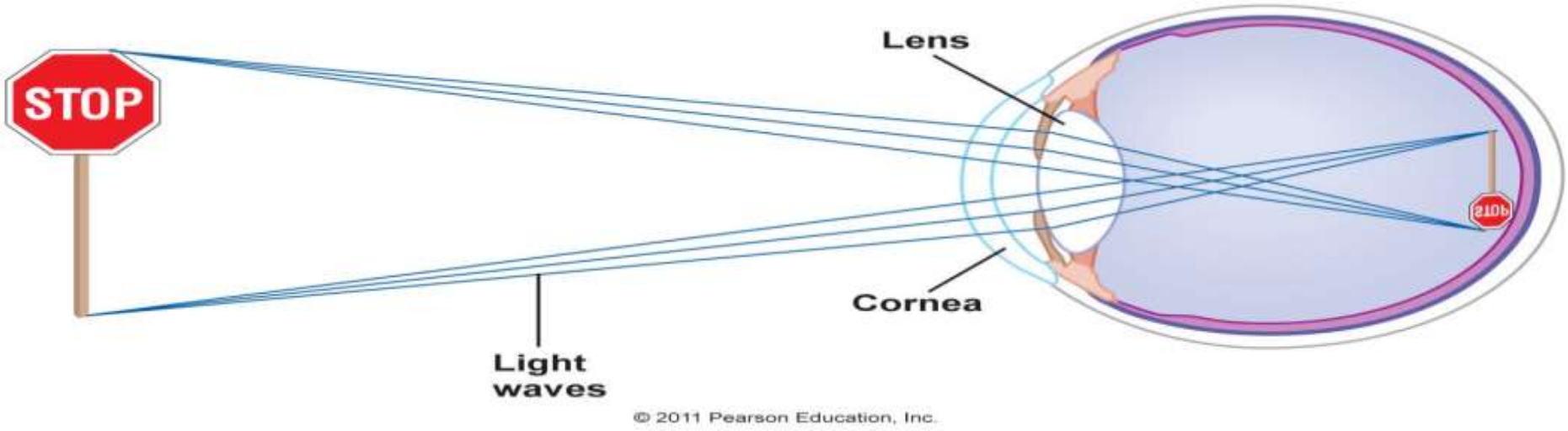
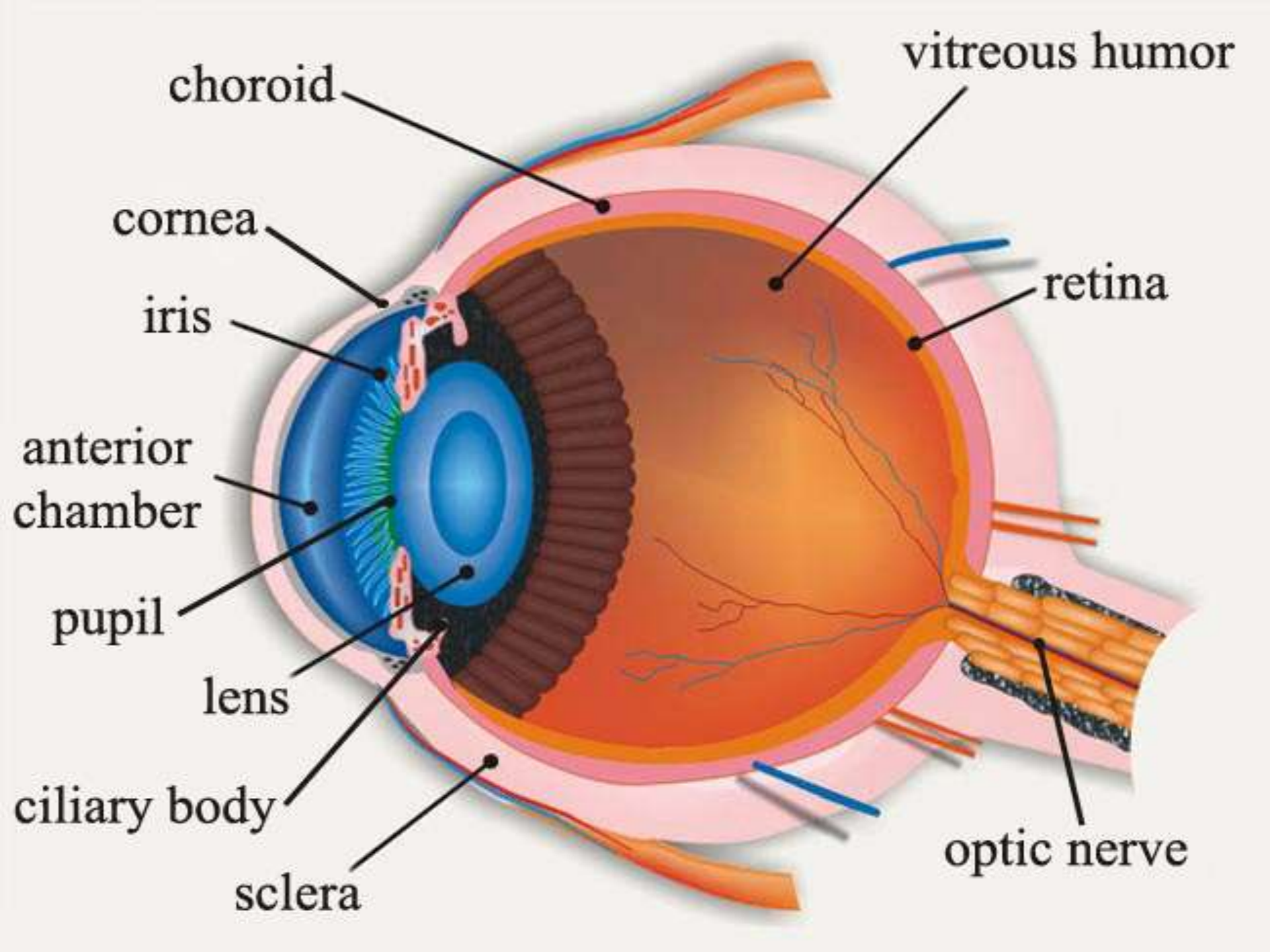
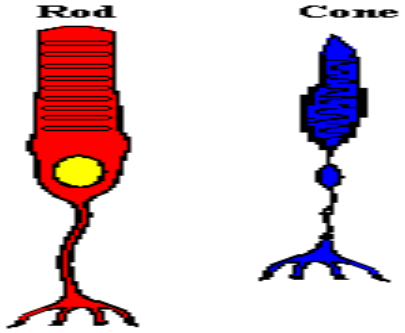
SENSE ORGANS: The EYE



