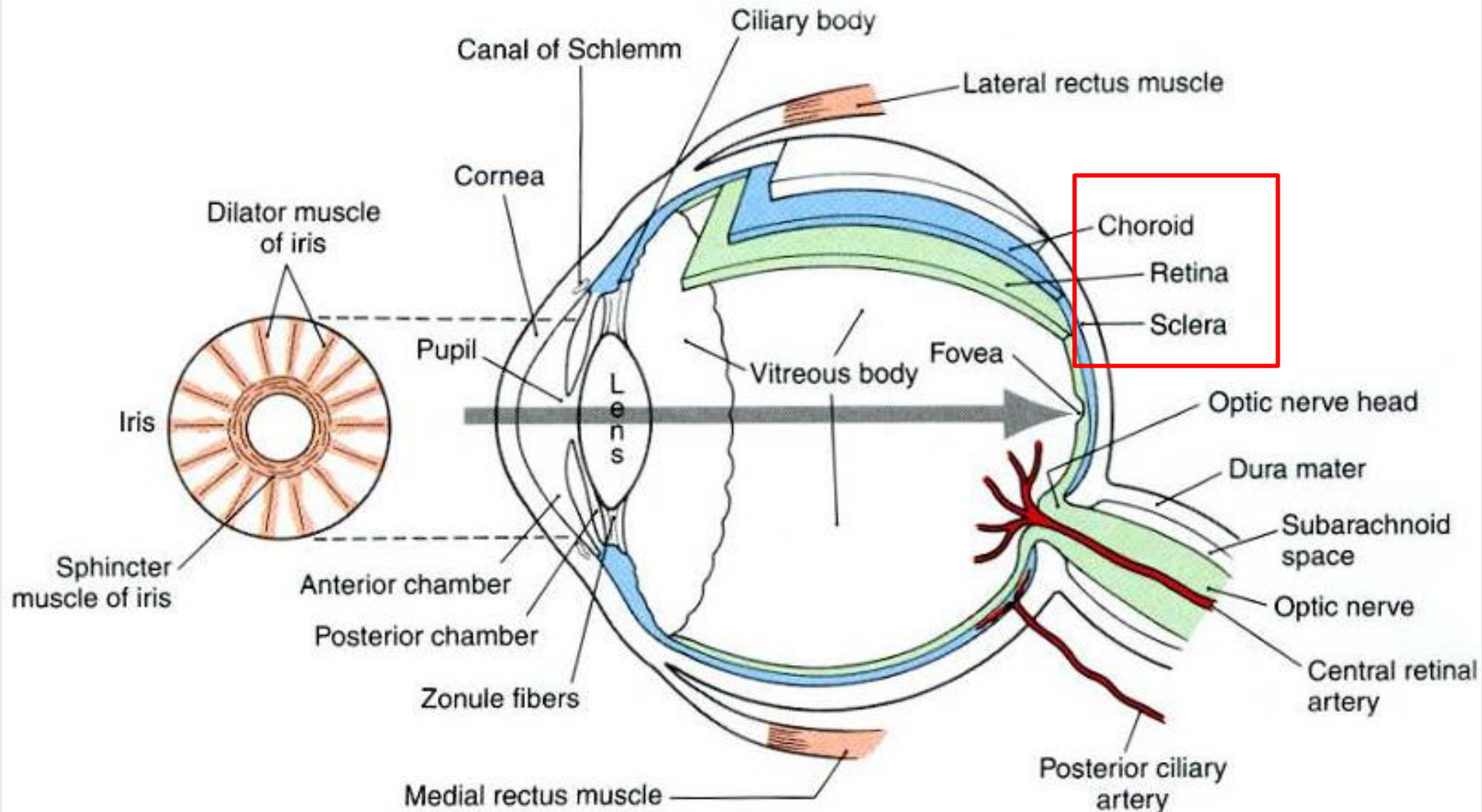
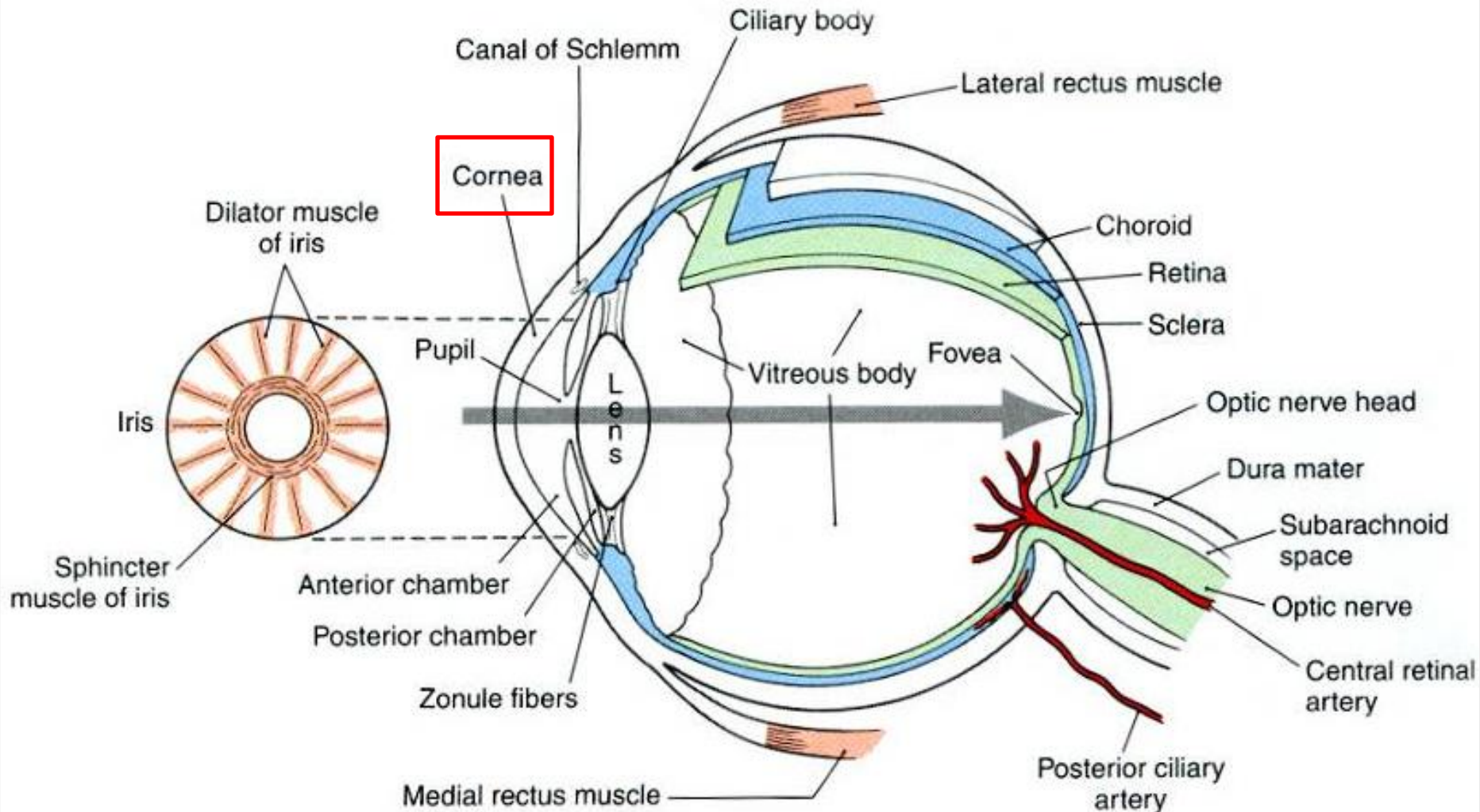


