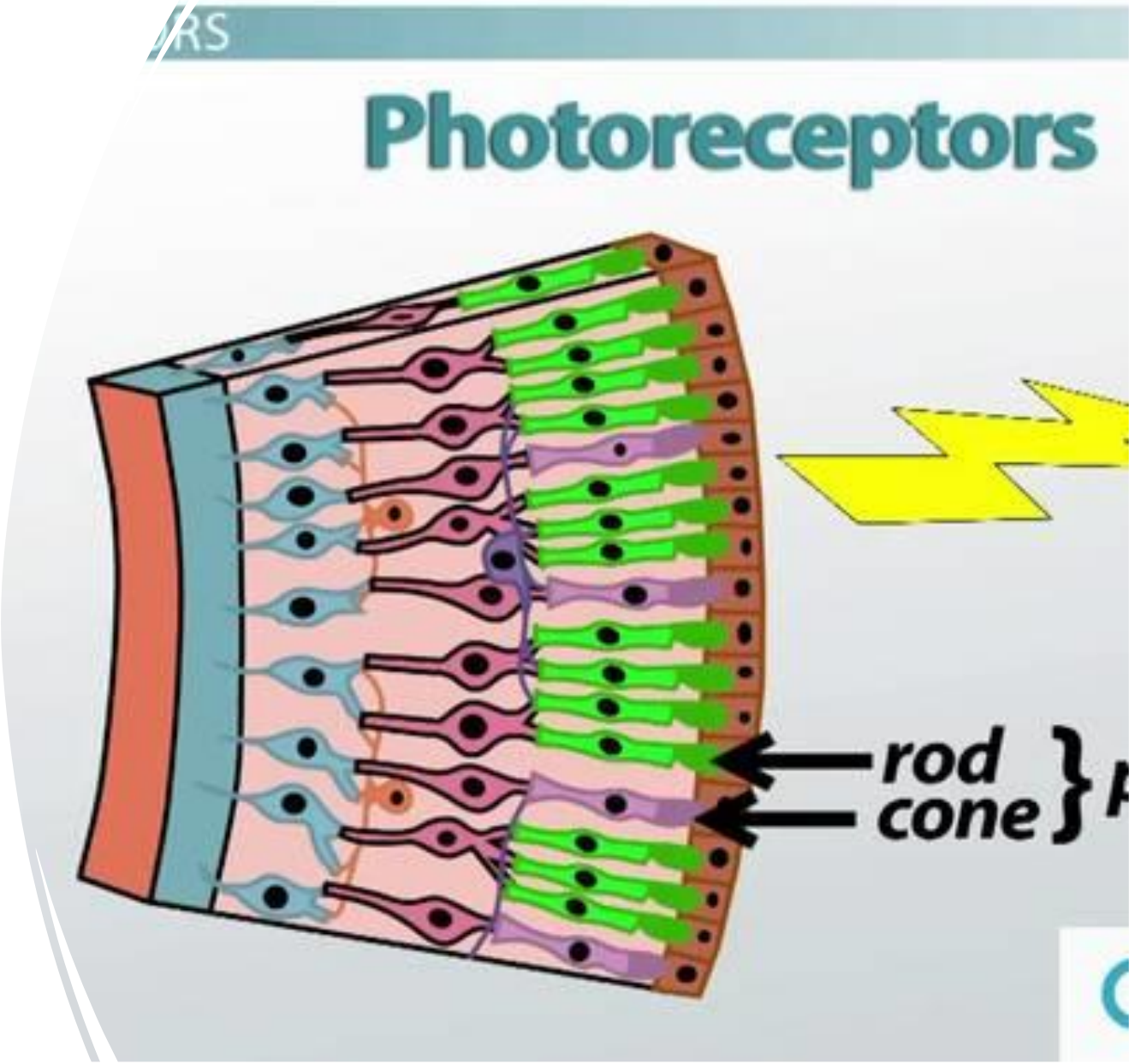
The **blind spot** is a small area on the retina of your eye where you can't see anything.



PHOTORECEPTORS

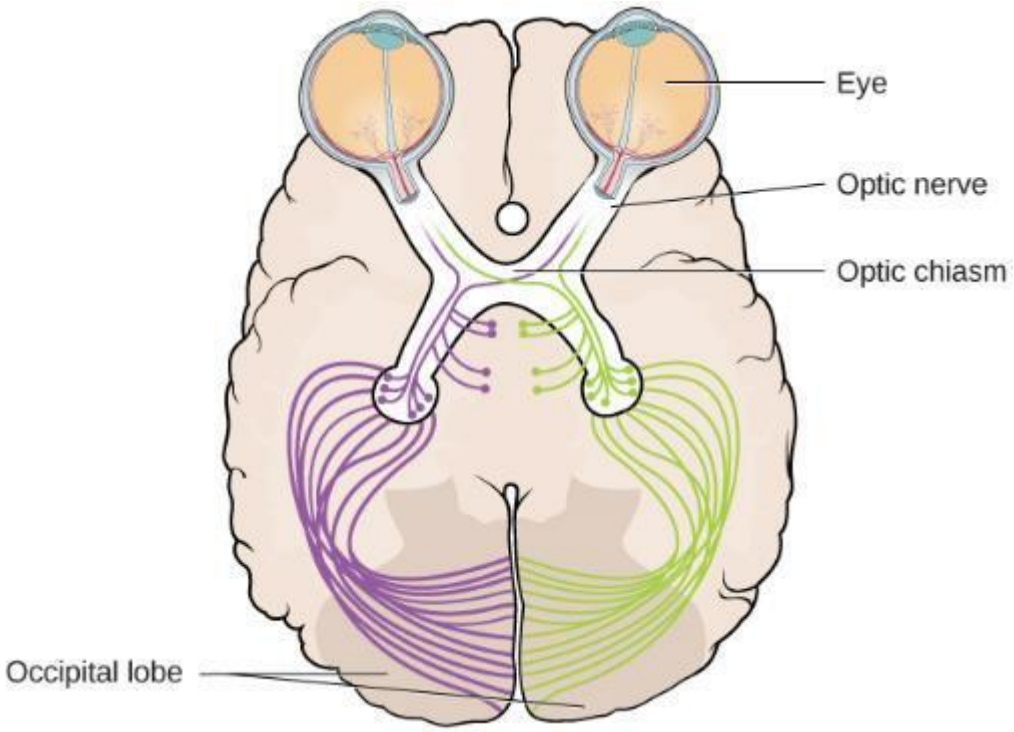
- **Cones:** 6.5 million in each eye
- Responsible for **daytime vision** (called **photopic** vision).
- Work best in **bright light**.
- Provide **sharp, detailed, and colorful** vision.

- **Rods:** 100 million in each eye
- Responsible for **night vision** (called **scotopic** vision).
- Work best in **low light** conditions.
- Very **sensitive** to light but don't detect color, which is why you see in shades of gray in the dark.
- Provide **blurry, low-detail** vision in dim light.
- Help detect **movement**, especially in your **peripheral (side) vision**.



Visual Processing Pathway: From Eye to Brain

1- Light enters the eye
•Converted into an electrical signal in the **retina**.
2- Signal travels through the retina
•Passes through retinal layers and down the **optic nerve** and **Optic Chiasm**.
3- Reaches the brain
•Signal goes to the **thalamus**, then to the **primary 4-visual cortex**.
•**Basic processing in primary visual cortex**
Processes light orientation and movement.
•**Advanced processing in specialized areas**
•**Fusiform Face Area** (faces), **Extrastriate Body Area** (body parts).