- Light shines on an object. Some colours in the light are absorbed by the object, some are reflected from it.
- This reflected light is taken in by your eye.
- The (lens) structures in the eye bend this light, to focus onto the transparent retina.
- The picture that forms is sent (*upside-down!*)to your brain, which interprets it properly for you.


choroid
vitreous humor
cornea
retina
iris
anterior chamber
pupil
lens
ciliary body
sclera
optic nerve

- **Two eyes** (biNocular) allow for 3-dimensional vision.
- The **Iris** controls the size of the hole (pupil).
- Eyeball is **white** on the outside – no light can come in.
- The inside is **black** – absorbs all light that did come in.
- Light coming in through the **pupil** is bent by the **lens** onto the **retina**.
- **Cone cells** pick up colour (in bright light).
- **Rod cells** pick up shapes (in dimmer light).



- The **Fovea** has cone cells only, for clearest vision.
- The **Blind Spot** has no cone cells or rod cells. It is where the optic nerve connects.
- The **Optic Nerve** takes the picture from retina to brain.

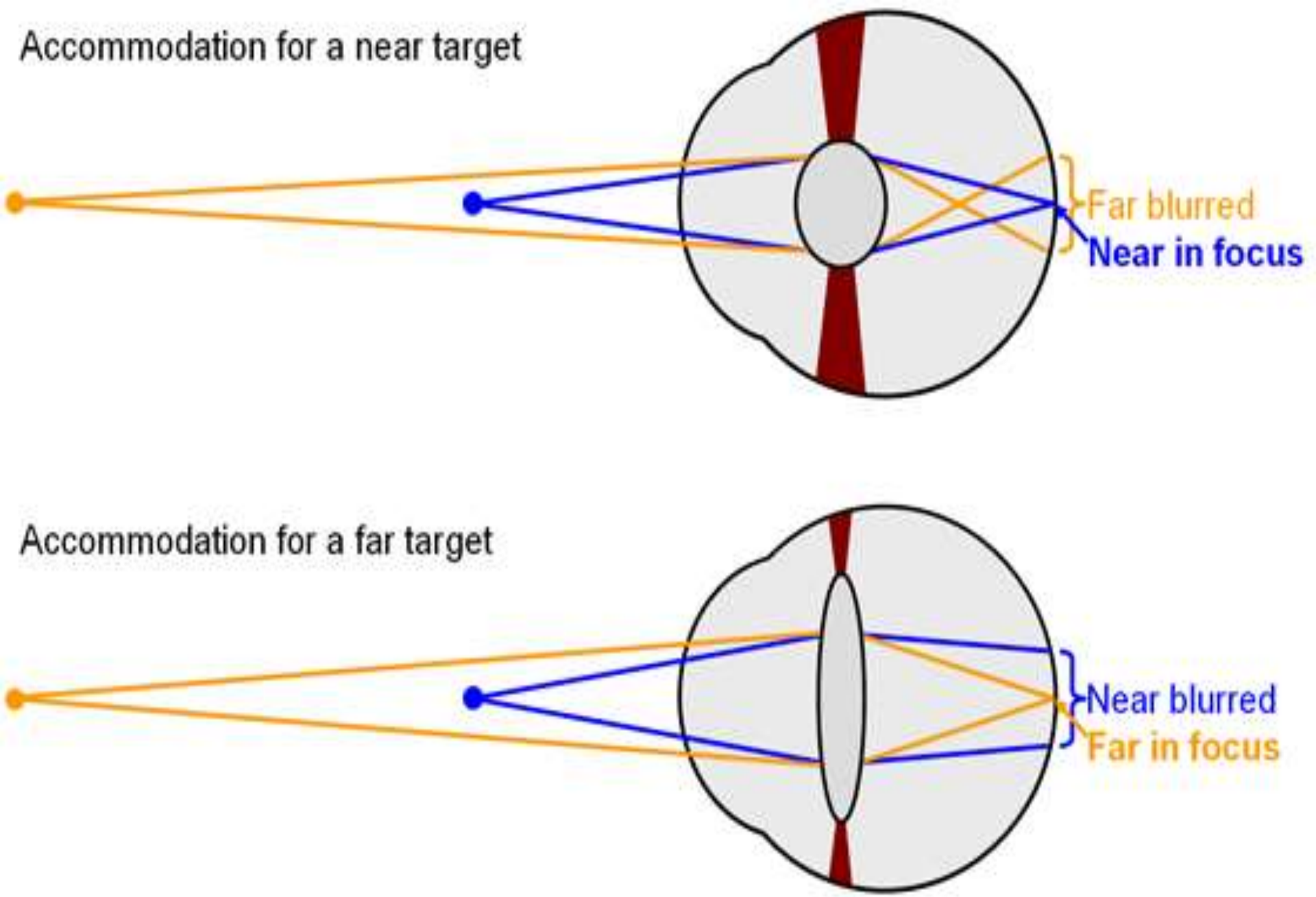
ACCOMMODATION (of LENS) for DISTANCE

OBJECT is FAR AWAY

- Light does not need to be bent too much.
- **Ciliary Muscles** relax.
- **Ciliary Bodies** move away from lens.
- These attached to lens by suspensory ligaments.
- Lens pulled into **flat** shape.
- Light is bent just enough for good focus.

OBJECT is CLOSE

- Light needs to be bent a lot to fit into small eyeball.
- **Ciliary Muscles** contract.
- **Ciliary Bodies** pulled towards lens.
- These attached to lens by suspensory ligaments.
- Lens squashed: **fat** shape.
- Light is bent a lot to allow for good focus.



