• The **somatic senses** are receptors associated with touch, pressure, temperature & pain

• The **special senses** are receptors associated with the senses (touch, smell, hearing, taste, vision & equilibrium)
Types of Receptors:

- **Chemoreceptors**: respond to changes in chemicals
- **Pain receptors**: respond to tissue damage
- **Thermoreceptors**: respond to changes in temperature
- **Mechanoreceptors**: respond to changes in movement or pressure
- **Photoreceptors**: respond to changes in light energy
The Eye & Vision:

- The organs of sight are the eyes, the eyelids, & the lacrimal apparatus

- The **eye orbit** contains the above organs & fat, nerves, muscles, & blood vessels

- The **eyelids** protect the eye (open & close)

- The **conjunctiva** is within the eyelids that provides mucous (is a mucous membrane) to wash the eye.
• The **lacrimal apparatus** contains the **lacrimal gland** & a series of ducts that connect the eye to the nose & throat. This secretes tears.

• This has 2 ducts which collect tears:
  – **Lacrimal sac** flows into the:
  – **Nasolacrimal duct** (empties into nasal cavity)

• Tears have **lysozymes** (enzymes that aid in eye infection prevention)

• There are 6 **extrinsic muscles** of the eyes, which allow for movements in all directions.
The Structure of the Eye:

The Fibrous Layer (outer layer):

- The **cornea** (a transparent, thin layer of epithelium that allows for light transmission into the eye)

- The **sclera** which is connected to the cornea (the white part of the eye) which protects the eyes & is the attachment for the extrinsic muscles

- The **optic nerve** is in the back of the eye & blood vessels which attaches to the sclera.
The Vascular Layer (middle layer):

- **Choroid coat** which nourishes the tissues of the eye & provides the pigment (melanocytes)

- The **ciliary body** forms the ring around the front of the eye; these hold the **lens** (transparent) in place

- The **iris** (a muscle) is the colored portion of the eye (the lens is directly behind it)

- The **pupil** is the opening of the eye that responds to light.
• The Sensory Layer (innermost layer):
  – The *retina* which *contains the photoreceptors (visual receptor cells)*. This is the inner lining of the wall.
  – The *vitreous humor* is the jellylike fluid that maintains the globular shape of the eyeball; this fills the posterior cavity of the eye.
• The lens is clear & elastic (flexible) meaning it can change its shape to focus.
  – This is called **accommodation**.

• The iris separates the **anterior chamber** (between cornea & iris) & **posterior chamber** (between iris & vitreous body which contains the lens) of the eye.

• **Aqueous humor** is the watery fluid in the eye.
* **Refraction** is the means of light bending in the eye. This is the focusing of an image.

* There are 2 types of visual receptors: rods and cones.

  * **Rods**: more sensitive to light, provide vision in dim light, produce colorless vision, & provide general outlines of vision (less precise images)

  * **Cones**: provide sharp images & detect color.
• The ear is the hearing organ.
• It contains 3 parts: the external, middle & internal parts.
• The *external ear*: 2 parts:
  – the *auricle* (a.k.a. *pinna*) collects sounds & directs them through the *external auditory meatus* (a.k.a. *external auditory canal*).
The **middle ear**:

- contains the **tympanic cavity**
- the **eardrum** (a.k.a. **tympanic membrane**): pressure is changed by the entering sound waves & reproduces vibrations
- the **auditory ossicles** (3 small bones:) bridge the eardrum & the inner & transmit the impulses as they increase the force (amplify) the force of vibrations.
  - **Malleus** (hammer)
  - **Incus** (anvil)
  - **Stapes** (stirrup)
• There is a tube that connects the inner ear to the throat. This is the **auditory tube**.

• This maintains air pressure on both sides of the eardrum (enables proper hearing)

• When there is a change in altitude, the pressure of the eardrum is off and hearing is impaired.

• A *popping* sound in the ear is the result of pressure equalizing (enabling hearing)
The *inner ear*:

- contains chambers & tubes referred to as a *labyrinth*. This includes:
  - *3 semicircular canals* which enable equilibrium
  - *Cochlea* which enables hearing
  - The *Organ of Corti* contains the hearing receptors & also contains hair cells.
Equilibrium:

- **Static equilibrium** is located within the **vestibular apparatus**. This is the maintenance & stability of the head when the head & body are still.

- **Dynamic equilibrium** is the balancing of the head & body during sudden movement. This is due to the **semicircular canals** of the ear.
Static vs. Dynamic Equilibrium:
Hi, I'm Stapes, the TIIINNEEST wittle bone in your body, located in your middle ear!

Sound waves entering your ear canal vibrate the malleus, the incus then me!

And I STOMP ON THE OVAL WINDOW TO SEND THE SIGNAL TO THE INNER EAR!

I AM THE ALL POWERFUL STAPES!

STOMP STOMP

YOUR AUDIO PERCEPTIONS ARE AT MY MERCY!

tee hee!

©2026 The Awkward Yeti

theAwkwardYeti.com
Sense of Smell:

- **Olfactory receptors**: chemoreceptors; only work when chemicals are dissolved in a liquid (for stimulation). Smell & taste work together.

- **Olfactory organs**:
  - located in the nasal cavity
  - contain olfactory receptors
  - Contain bipolar neurons with cilia
• Gases enter the nasal cavity & are dissolved into watery fluids for the receptors to detect them.

• **Odorant molecules** are substances that trigger the sense of smell.

• Olfactory receptors adapt quickly.

• **Anosmia** is the partial or complete loss of smell

http://www.google.com/imgres
Sense of Taste:

- The **taste organs** are the **taste buds**.
- These are located on the tongue, roof of the mouth & pharynx.
- They have **papillae**, tiny elevations that contain the taste receptors; the cells that respond are **gustatory cells** (taste cells).
- These are chemoreceptors & detect chemicals when dissolved in liquids.
- This **fluid** is provided by the **salivary glands**.
• There are 4 types of taste cells:
  – Sweet, sour, salty, & bitter

• Some scientists recognize 3 other types:
  – Alkaline, metallic & umami (tasting MSG)

• These receptors adapt quickly.

• **Taste** is the [stimulating chemicals]

• **Flavor** is the taste, odor, texture (touch), & temperature.

*See site:
Know the following: Conjunctivitis (pg. 280), night blindness, colorblindness (pg. 285), cataracts, glaucoma (pg. 287), myopia, hyperopia, astigmatism (pg. 290-291), deafness, otosclerosis (pg. 298), Meniere’s syndrome, vertigo (pg. 299), olfactory auras (pg. 301), strabismus, and presbyopia (pg. 303).

Read Summary, pgs. 304-306.

Review, pgs. 306-307, #1, 5, 11, 12, 13, 16, 17, 21, 26, 30, & 31. E.C. #37 & 44