Dark and light adaptation

Dark Adaptation:

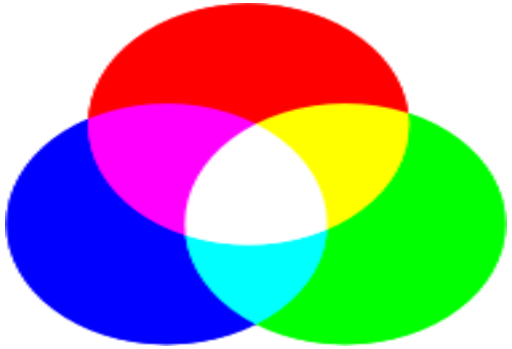
- **Rods** help us see in dim light or dark rooms.
- **Takes around 10 minutes** for full night vision to "turn on" (rods need time to recover after being exposed to bright light).
- This process is called **dark adaptation**.

Light Adaptation:

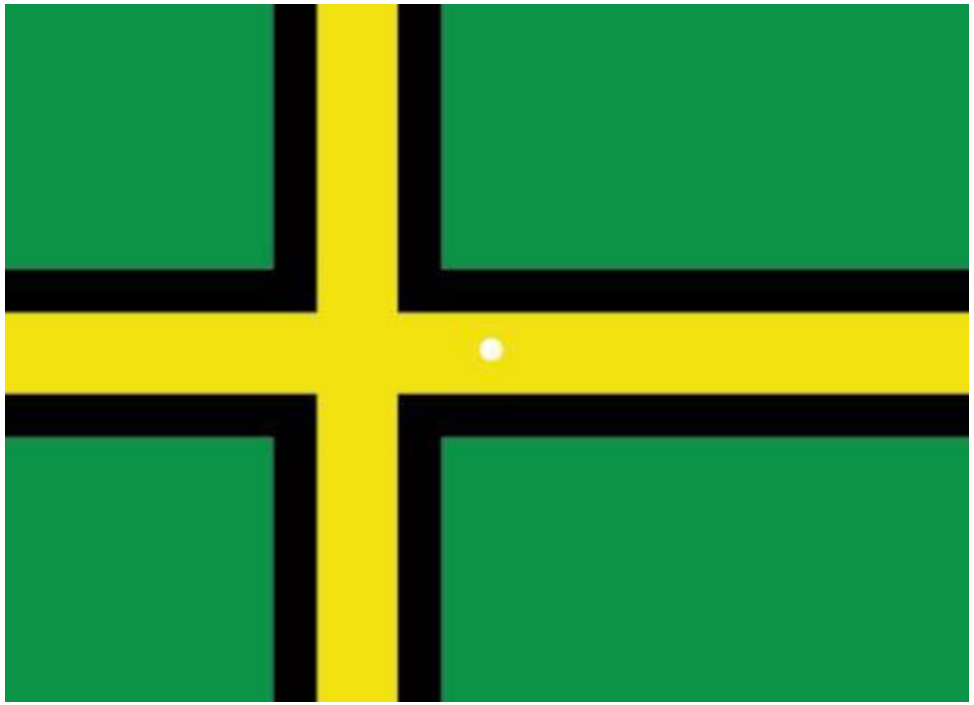
- When moving from a dark room to bright light (like leaving a movie theater), **rods and cones** are "bleached" by the sudden brightness.
- **Light adaptation** happens almost instantly, but it may cause temporary blindness for a few seconds.

Theories of color vision

- **Trichromatic Theory**: This theory, proposed by *Young* (1802) and *Von Helmholtz* (1867), suggests that we perceive color based on three types of cone cells in the retina that are sensitive to different wavelengths of light—red, green, and blue. These cones work together to allow us to see a full range of colors under normal lighting conditions.
- However, it's important to note that these cones don't exclusively respond to just one color, but they have a *preference* for certain wavelengths (Svaetichin, 1955).



•The trichromatic theory predicts that after staring at something, you should see white when looking away to a white wall.

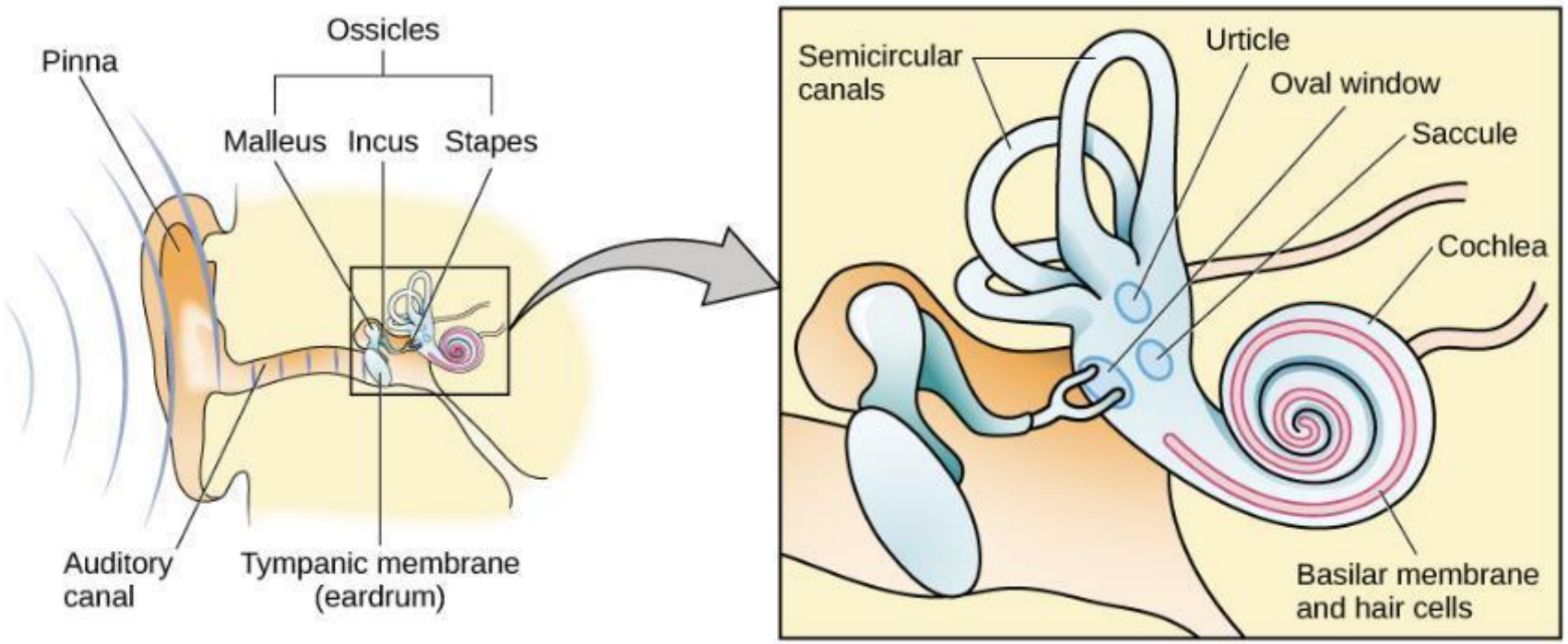


Opponent-Process Theory

- Explain this afterimage effect, *Hering* (1920) proposed the **opponent-process theory**. This theory suggests that our visual system processes color in opposing pairs: red-green, blue-yellow, and black-white. After prolonged exposure to one color (e.g., red), the cells that process red become fatigued. When you then look at a neutral surface, the opposite color (in this case, green) becomes more prominent, creating the afterimage.