# The Visual System

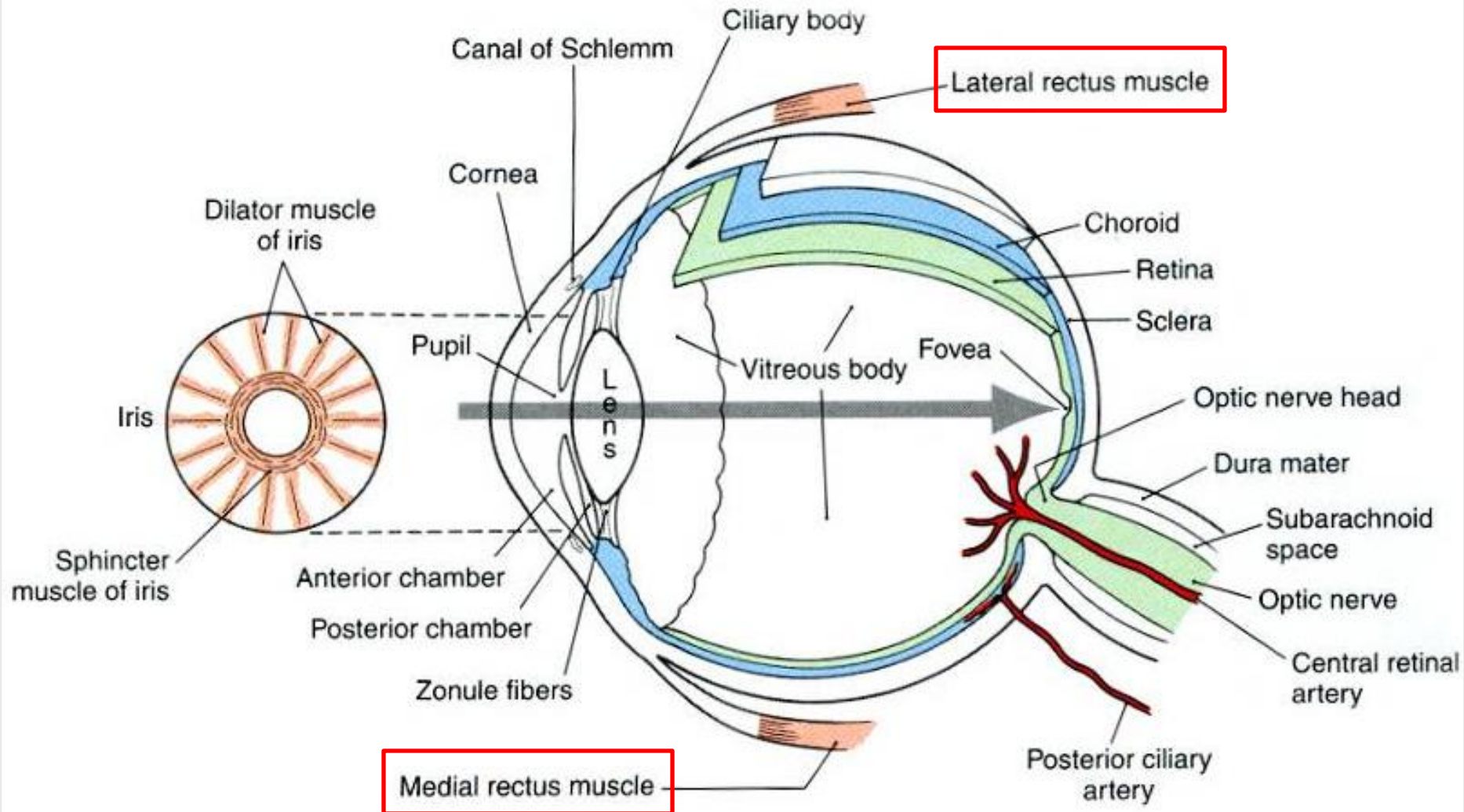
# Anatomy of the eye



# Anatomy of the eye

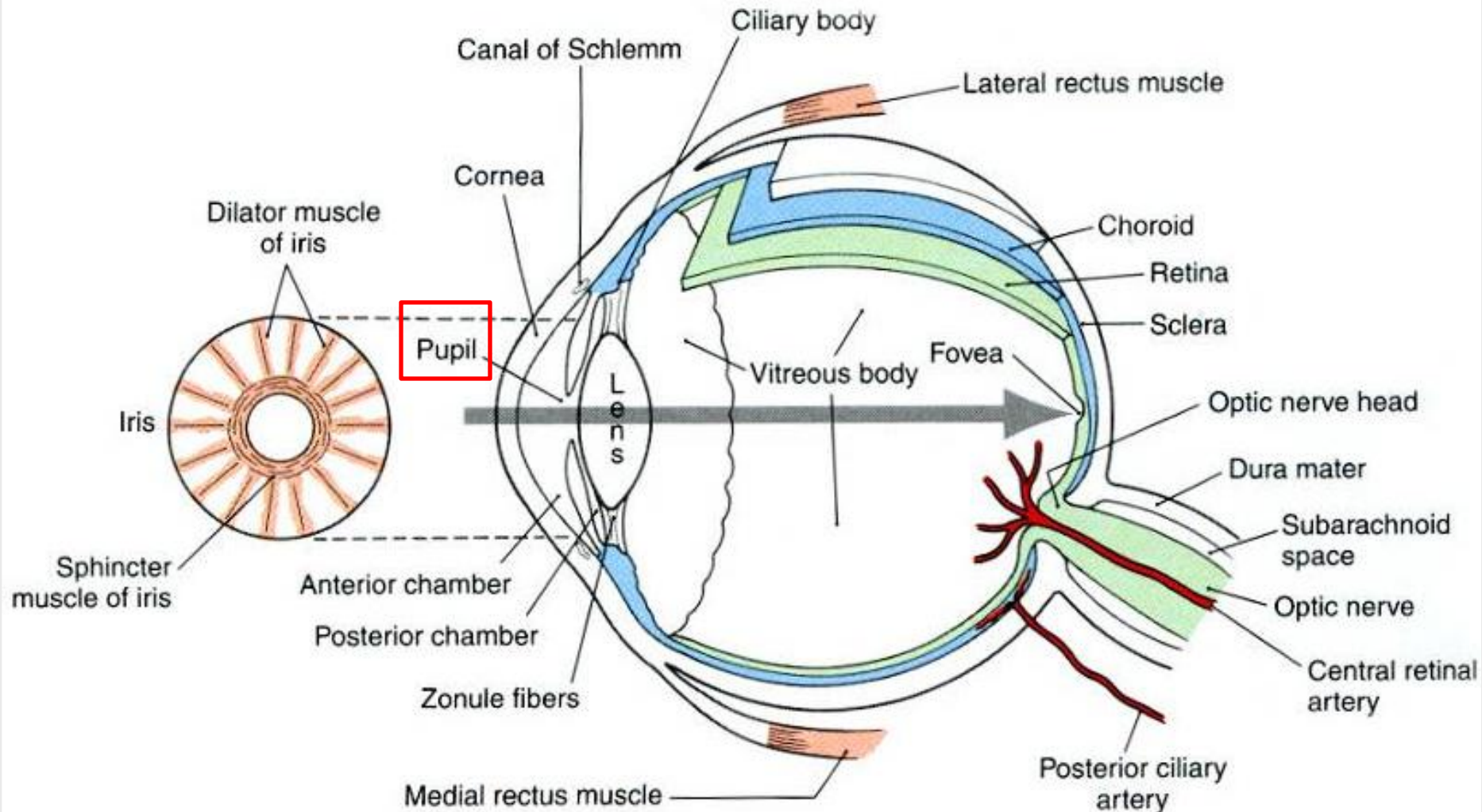


# Anatomy of the eye

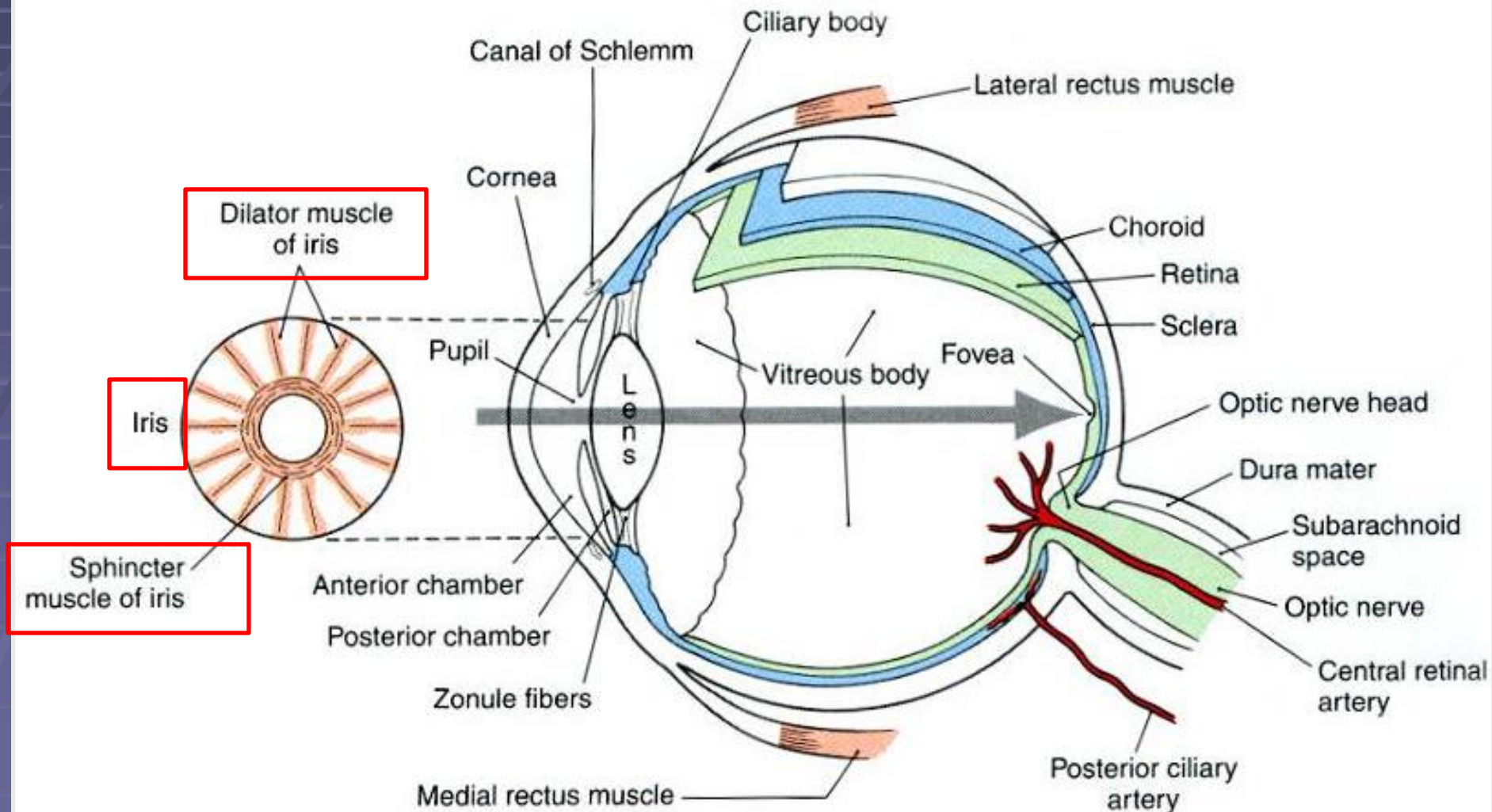