ACCOMMODATION for *DISTANCE*

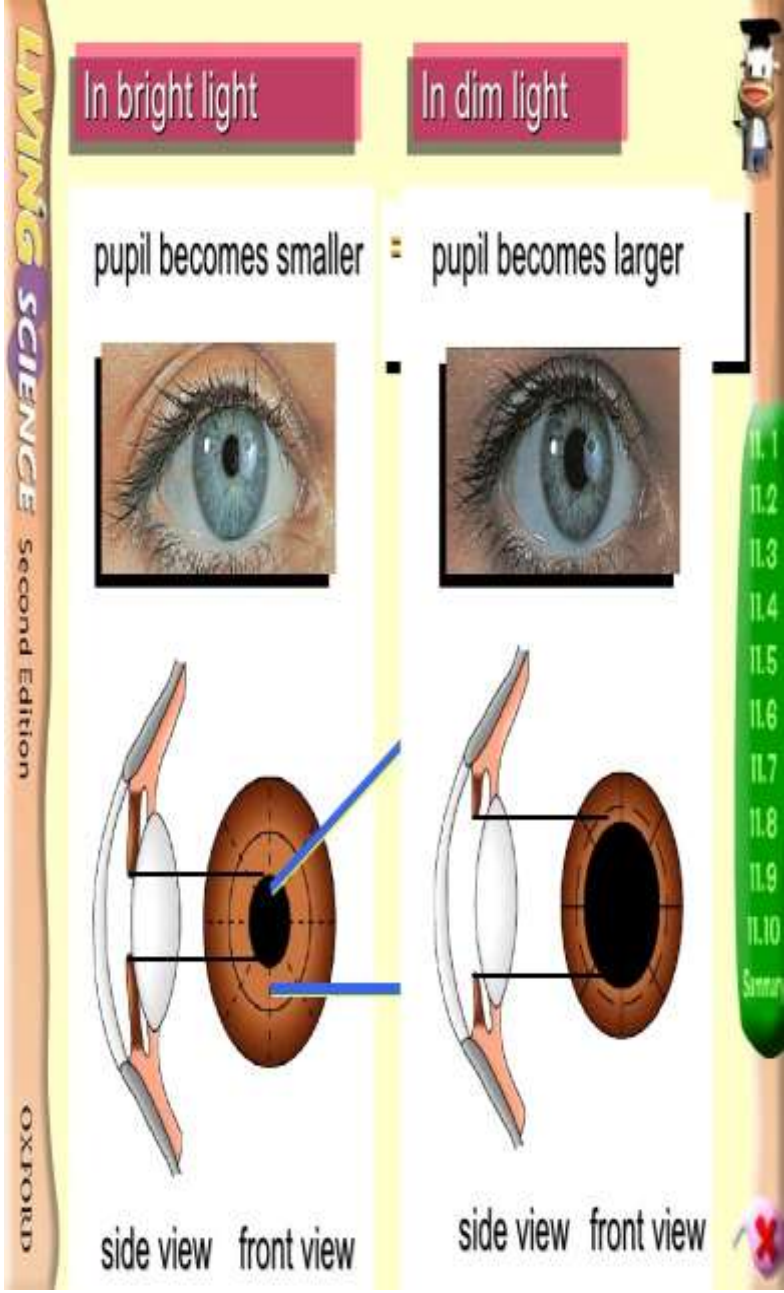
*PUPIL*lary MECHANISM

In BRIGHTER LIGHT

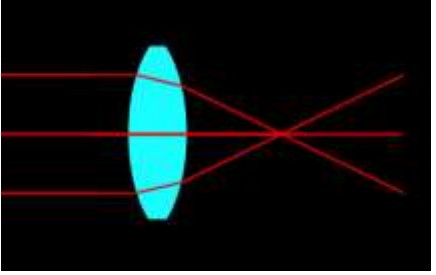
- Too much light causes over-exposure in the eye.
- Pupil needs to get smaller.
- Radial muscles of Iris relax.
- **Circular muscles** contract.
- Iris is pulled closer.
- *Pupil*lary hole gets smaller.
- Less light can come in.