Sense of Hearing and Balance

ANATOMY OF THE AUDITORY SYSTEM



The ear is divided into 3 divisions:

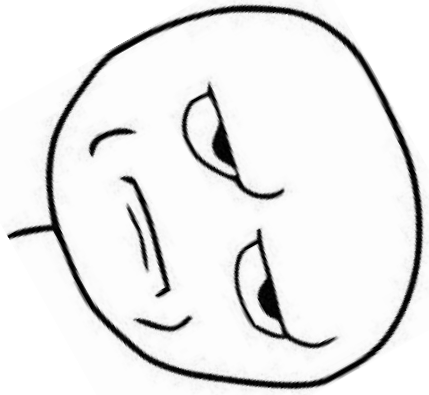
Outer - pinna and tympanic membrane

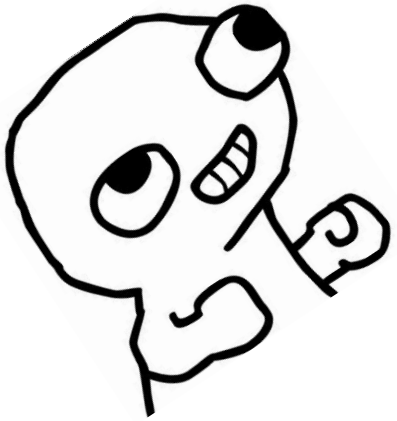
Middle - the three ossicles: malleus, incus, and stapes

Inner - cochlea and basilar membrane

Sense of Hearing

- Hearing begins when sound waves enter the ear
- Human ear is sensitive to a particular range of **sound waves.**
- The **human ear** is sensitive to a specific range of sound waves, typically from about **20 Hz to 20,000 Hz**.



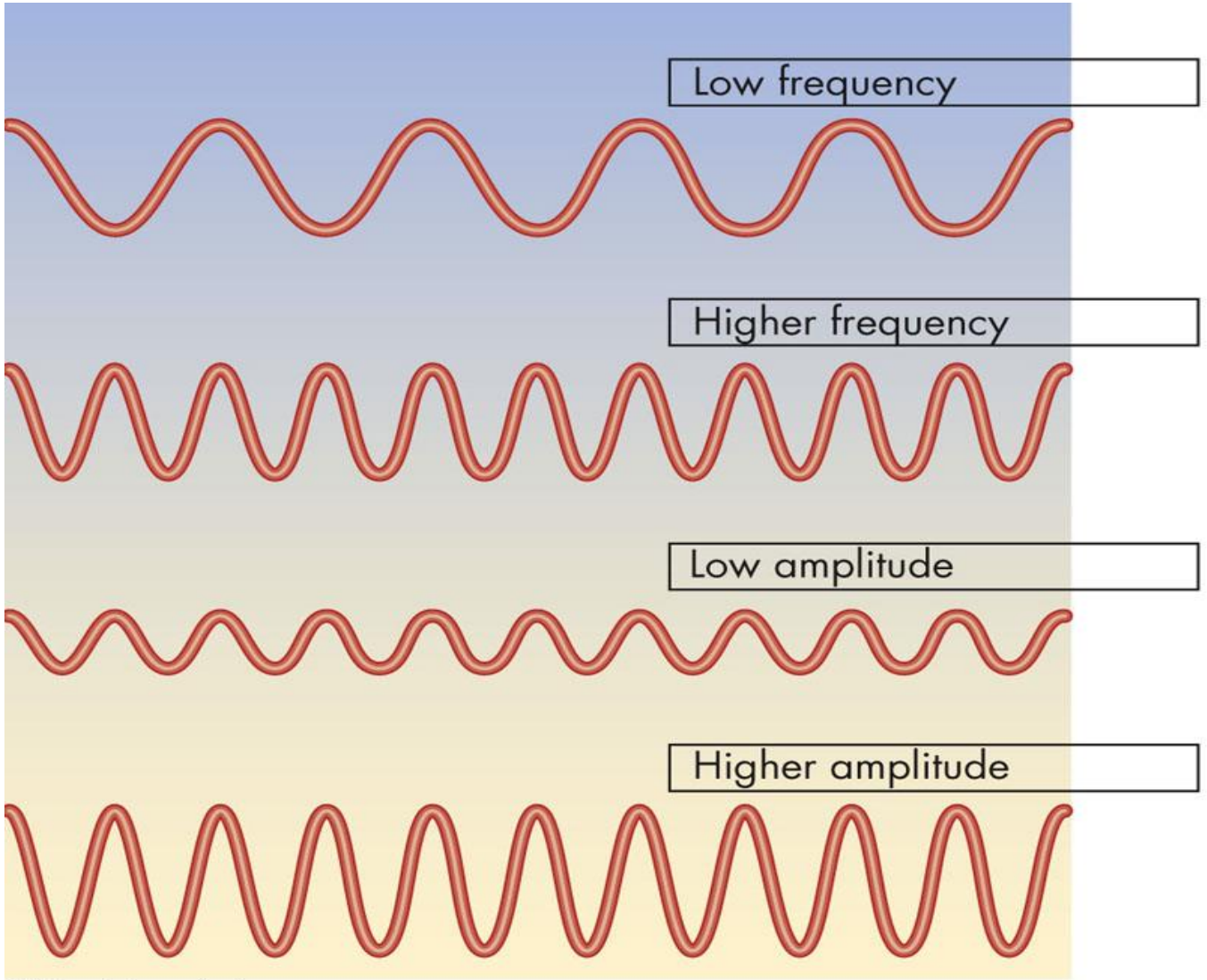


Hearing range decreases as we age,
by the age of 70 many people have trouble hearing sounds above 6,000 Hz

Properties of Sound

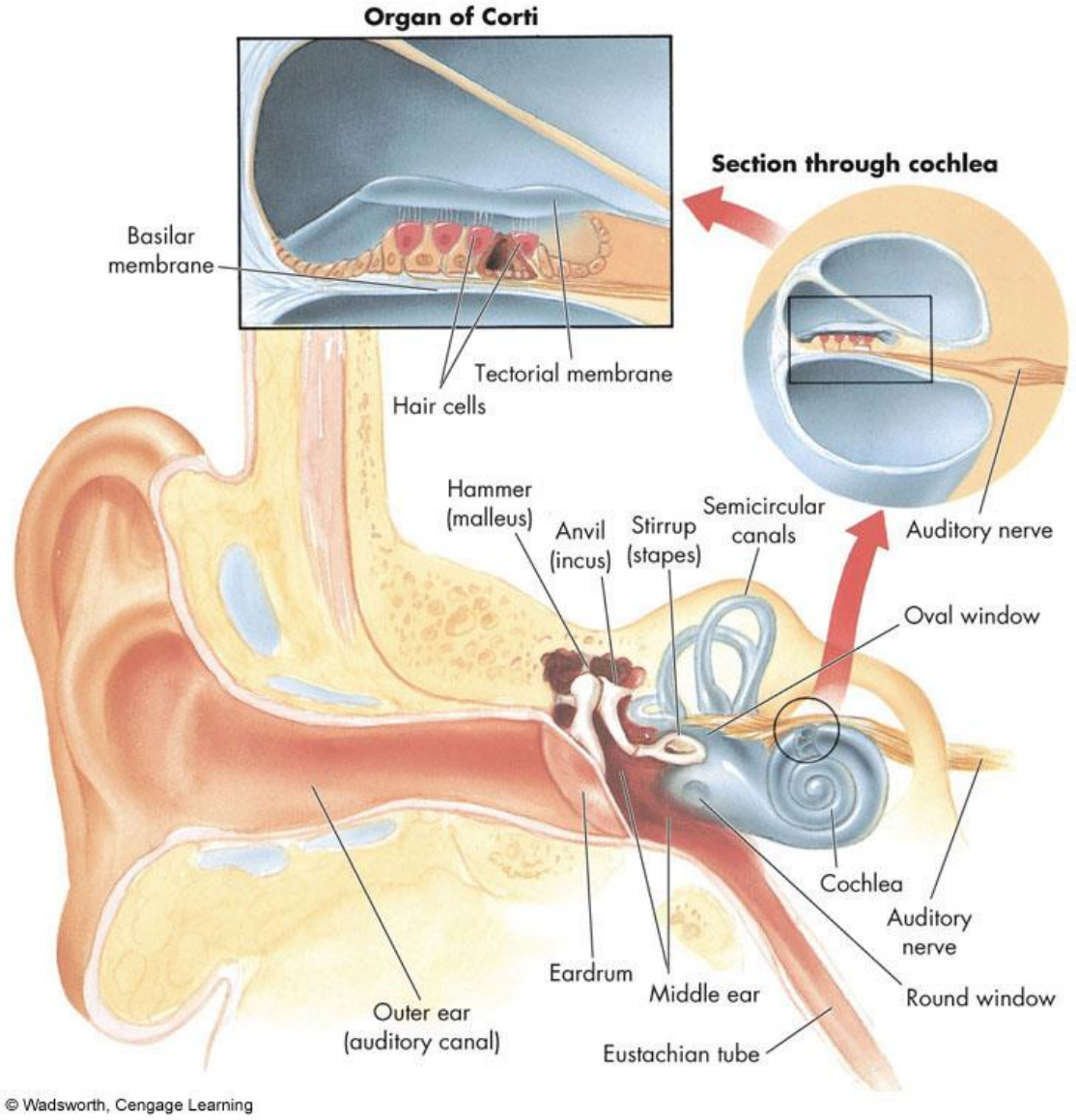
- **Amplitude**
  - Pertains to loudness of the sound
  - Expressed in decibels (dB)
- **Frequency**
  - Pertains to pitch of the sound
  - # of cycles per second
  - Expressed in hertz (Hz)
  - Pitch of women's voice is higher than men's
- **Timbre**
  - Pertains to distinct quality of sound.
  - Distinguishes between two tones that have the same loudness and frequency but still sounds different