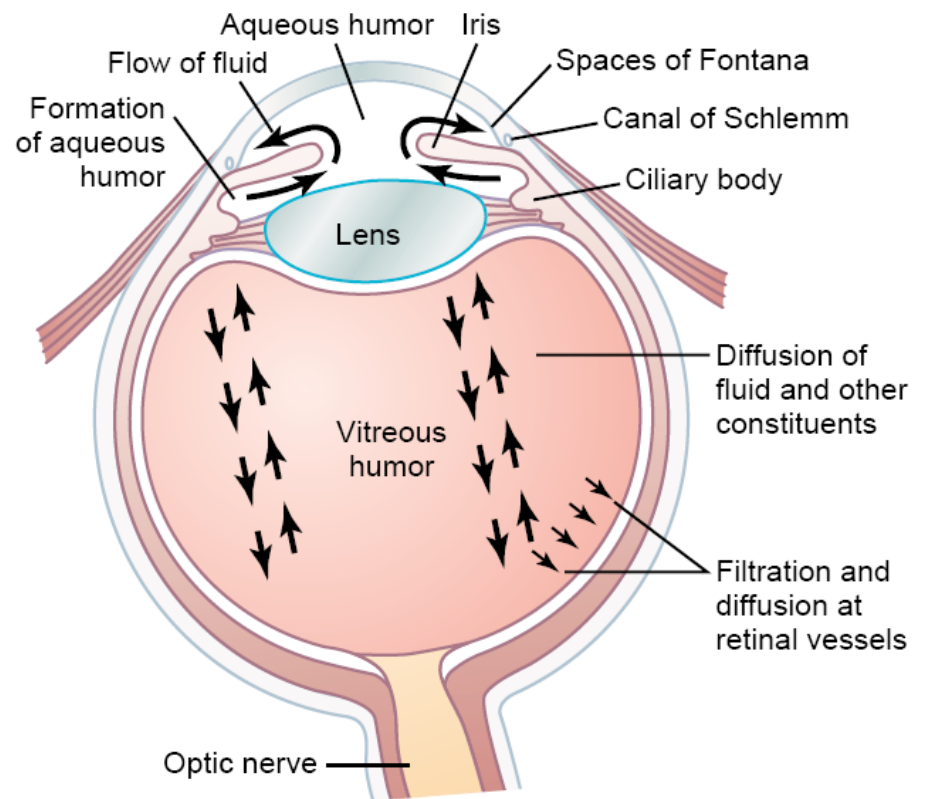
# Anatomy of the eye



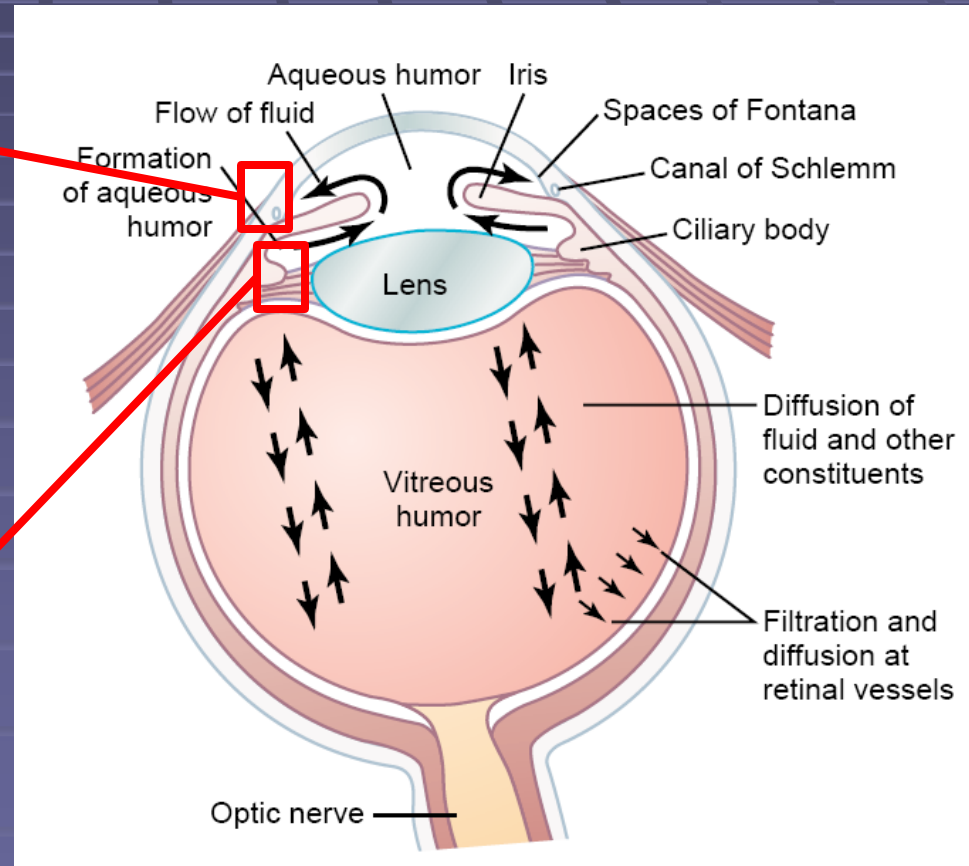
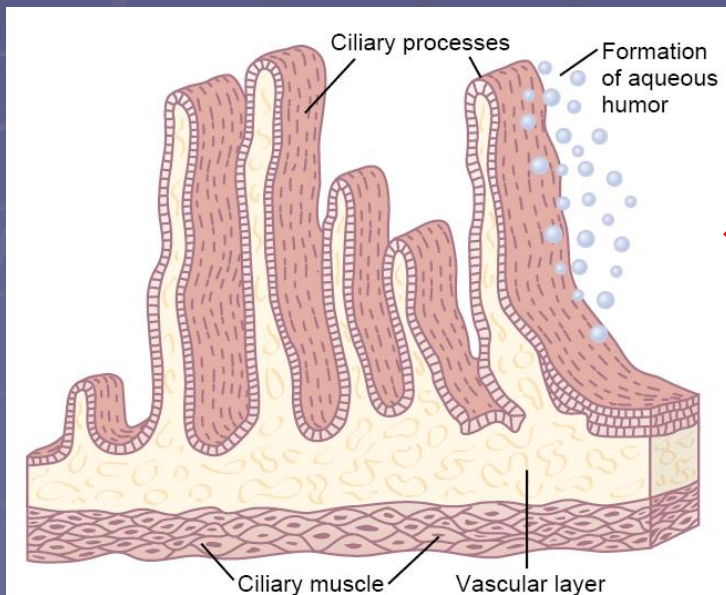
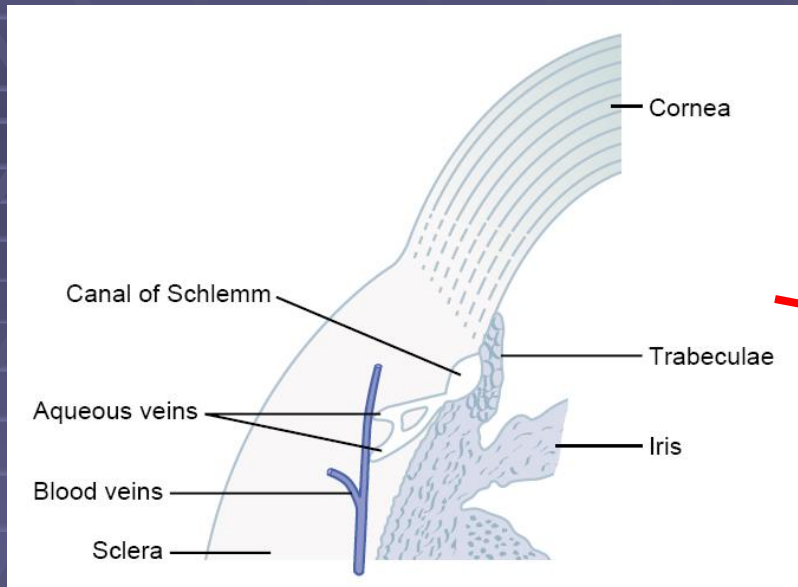
# Anatomy of the eye