In DARKER LIGHT

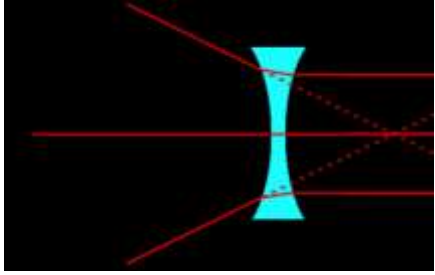
- More light needs to come in to pick out the picture.
- Pupil needs to get bigger.
- Iris' circular muscles relax.
- **Radial muscles** contract.
- Iris is pulled outwards.
- *Pupil*lary hole gets bigger.
- More light can come in.



PUPILLARY MECHANISM for *DARKNESS*

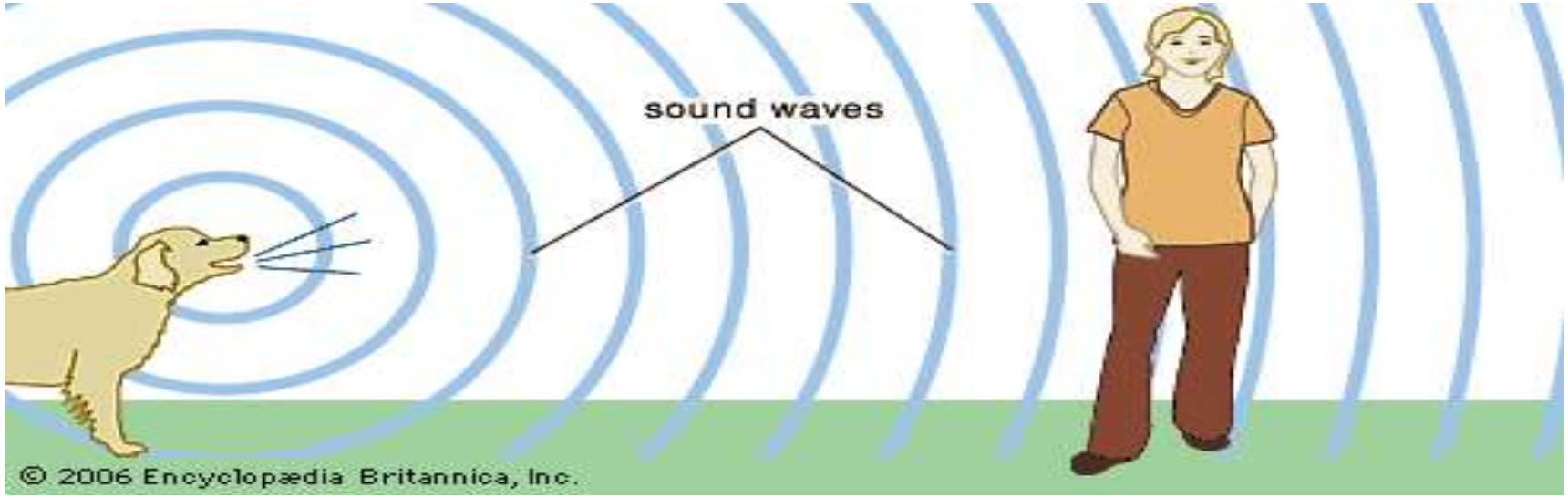


PROBLEMS of VISION

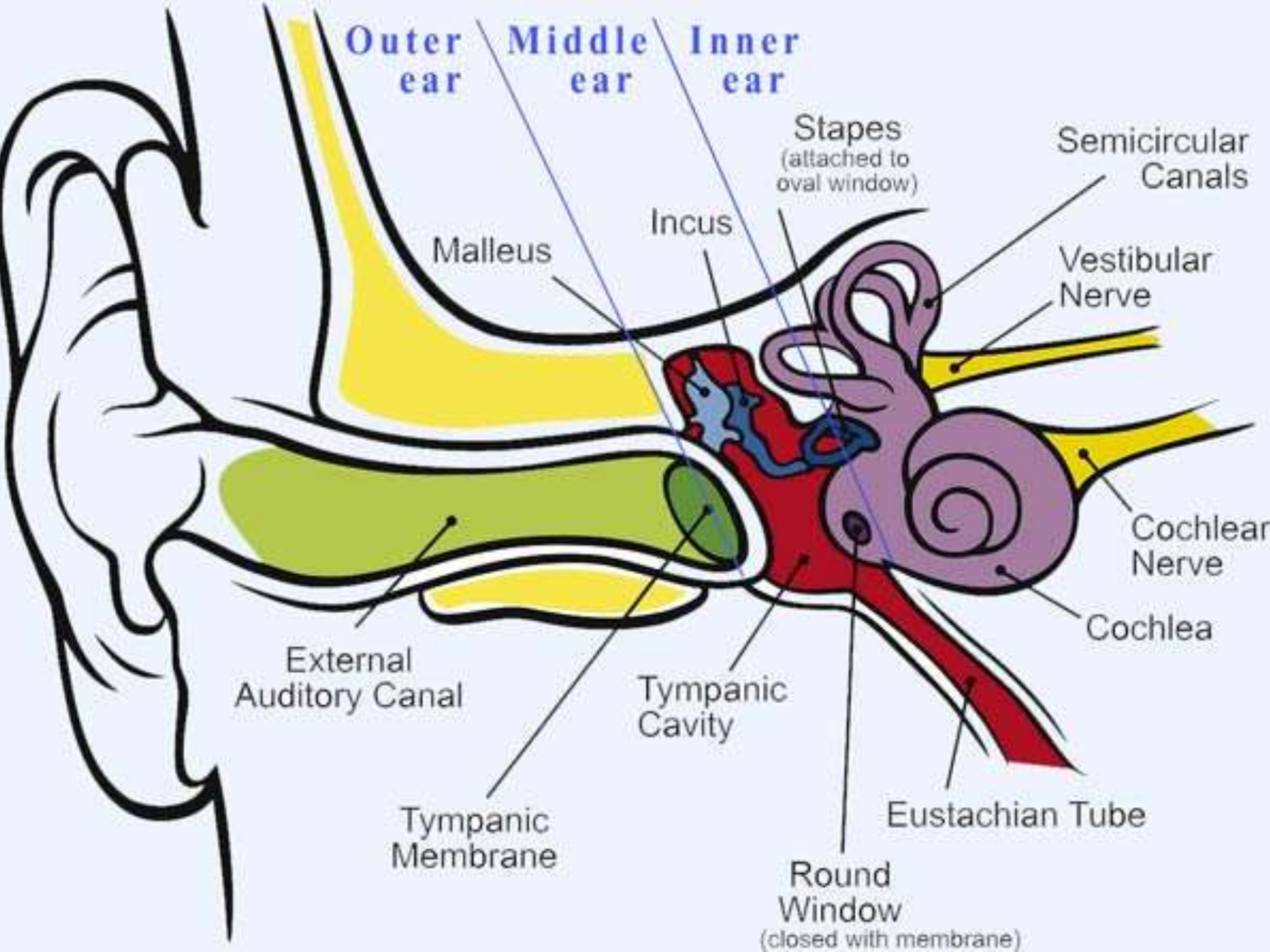


1. **Far-Sightedness** – you can see things far away. But cannot accommodate the lens to see closer things. Solution: glasses with **the same shaped** (convex) lens to bend the light properly for focus in the eye.
2. **Short-Sightedness** – can see things close up, but cannot flatten lens enough to see far-away things. Solution: glasses with **opposite shaped** (concave) lens to spread light out before it comes into the eye.
3. **Astigmatism** – uneven lens surface = partial focus.
4. **Cataracts** – lens loses its turgidity (tightness). It can be replaced by an artificial lens.