Sound Waves of Various Frequencies and Amplitudes



Parts of the Ear

1. Outer Ear
    - Composed of the Pinna or the external ear, auditory canal and the eardrum
2. Middle Ear
    - Tiniest bones in the middle ear: **Ossicles** (hammer, anvil and stirrup)
    - Acts as an amplifier
    - Oval window – Round window- balances the pressure



Parts of the Ear

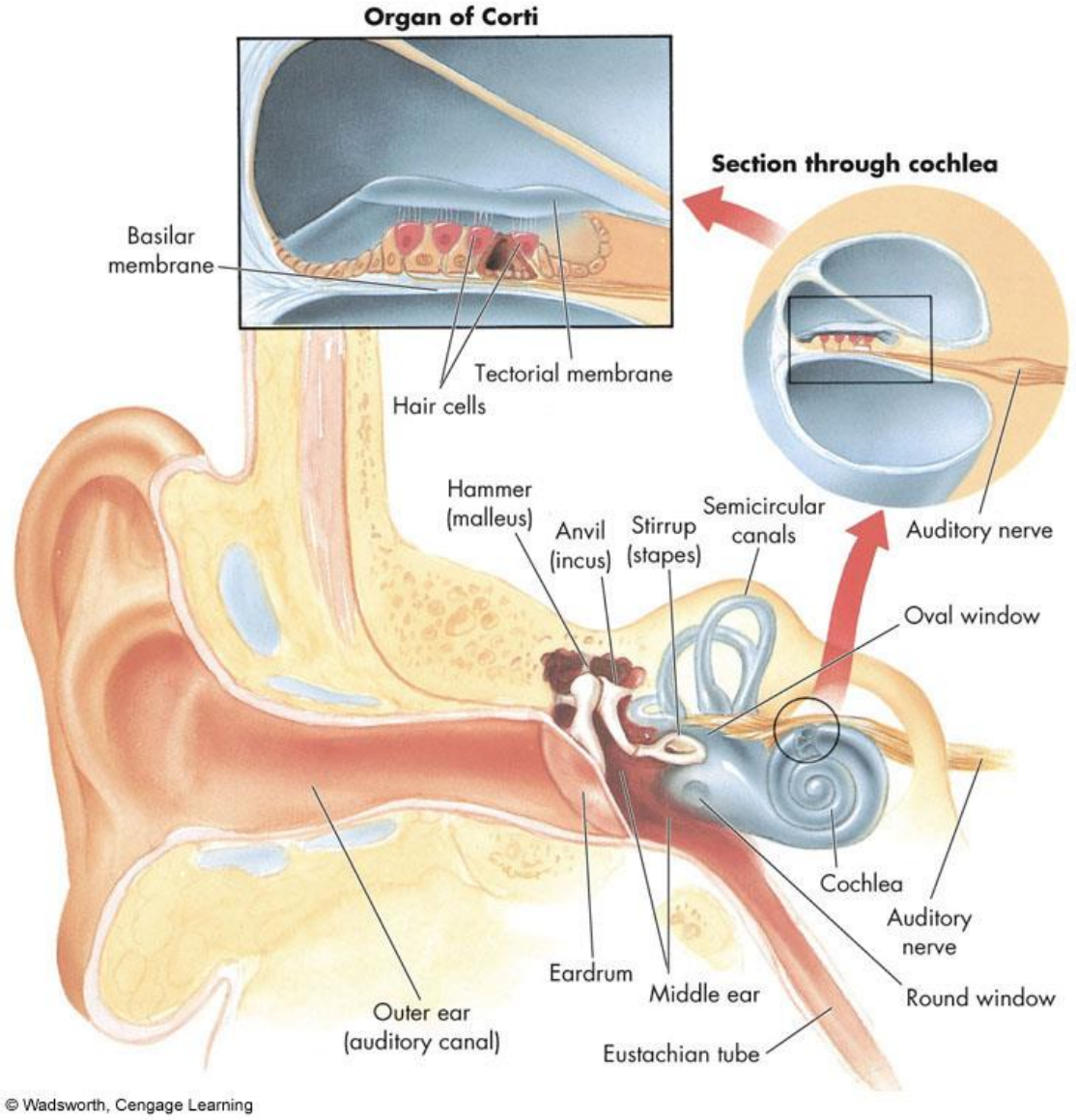
3. Inner Ear

Composed of two organs:

- **hearing**

  -Cochlea

  - Contains hair cells
  - Tubes inside the cochlea contains fluid
  - Basilar membrane (center for auditory transduction)



Transduction in the ear

- To sense sound waves from our environment, they must reach the inner ear. Sound waves are first funneled by the **pinna** into the **auditory canal**. They then hit the **tympanic membrane** (eardrum), which vibrates and passes the sound through the **ossicles** (three small bones: malleus, incus, and stapes) to amplify the sound. The amplified sound waves then enter the **cochlea**, a fluid-filled structure with auditory hair cells that are organized based on the frequency they detect.
- When hair cells vibrate, they turn vibrations into neural impulses, called the organ of Corti, and send them to the thalamus up the auditory nerve.