# Intraocular Fluid

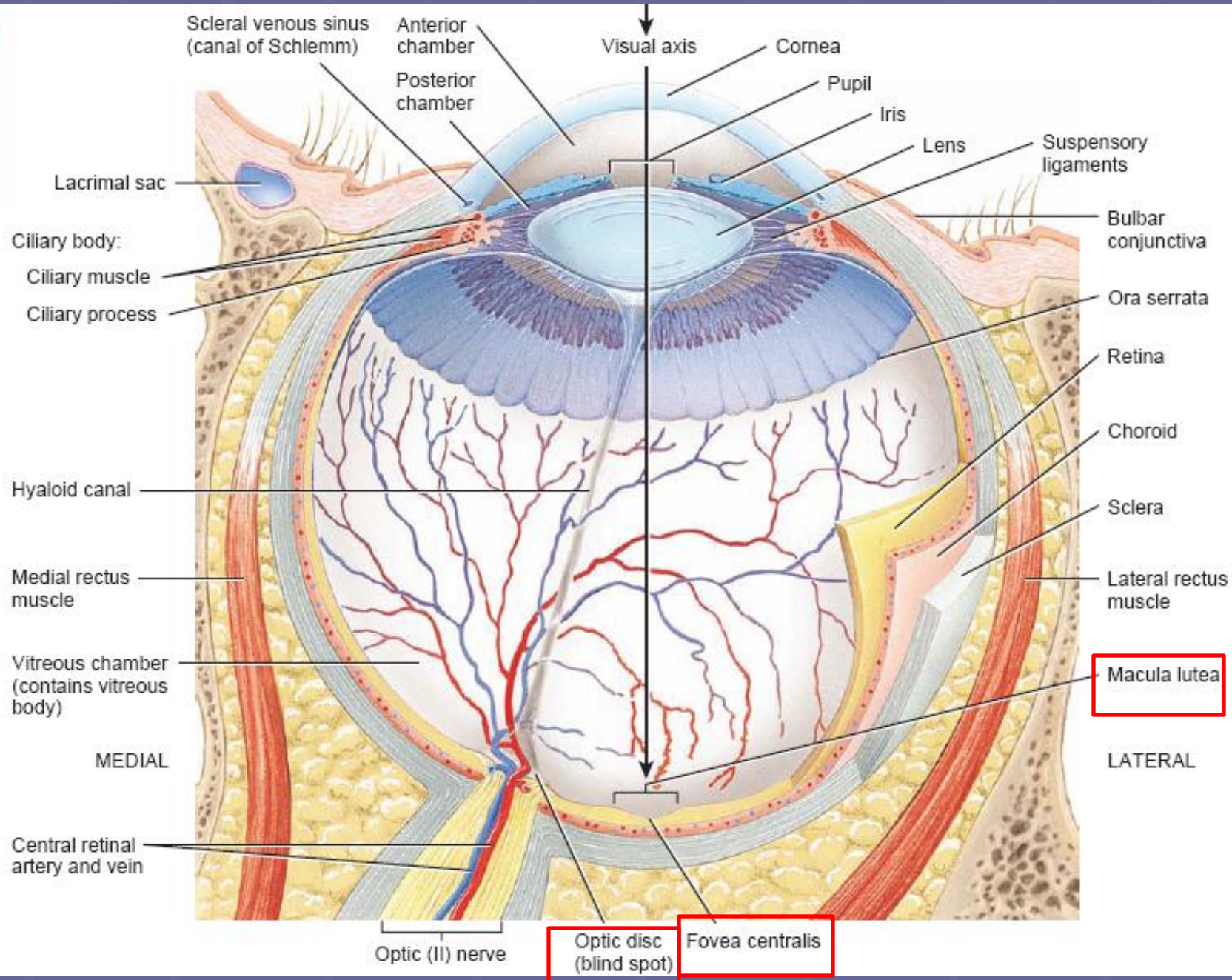


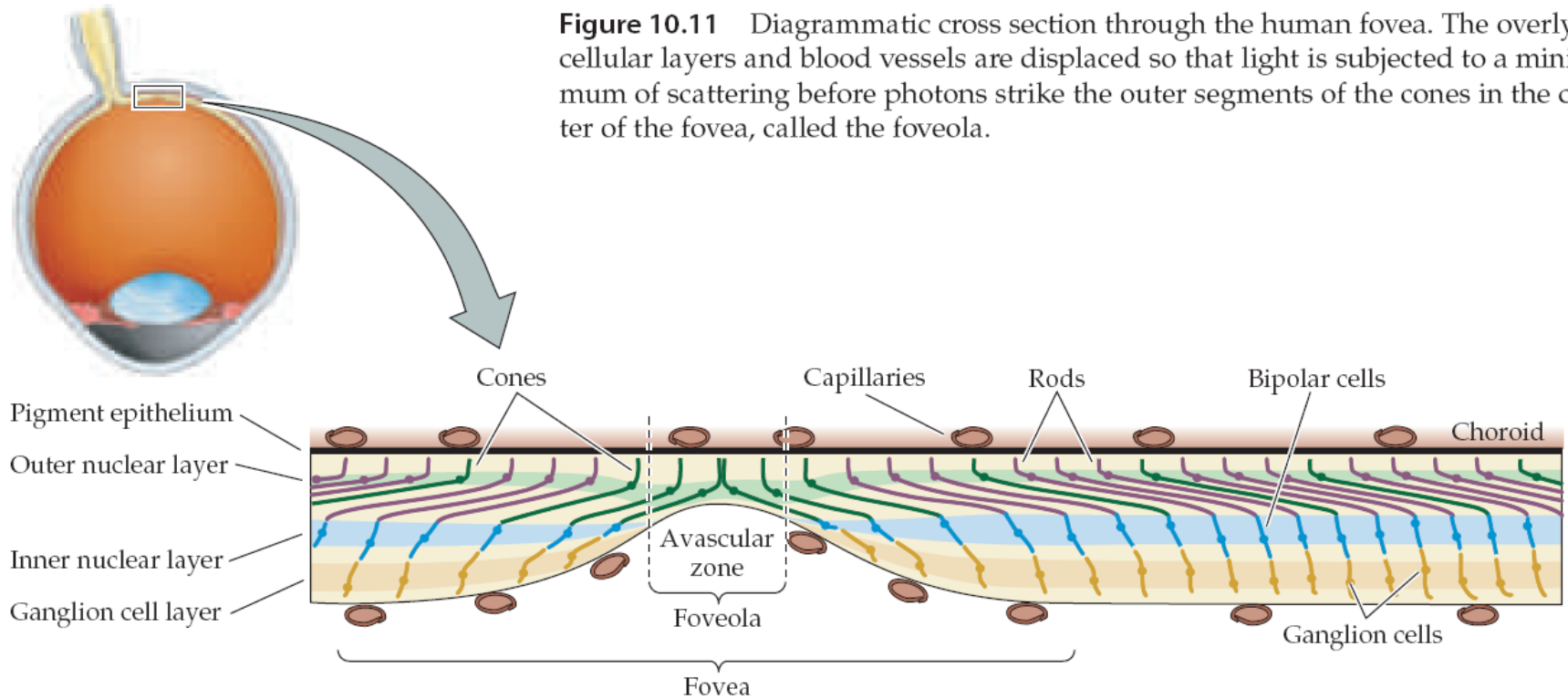
# Intraocular Fluid

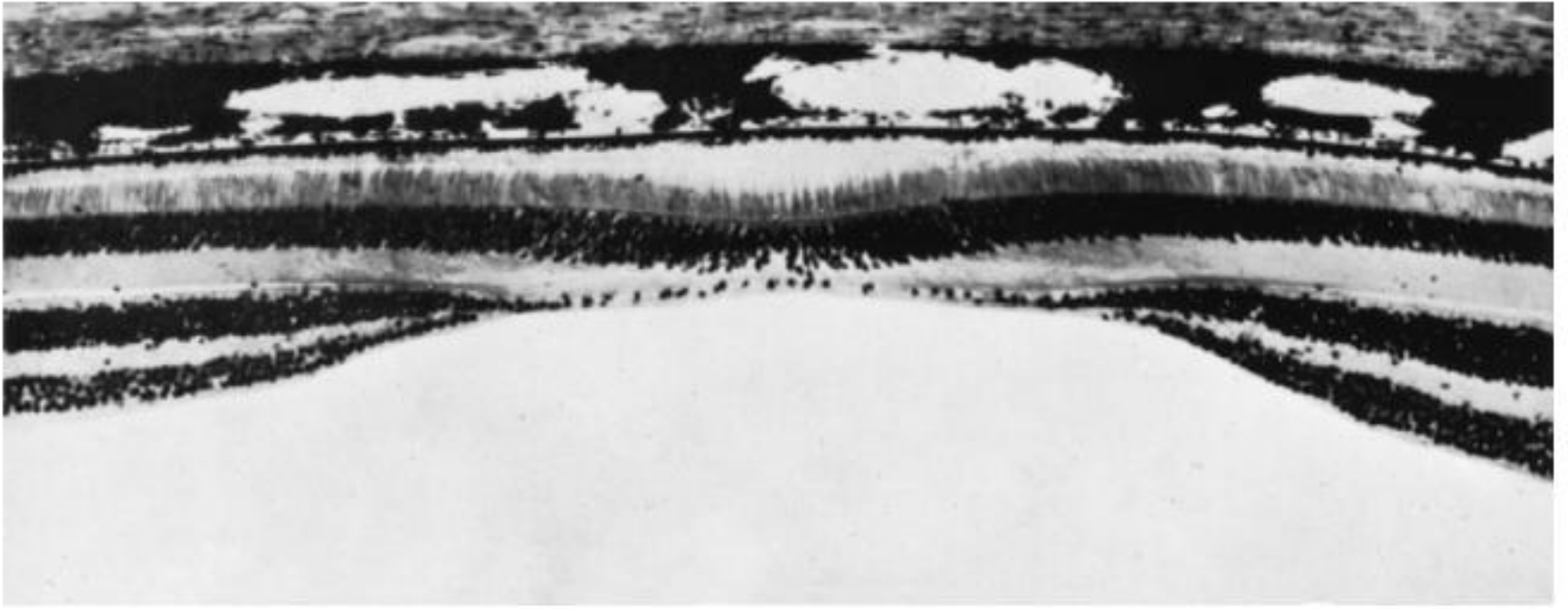


## Glaucoma









- **Macular Degeneration**
- **age-related macular degeneration**
- **juvenile macular degeneration**
  - “Stargardt disease”



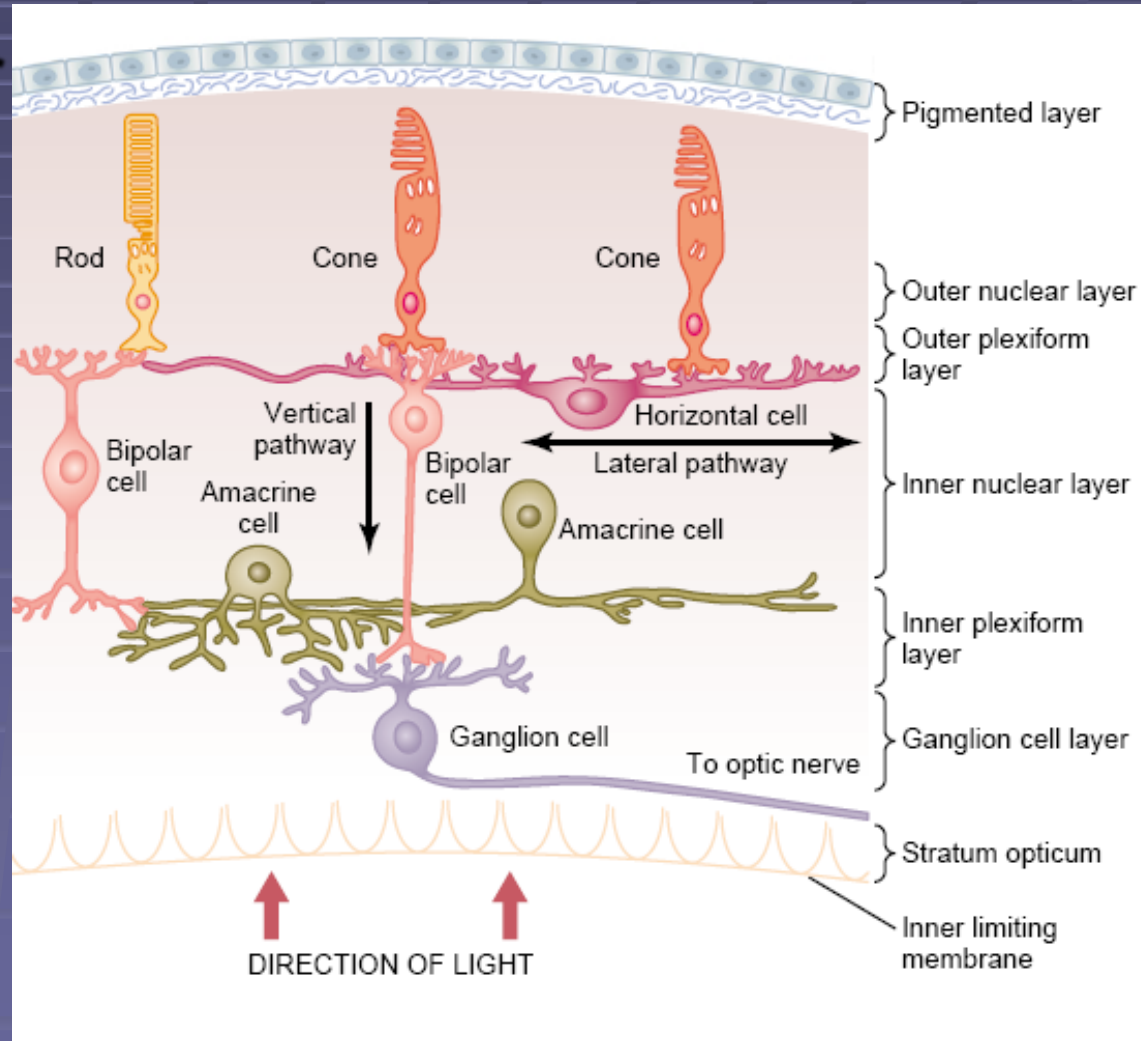






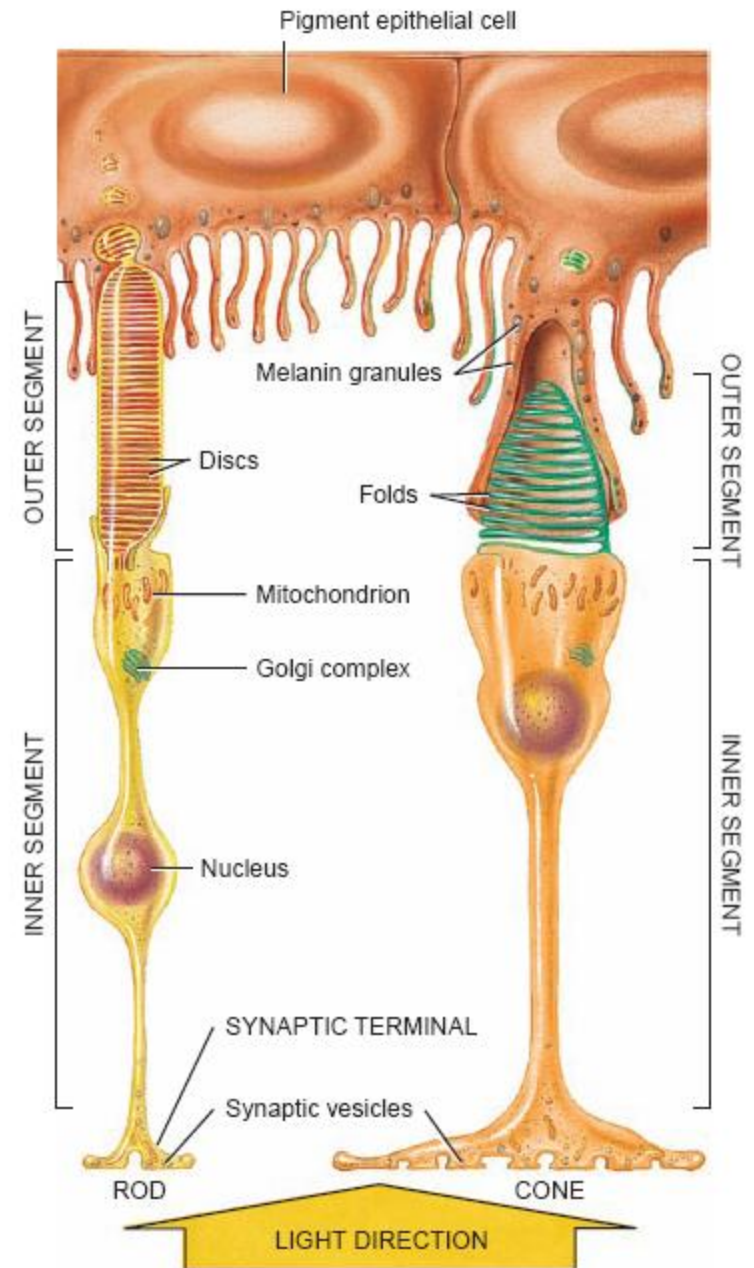
# Retina

- Pigmented layer
- Photoreceptors
- Bipolar cells
- Ganglion cells
- Horizontal cell
- Amacrine cell