SENSE ORGANS: The EAR



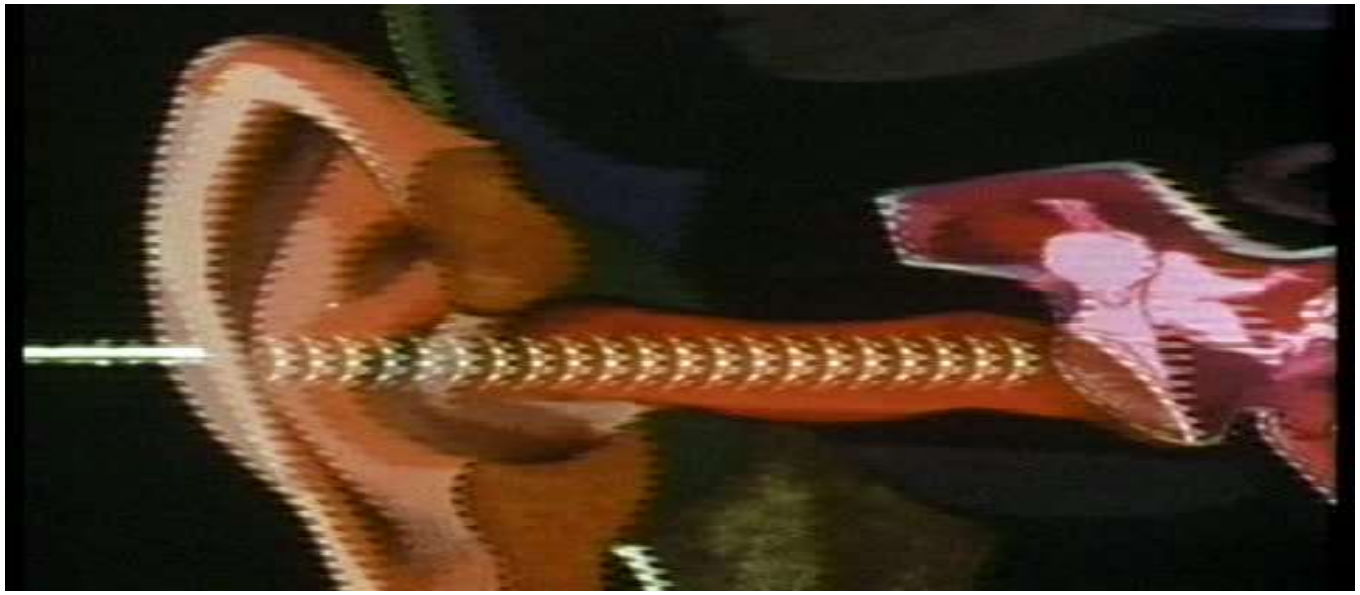
- Sound is created by vibrations.
- These vibrations are conducted through the medium (air, water, solids).
- When they reach your ear, these sounds cause your eardrums to vibrate in the same way.
- Your ear has 3 sections: Outer, Middle, Inner.
- This vibration passes through to your brain, which interprets the sound.


Outer ear
Middle ear
Inner ear
Stapes
(attached to oval window)
Semicircular Canals
Incus
Malleus
Vestibular Nerve
Cochlear Nerve
Cochlea
External Auditory Canal
Tympanic Cavity
Tympanic Membrane
Round Window
(closed with membrane)
Eustachian Tube

HEARING

- The **Pinna** catches the sound's vibrations, and sends it down the **Auditory Canal** to vibrate the **Tympanic Membrane**.
- This vibration sent through 3 bony **Ossicles** (called **Malleus**, **Incus**, **Stapes**) – in air attached to **Eustachian Tube** - and vibrates the membrane called the **Oval Window**.
- Vibration now goes through fluids in **Cochlea**, past **Organs of Corti**, absorbed by membrane called **Round Window**. *Organs of Corti* send message via **Auditory Nerve** to Brain's **Cerebrum**.