https://www.youtube.com/watch?v=98-6WfdumZY

Deafness

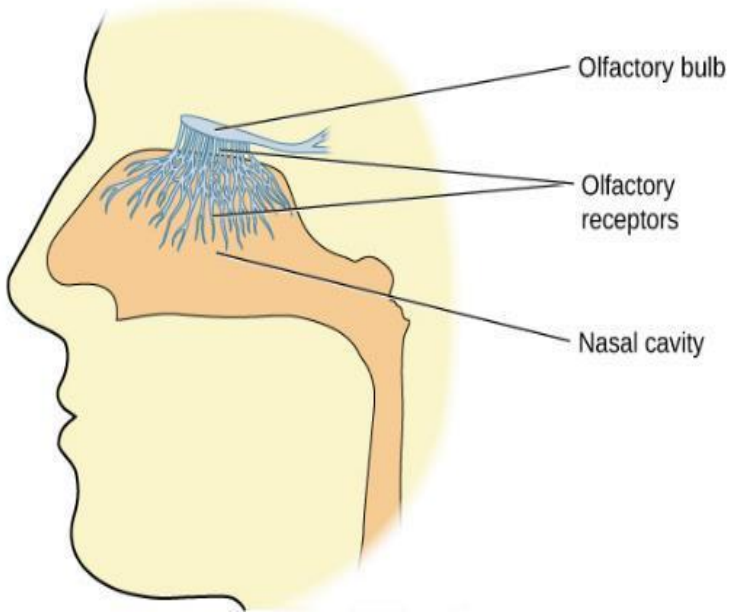
- Conductive deafness
  - Damage to middle ear
  - Hearing aids can help
- Sensorineural deafness
  - Damage to inner ear or auditory nerve
  - Cochlear implants may help with damage to inner ear, but not auditory nerve

The Chemical Senses: Smell and Taste

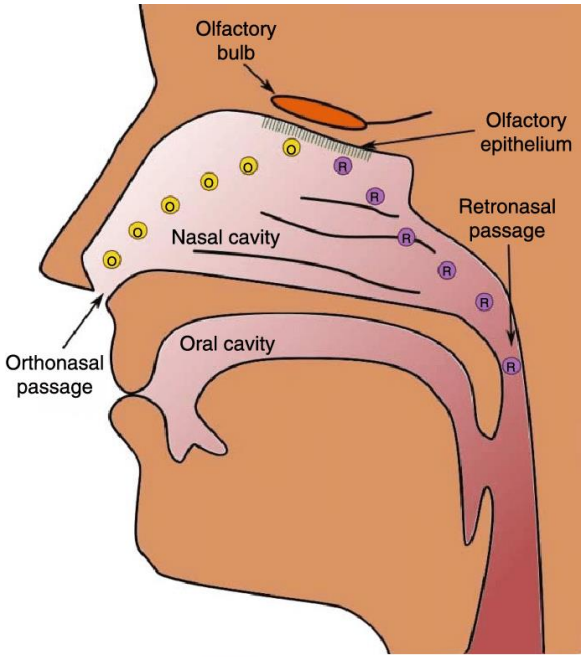
SMELL (OLFACTION)

Transduction:

1. Odor molecules bind to receptors.
2. Chemical changes cause signals to be sent to the olfactory bulb (where the olfactory nerves begin).
3. Information is sent to the limbic system and primary olfactory cortex.



SMELL (OLFACTION)

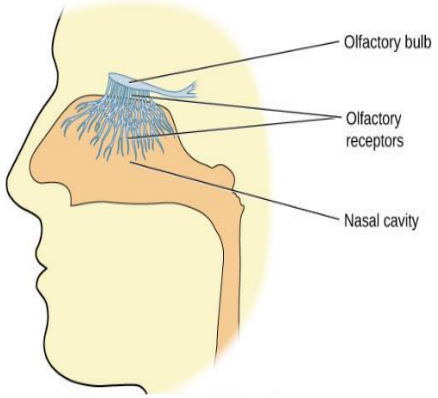


1. Odorant Molecules
When we inhale, odorant molecules (tiny particles from substances like food, flowers, or smoke) enter our nose through the nasal passages.

2. Olfactory Receptors
Inside the nasal cavity, at the top, lies the **olfactory epithelium**, a small patch of tissue containing millions of specialized nerve cells called **olfactory receptor neurons (**40 million). These neurons have hair-like extensions called **cilia**, which are coated with receptors that bind to specific types of odor molecules.

3. Binding of Odor Molecules
When odorant molecules bind to the receptors on the cilia, this triggers a cascade of chemical reactions within the olfactory receptor cells, leading to the generation of an electrical signal.

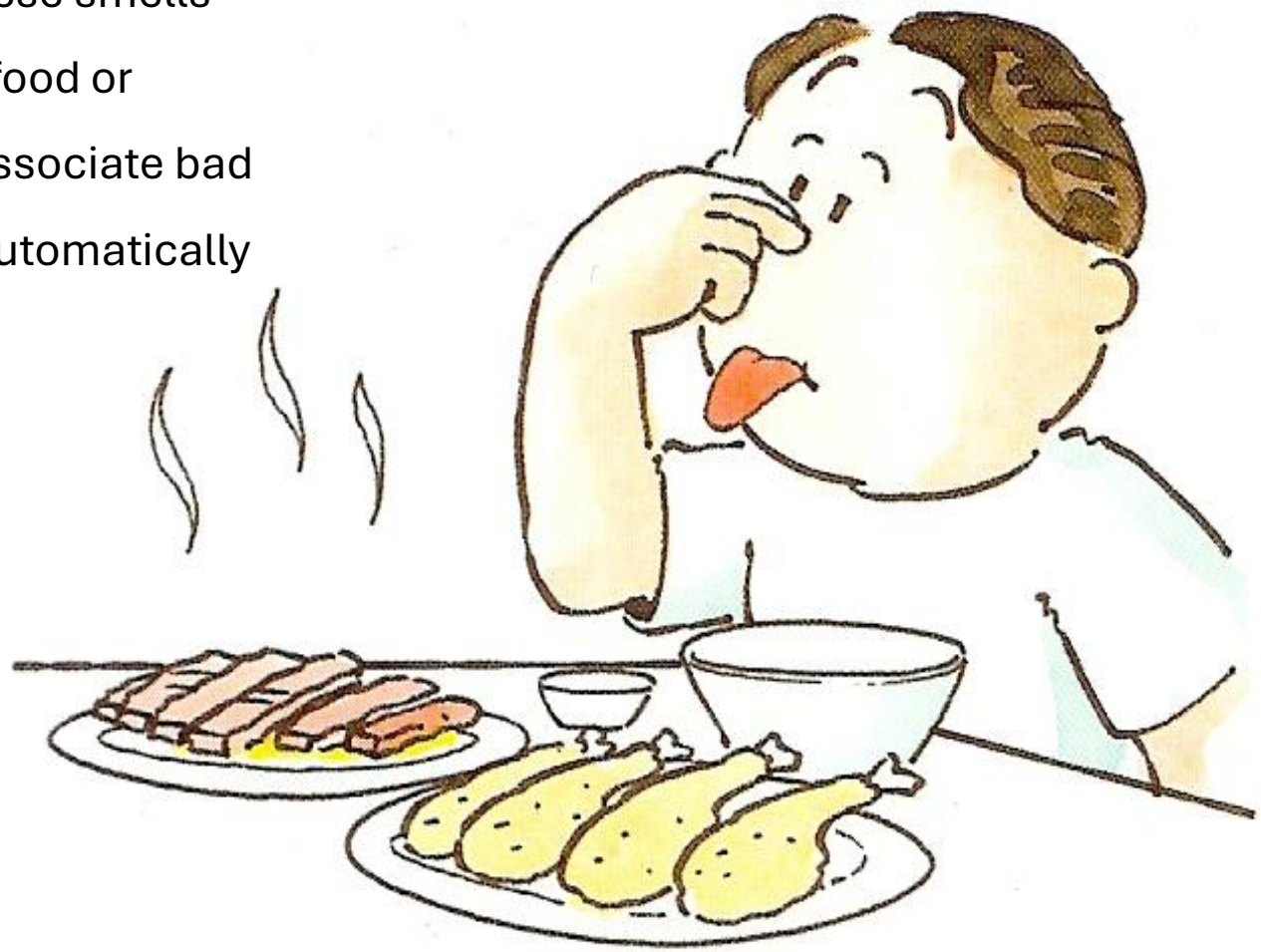
4. Olfactory Bulb
These electrical signals are then transmitted via the **olfactory nerve** to the **olfactory bulb**, a part of the brain located just above the nasal cavity. The olfactory bulb processes these signals and begins the process of identifying the smell.