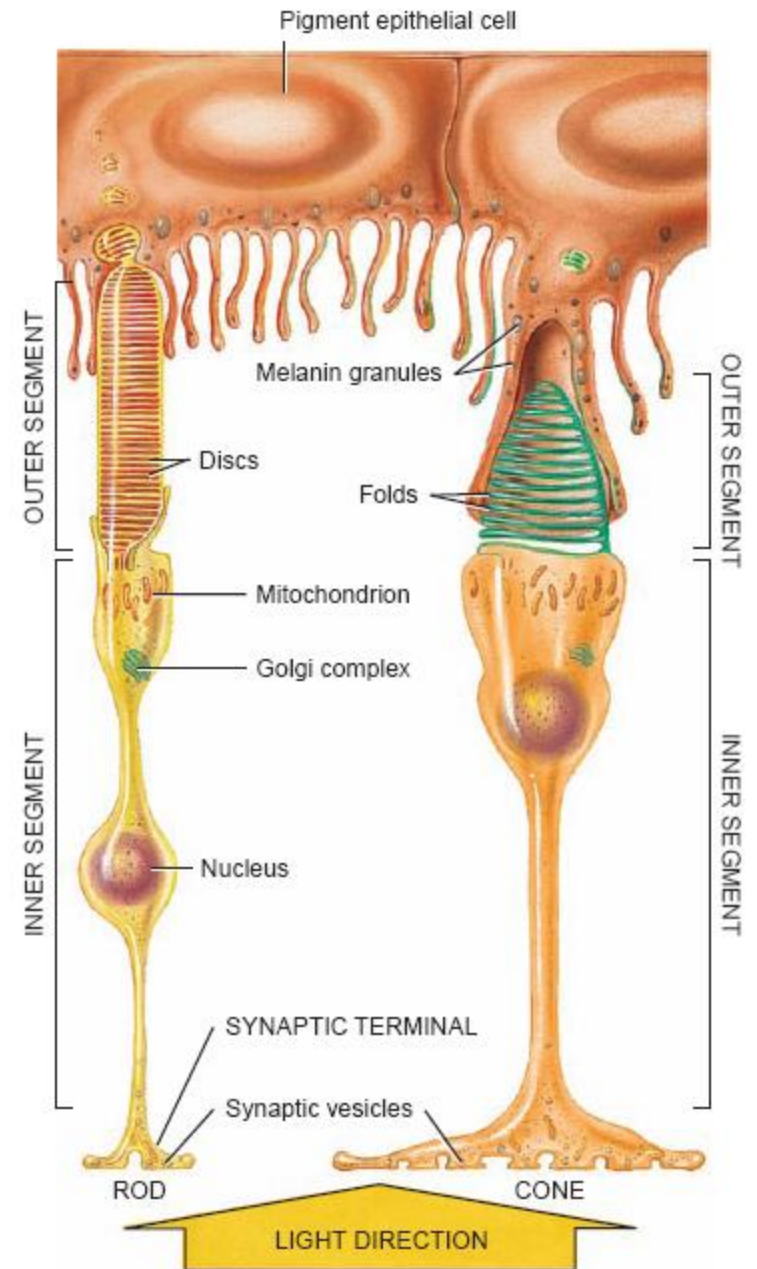
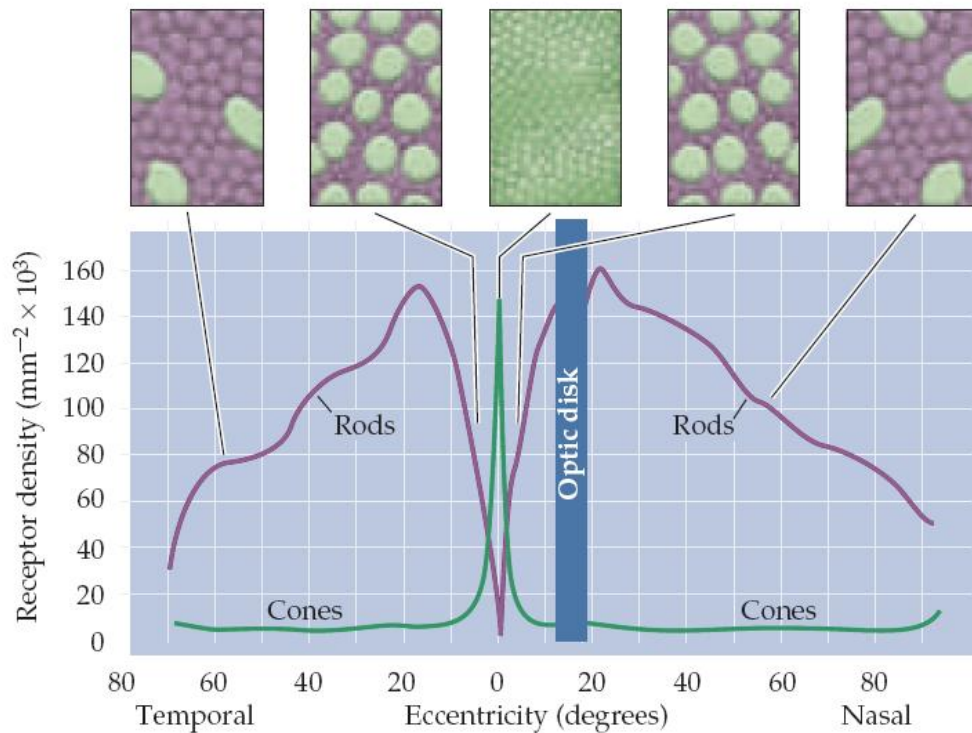
# Photoreceptors

- Cones
- Rods



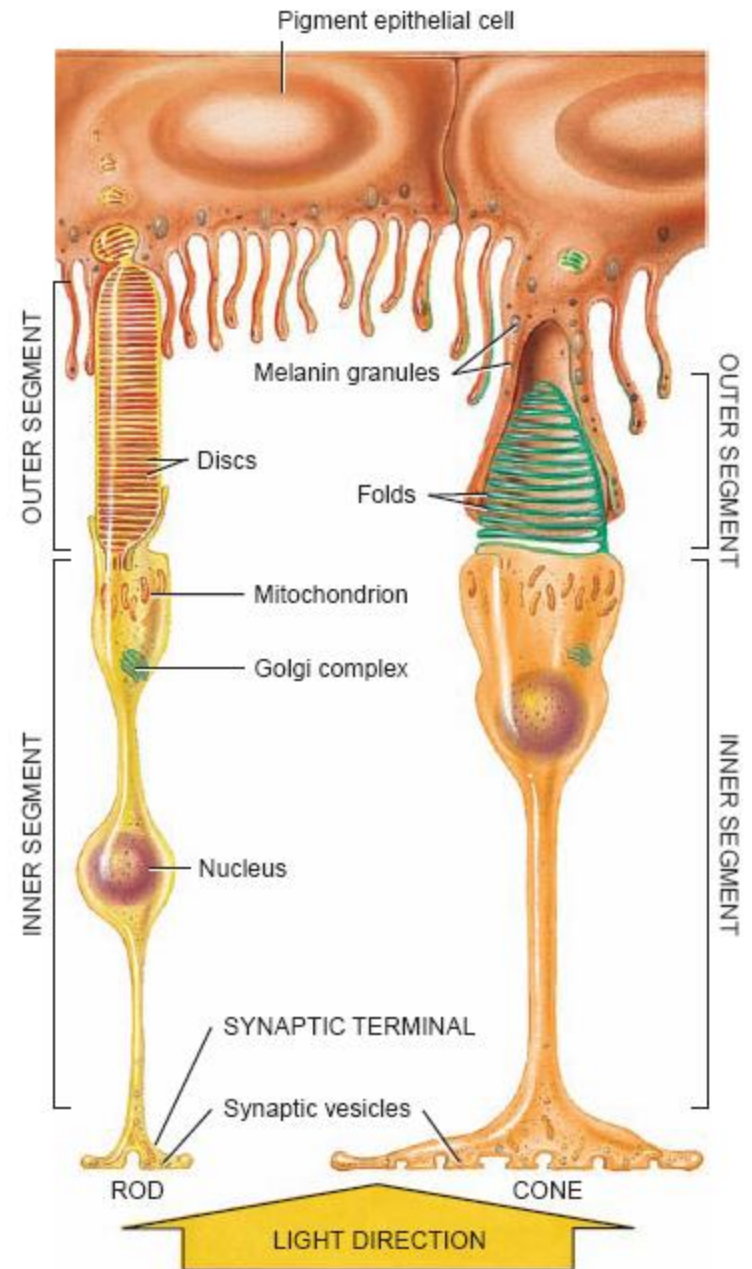
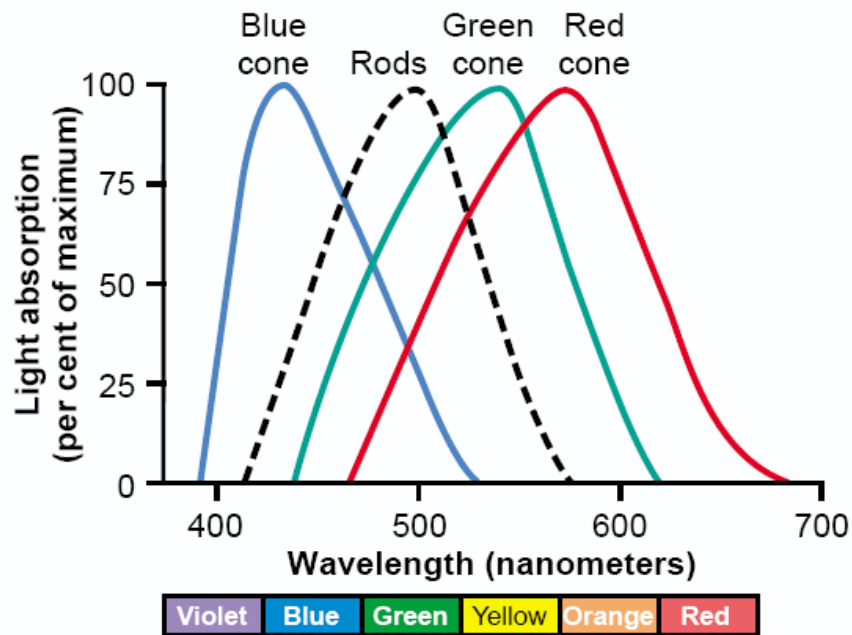