IMPORTANT POINTS



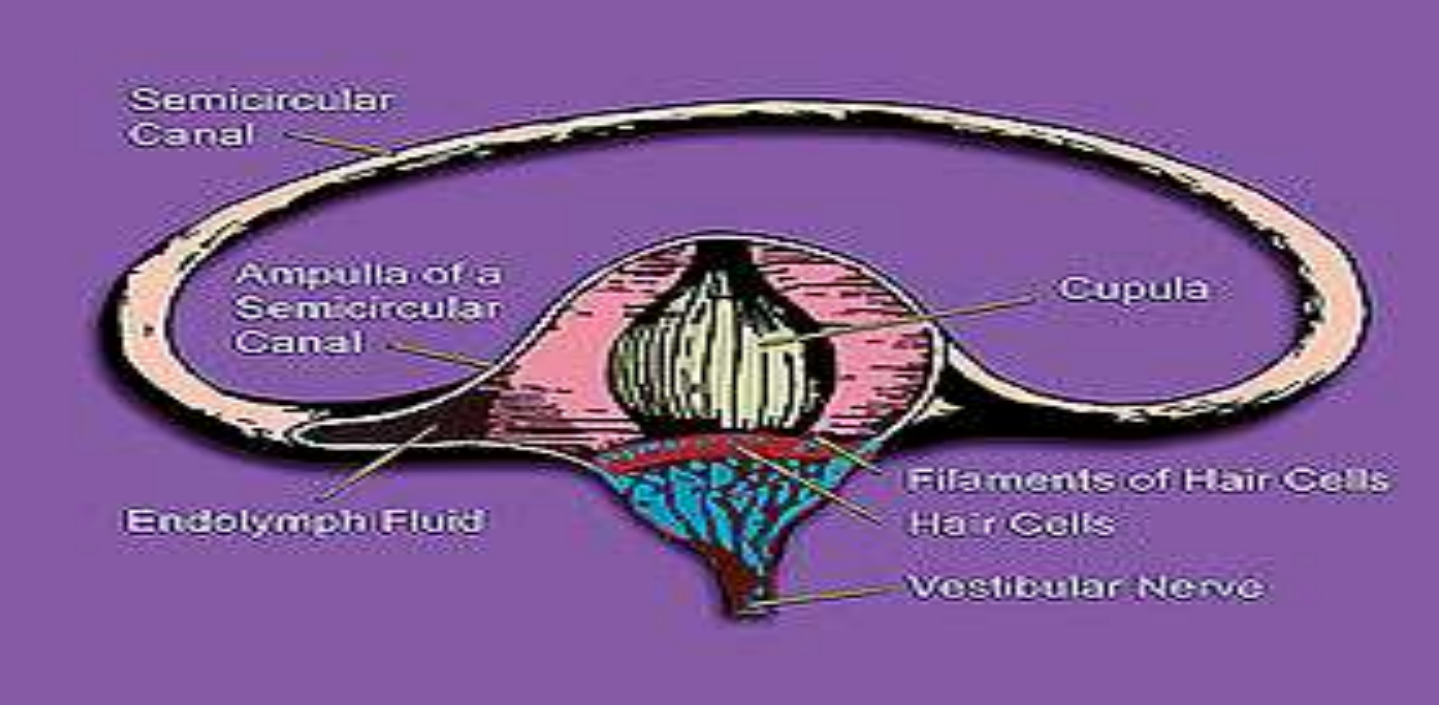
- **Pinna** is made of cartilage.
- **Auditory Canal** protects Tympanic Membrane.
- **EarDrum** has air on both sides = equal pressure, so it can vibrate freely.
- Sound travels best through solids, so **bones** amplify it.
- **Round Window** is at **Eustachian Tube** – air helps absorb any vibrations to stop it from travelling back.

PROBLEMS of HEARING

1. **Middle Ear Infection** – germs come in air of Eustachian Tube. Body releases fluids to flush them. Causes Ear-Ache. (Note: *Grommets*.)
2. **Deafness** – they are **DEAF** – ***NOT*** stupid!!! Could be from damage in any of the ear's **Three Sections**, or in the **Auditory Nerve**, or in that part of the **Brain**.

- **Treatment** –Sign Language.

  - Hearing Aids.



BALANCE

- Attached to the Cochlea are the **Semi-Circular Canals.**
- There are **three** Canals – one for each dimension: **Horizontal**. ***Left and Right***. **Front and Back**.
- If you are too far forward, **that** Canal is stretched too far to the front. It tells the brain. The brain tells your body to move back a little.
- These messages are sent by all three canals to your brain all the time. Result: a balanced body.