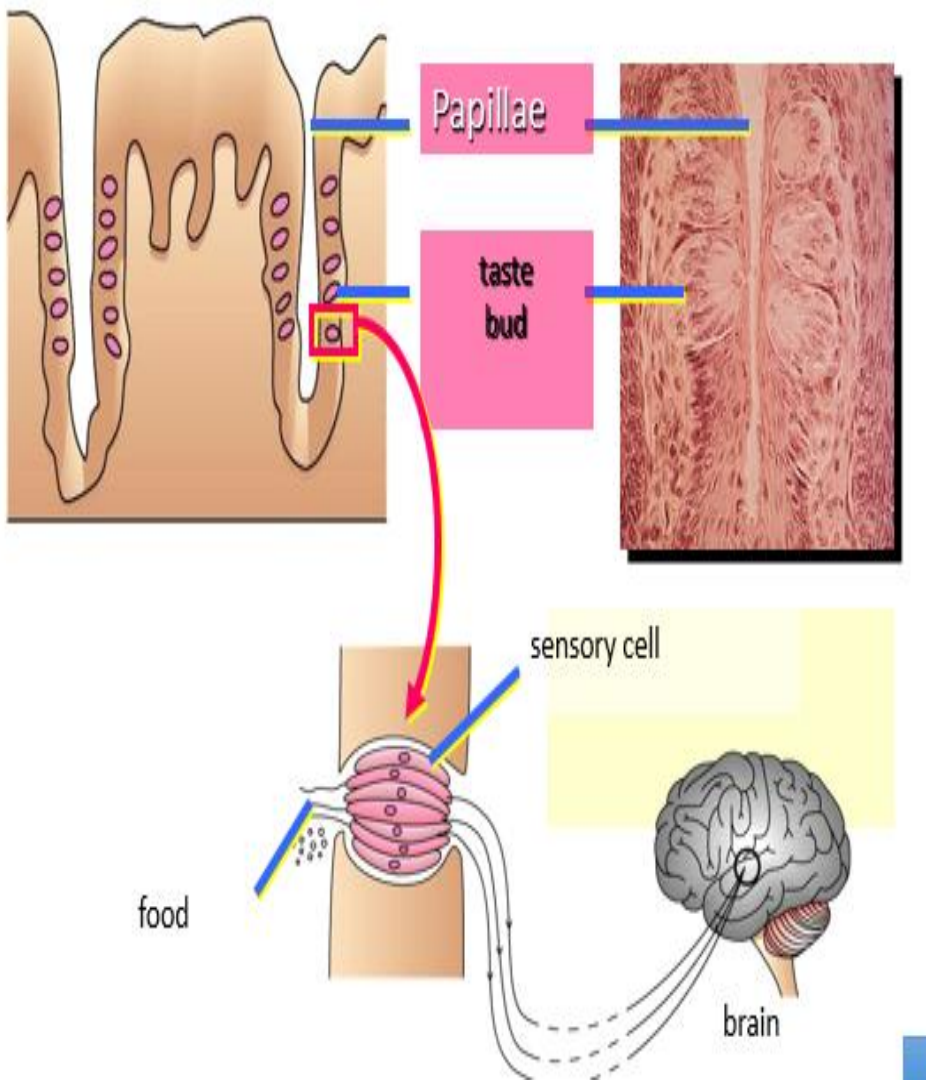
5. Perception of Smell
Finally, the brain interprets these signals, allowing you to consciously perceive and identify the smell.

https://www.youtube.com/watch?v=utfgOsWrBiM

The **sense of smell** is one of the first senses to develop because it plays a crucial role in survival. From an early age, we instinctively react to bad or foul odors, as these smells often signal something dangerous, like spoiled food or harmful substances. Our body has learned to associate bad smells with potential danger, which is why we automatically cover our noses when we encounter them.



Taste



- Taste works similarly to smell, but instead of using olfactory receptors, it uses **taste receptor cells** located in **taste buds**. These taste buds are found in small divots around the bumps (papillae) on your tongue.
- When chemicals in food, called **tastants**, bind to these receptors, we perceive the five basic tastes: **sweet, sour, bitter, salty, and umami** (savory).
- While it was once believed that different parts of the tongue specialized in certain tastes (like bitter at the back and sweet at the front), modern research shows that all taste receptors are distributed across the tongue and can detect all tastes.

Touch and Pressure

- Our ability to experience touch, pain, pressure, warm sensation and cold sensation is due to the excitation of numerous receptors found in the skin
- Sensory receptors in skin fire when skin surface is touched

Receptors of touch

- **MECHANORECEPTORS**
  - Respond to mechanical stimulation such as pressure, stretching of the skin and vibration
  - 4 types
    - Merkel
    - Meissner disks
    - Ruffini cylinders
    - Pacinian corpuscles


Why
Do I
Have Pain?

- **NOCICEPTORS**
  - Pain receptors are found among the free nerve endings located both near the surface of the skin (detect extreme temperatures) and below the skin's surface (detects sharp and punctuate sensation)

Gate Theory of Pain

- The theory suggests that the spinal cord contains a neurological "gate" that controls whether pain signals can reach the brain. This gate can either open to allow pain signals to travel to the brain or close to block them.

Large and Small Nerve Fibers:

- **Small fibers** (pain fibers) transmit pain signals.
- **Large fibers** transmit non-painful sensations such as touch or vibration. When both types of fibers are activated, the large fibers can inhibit the transmission of pain by closing the gate. This is why rubbing a painful area sometimes reduces the sensation of pain.
- The brain can also influence the gate's status. Psychological factors such as attention, emotions, and mental state can open or close the gate. For example, focusing on pain might keep the gate open, while distraction or positive emotions can help close it, reducing pain perception.
- https://www.youtube.com/watch?v=mgwa14lfTXQ

STRESS FROM HEARTBREAK GRIEF CAN FLOOD THE BODY WITH HORMONES, SPECIFICALLY CORTISOL, WHICH CAUSES THE HEAVY-ACHY FEELING YOU GET IN YOUR CHEST AREA.

GESTALT PRINCIPLES OF PERCEPTION

Gestalt psychology – field of psychology based on the idea that the whole is different from the sum of its parts.

Gestalt Principles of Perception describe how our brains tend to organize visual elements into patterns or wholes, rather than seeing them as separate parts. Here are the main principles:

Proximity: Objects that are close to each other are perceived as a group.

Similarity: Elements that look similar (in shape, color, or size) are seen as part of the same group.

Continuity: Our eyes follow continuous lines or patterns, even when interrupted.

Closure: We tend to fill in gaps in incomplete figures to see a whole shape.

Figure-Ground: We distinguish an object (figure) from its background (ground).