# Photoreceptors

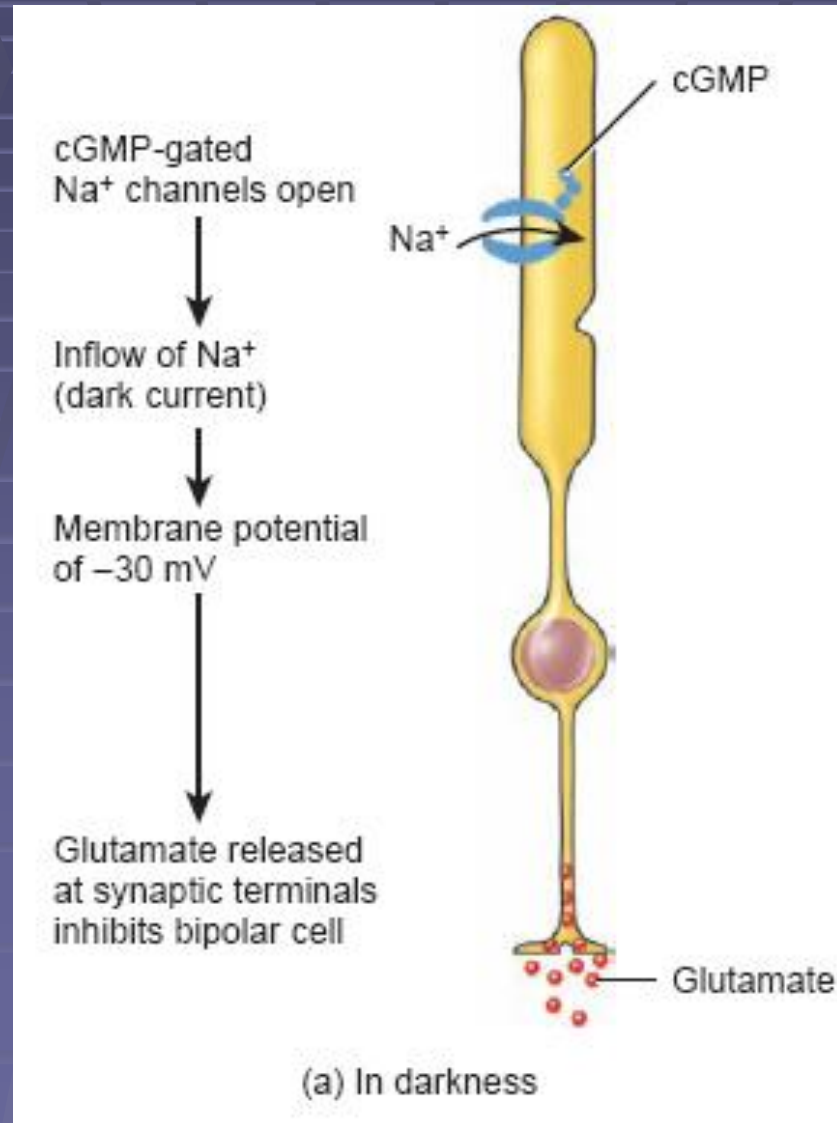




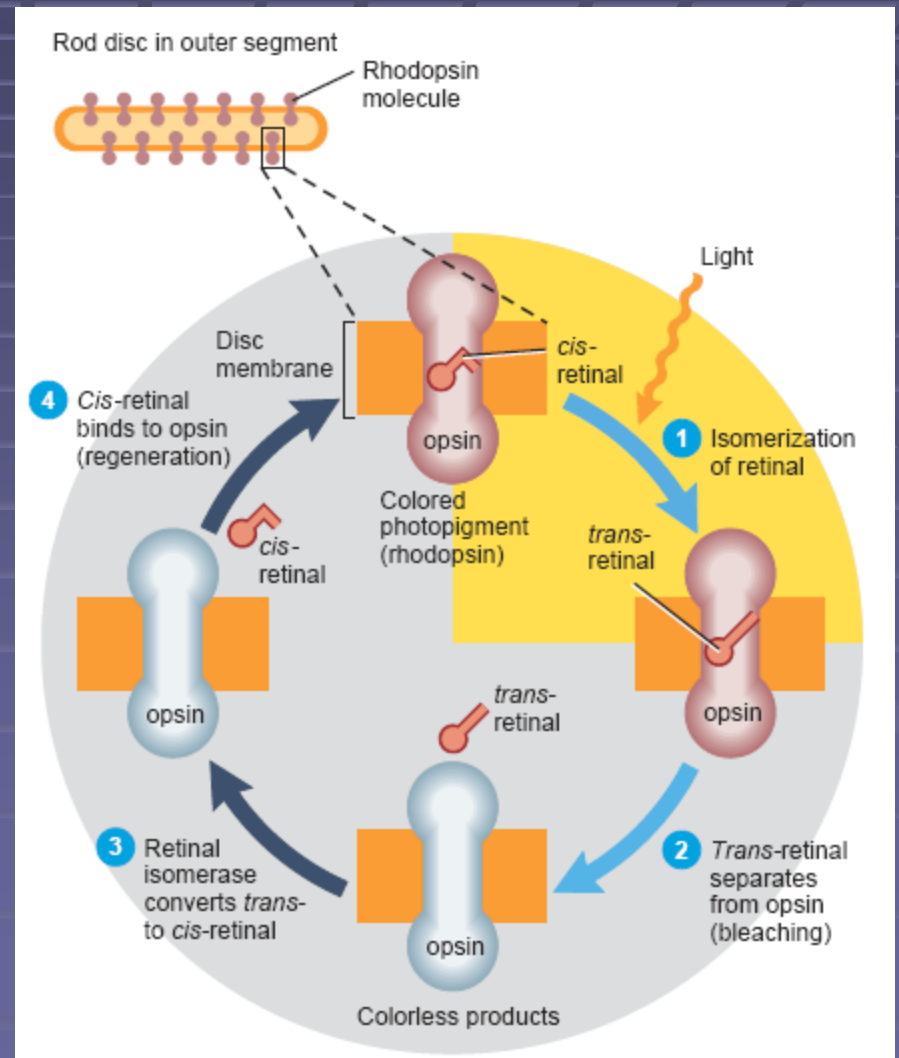
# Photoreceptors



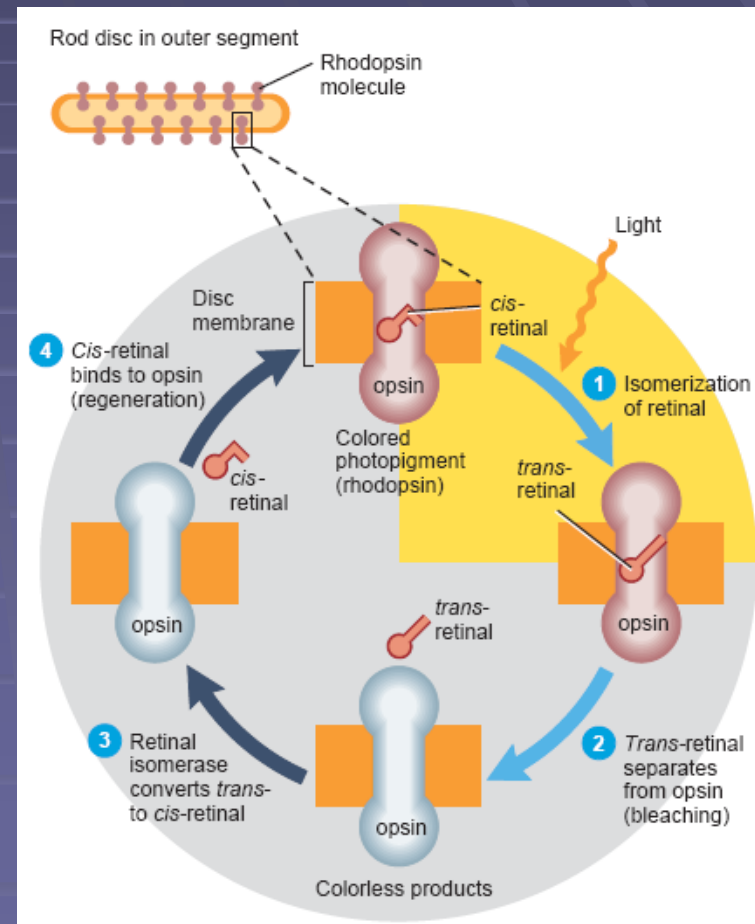
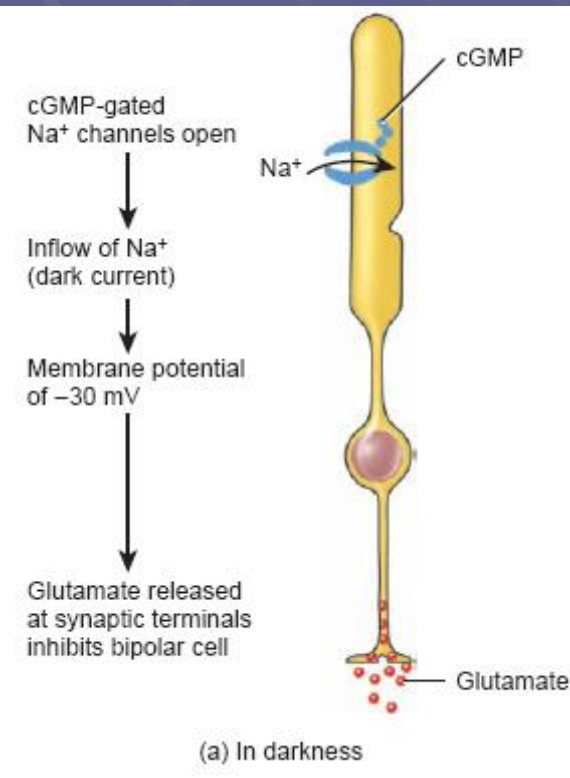
# Light Detection



# Light Detection

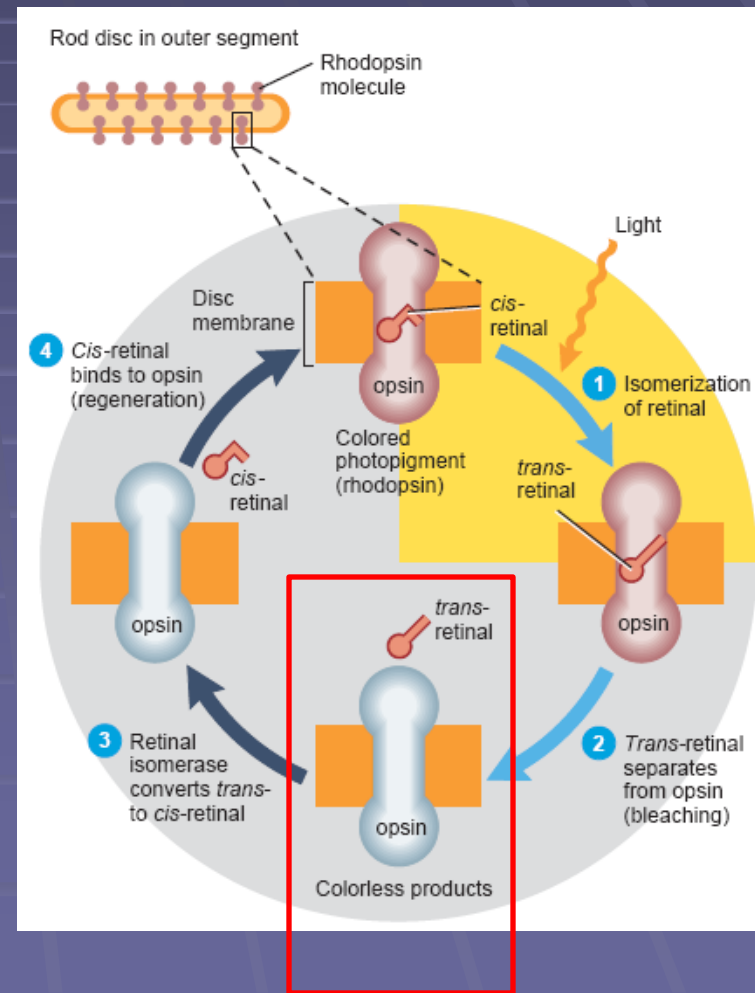
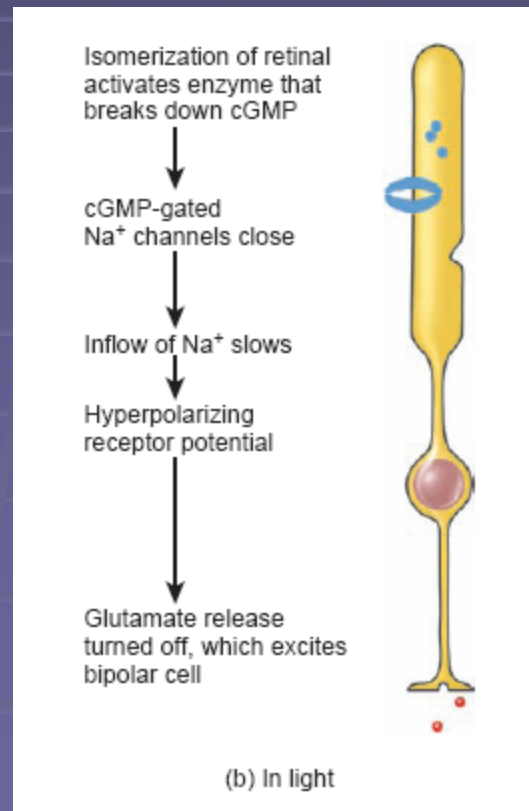
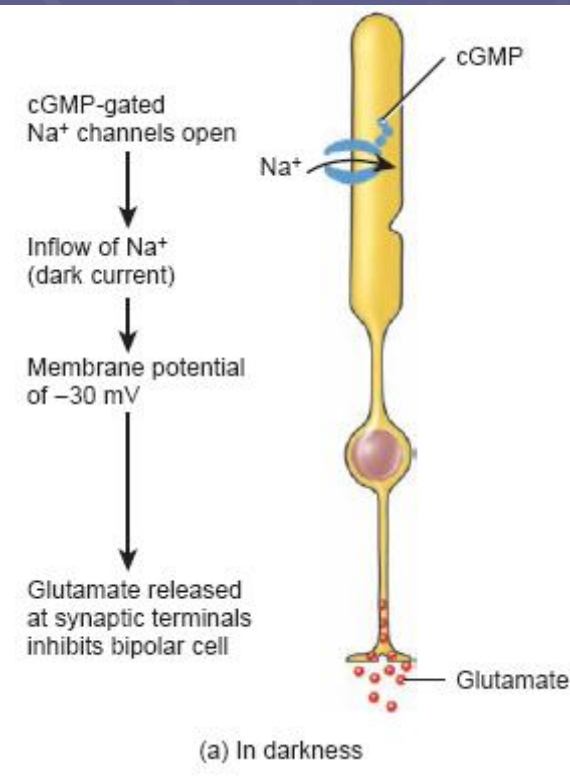