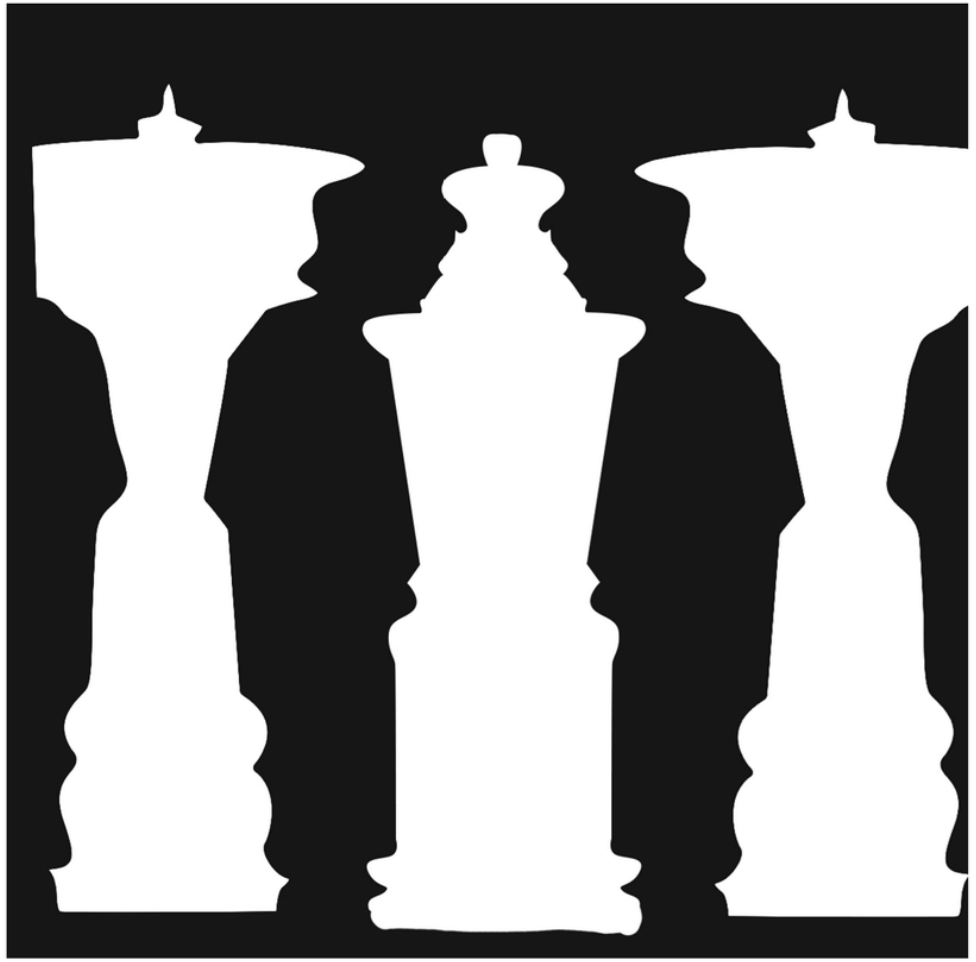
Symmetry: Symmetrical shapes are perceived as being grouped together.

FIGURE-GROUND RELATIONSHIP

The **Figure-Ground Relationship** explains how we visually separate an object (the **figure**) from its background (the **ground**). Our brain does this automatically when we look at a scene or an image.

•**Figure**: The object or element that stands out and captures our attention. It's the focus of what we are looking at.

•**Ground**: The background or surrounding space that supports the figure but is less noticeable.



GESTALT PRINCIPLE OF PROXIMITY

The idea that things that are close to one another tend to be grouped together.

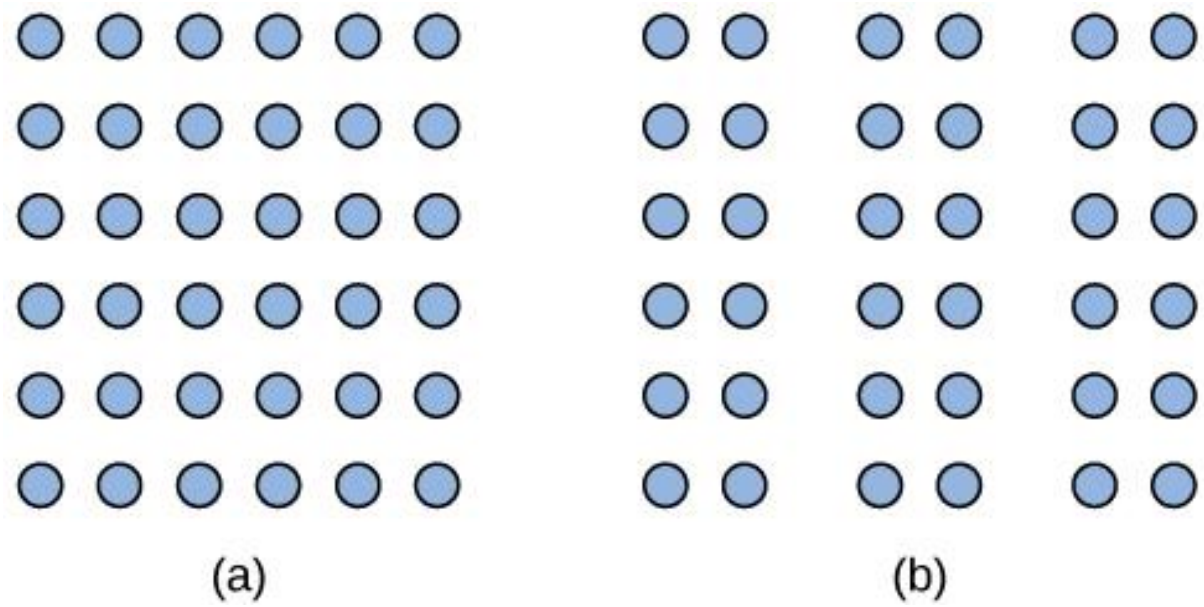
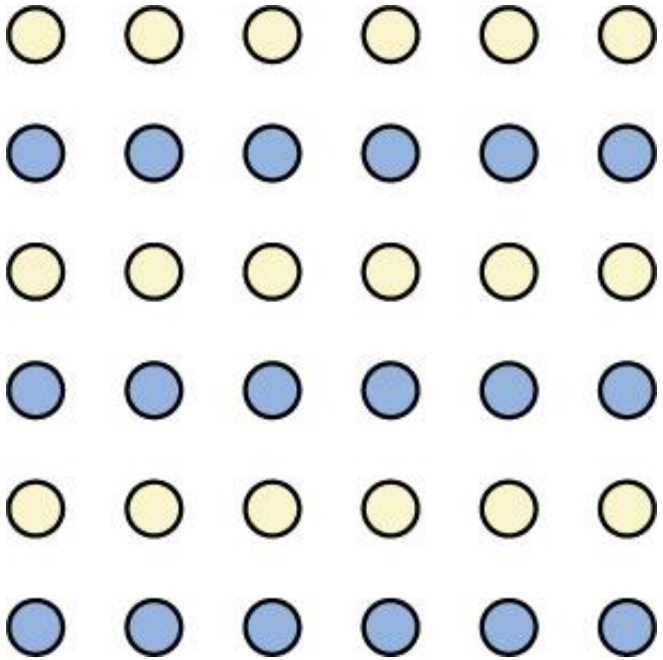


Figure 5.24

The Gestalt principle of proximity suggests that you see (a) one block of dots on the left side and (b) three columns on the right side.

GESTALT PRINCIPLE OF SIMILARITY

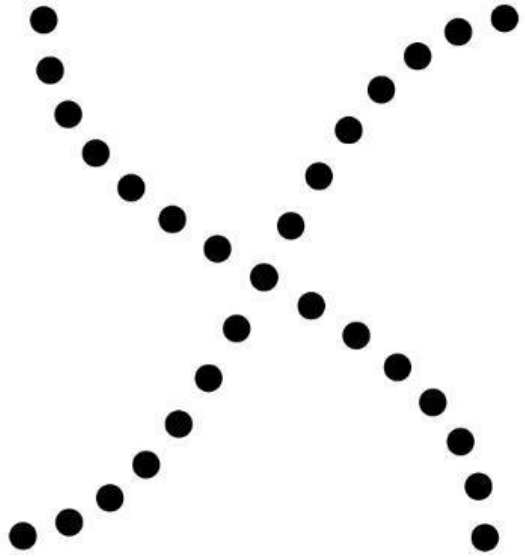
The idea that things that are alike tend to be grouped together.