# Light Detection

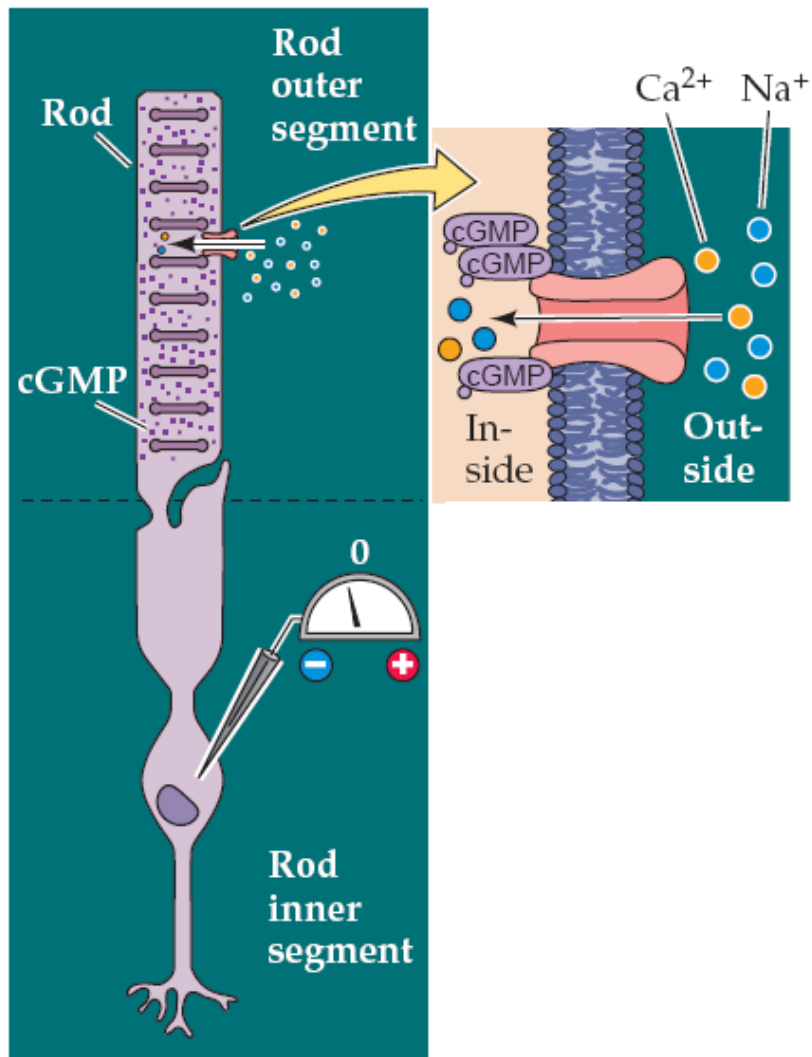




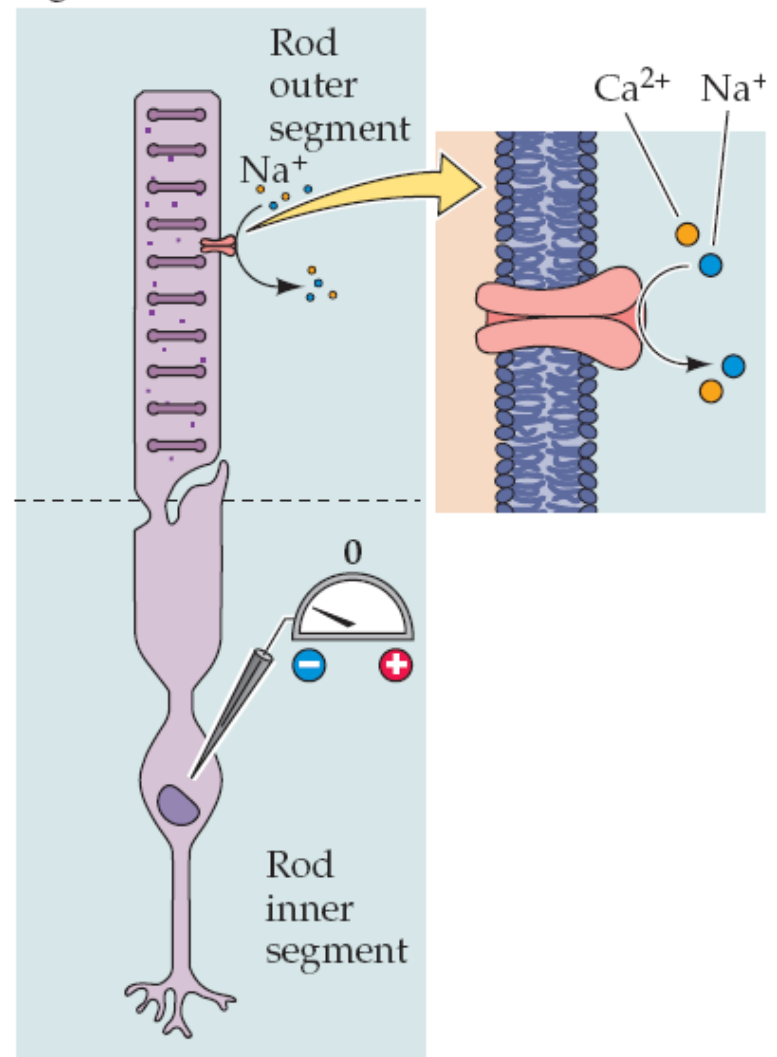
# Light Detection



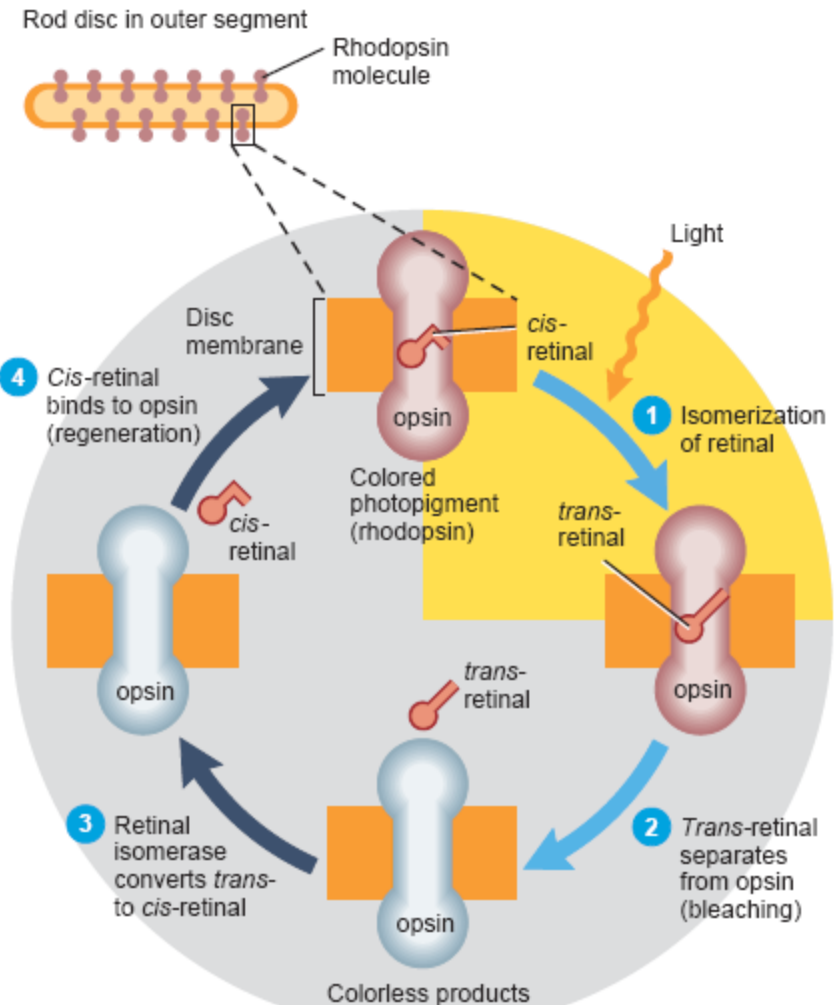
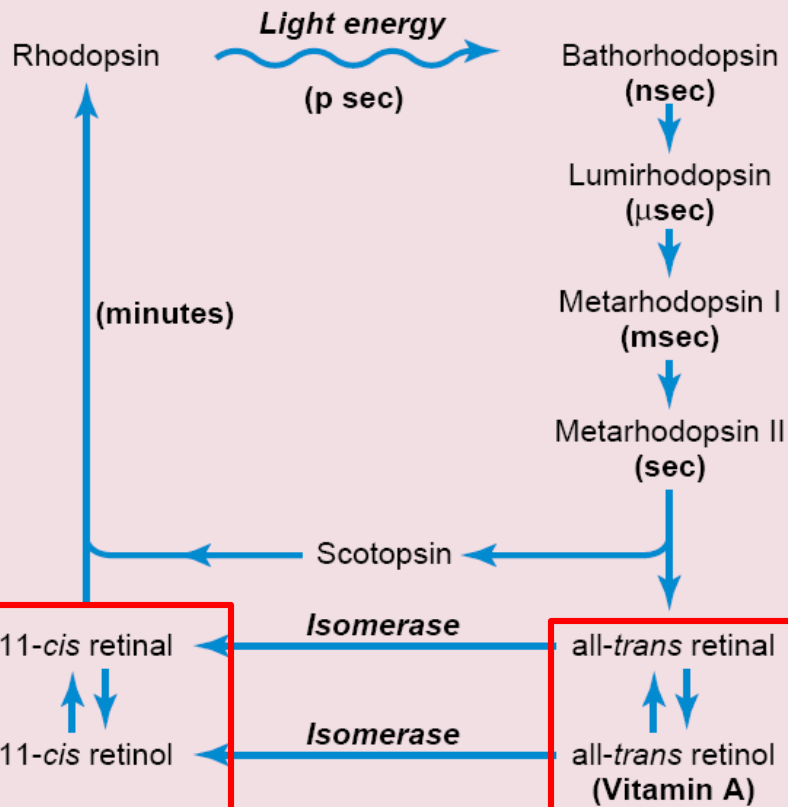
Dark