When looking at this array of dots, we likely perceive alternating rows of colors.

GESTALT PRINCIPLE OF CONTINUITY

The idea that we are more likely to perceive continuous, smooth flowing lines rather than jagged, broken lines.



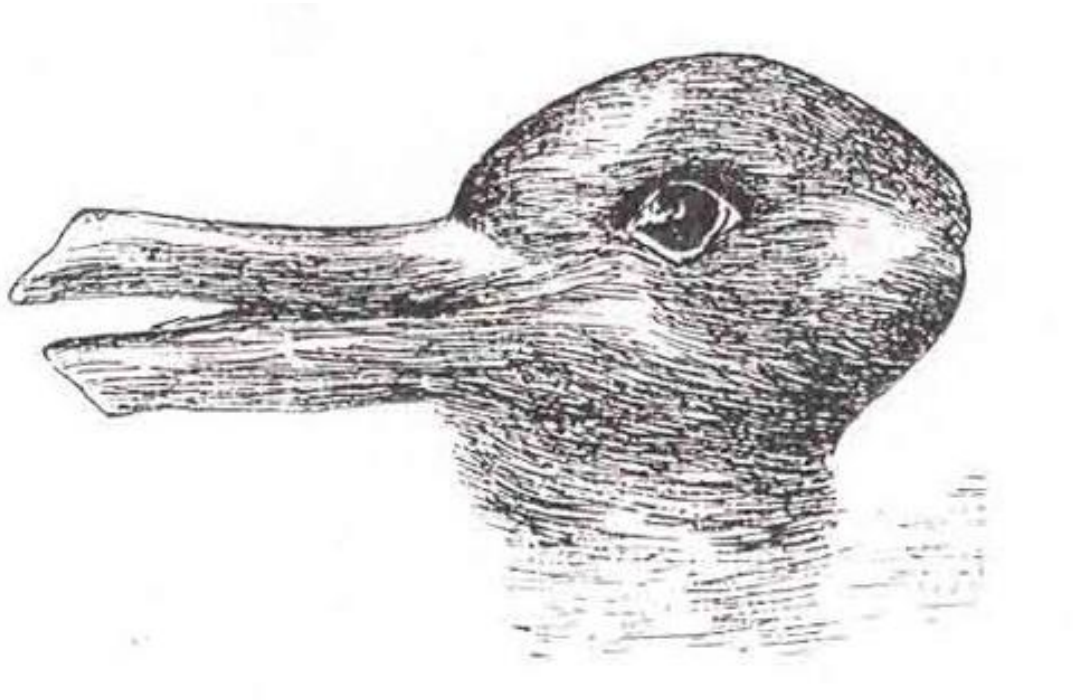
Good continuation would suggest that we are more likely to perceive this as two overlapping lines, rather than four lines meeting in the center.

GESTALT PRINCIPLE OF CLOSURE

Closure suggests that we will perceive a complete circle and rectangle rather than a series of segments.

DUCK OR RABBIT?

Take a look at the following figure. How might you influence whether people see a duck or a rabbit?



FACTORS AFFECTING PERCEPTION

Sensory adaption – not perceiving stimuli that remain relatively constant over prolonged periods of time.

Attention

- **Inattentional blindness** - Failure to notice something that is completely visible because of a lack of attention.

https://www.youtube.com/watch?v=z-Dg-06nrnc

FACTORS AFFECTING PERCEPTION

Motivation

- Motivation refers to the internal drives that direct attention and influence what individuals perceive and how they interpret stimuli.
- Sometimes we think we hear something such as a phone ringing when it is not because we are motivated to perceive it (such as waiting for an important phone call).

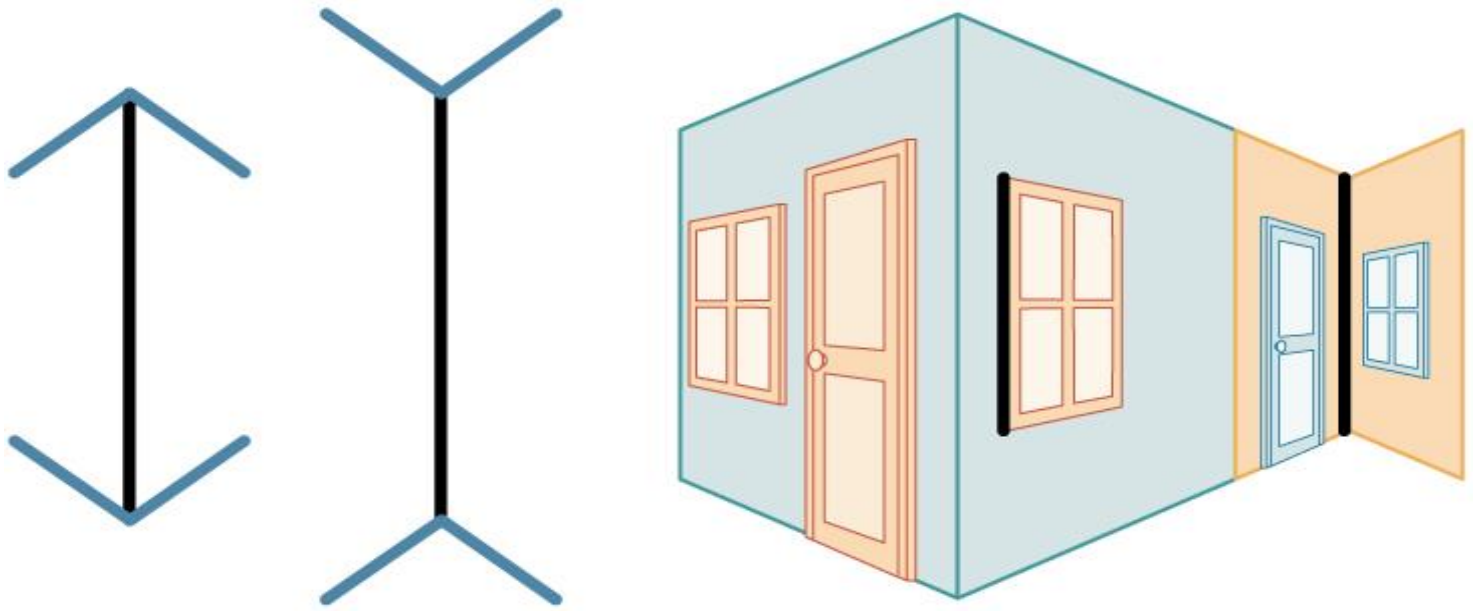
Beliefs, values, prejudices and expectations

- These are cognitive and affective components that shape an individual's worldview and interpretative lens through which they perceive information.
- People who hold positive attitudes towards low-fat foods are more likely to rate foods with low-fat labels as tasting better than people with less positive attitudes about low-fat products.

Life/Cultural experiences

- Life experiences encompass the cumulative knowledge and encounters an individual has throughout their life

MULLER-LYER ILLUSION



In the Müller-Lyer illusion, lines appear to be different lengths although they are identical.

(a) Arrows at the ends of lines may make the line on the right appear longer, although the lines are the same length.

(b) When applied to a three-dimensional image, the line on the right again may appear longer although both black lines are the same length.