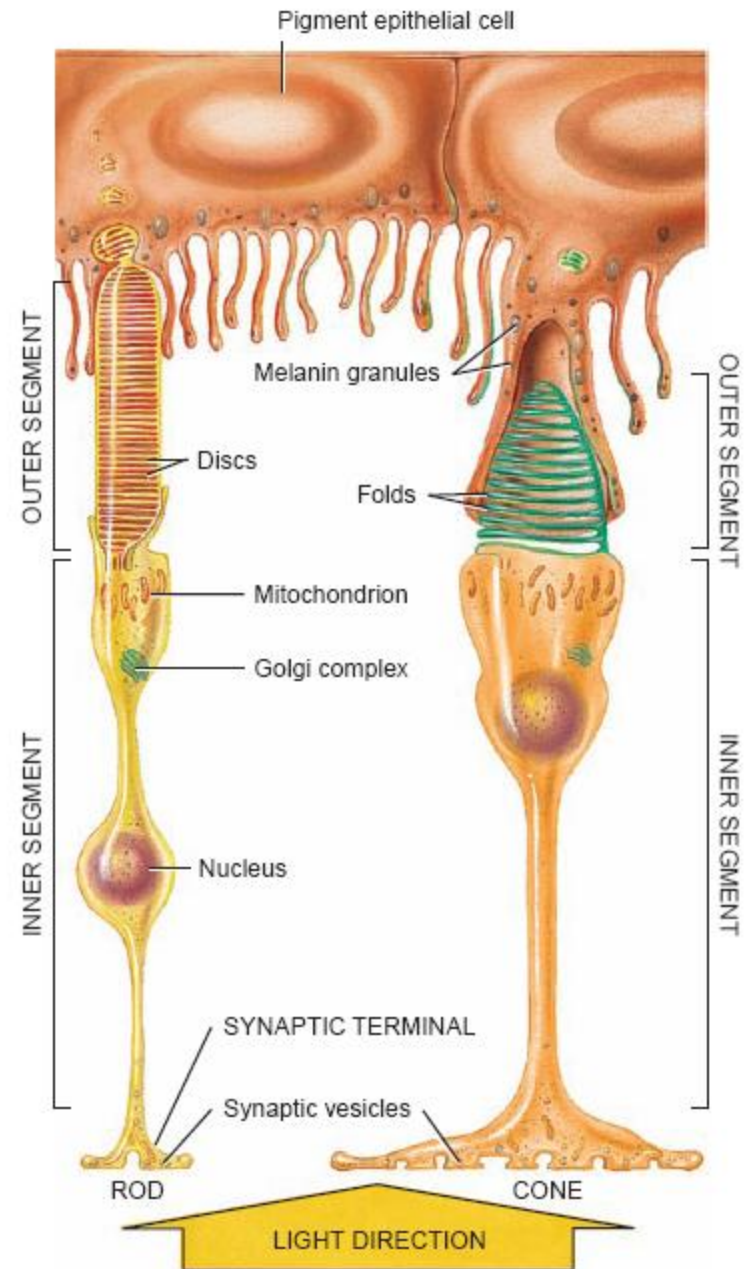
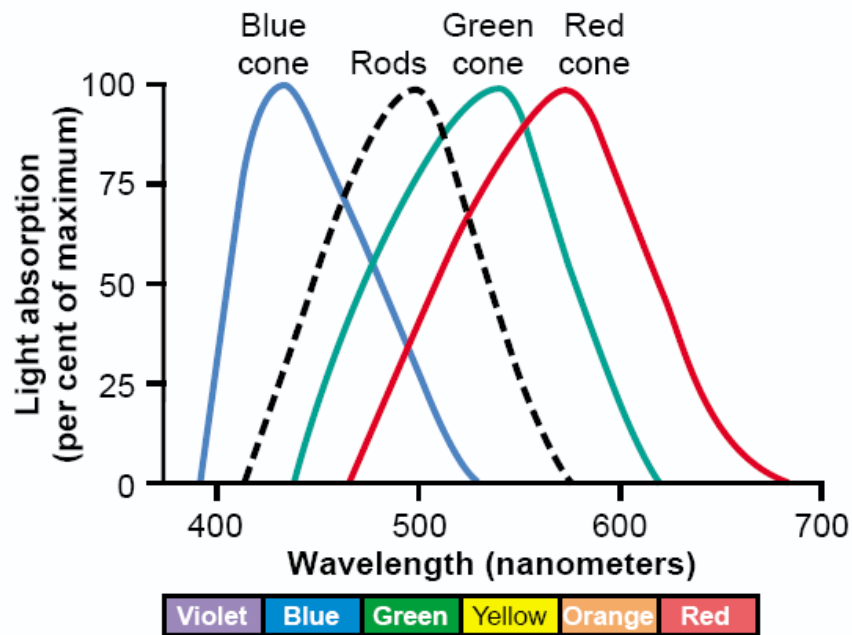
Light



# Light Detection

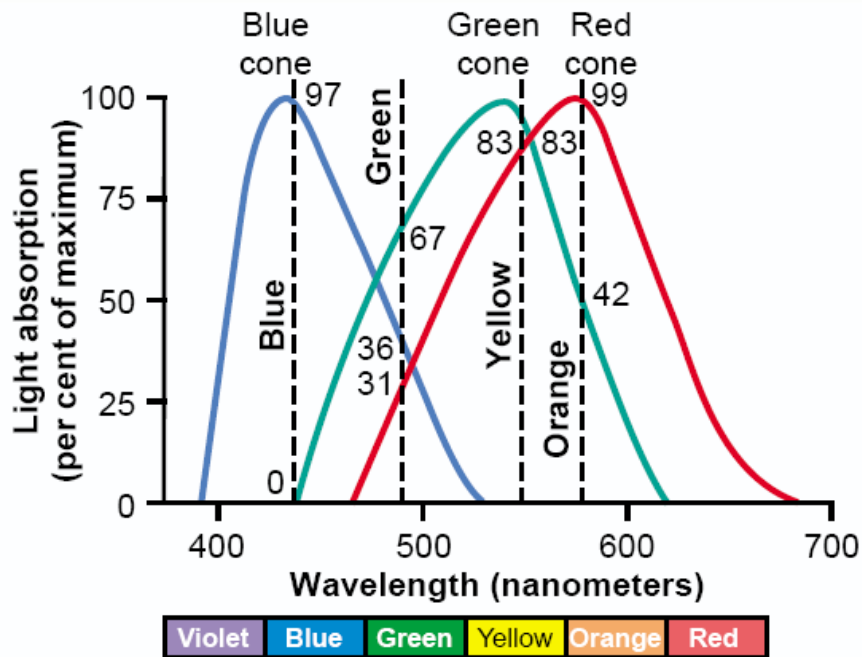


# Photoreceptors

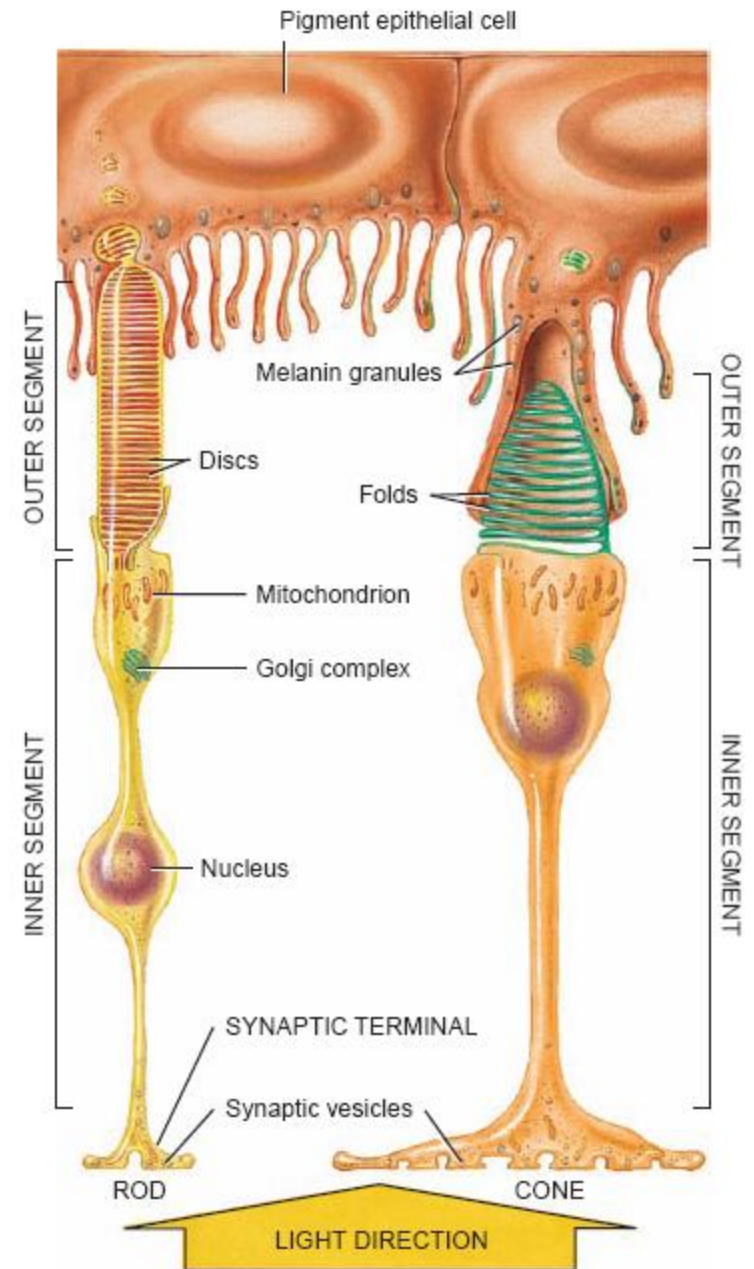




# Photoreceptors



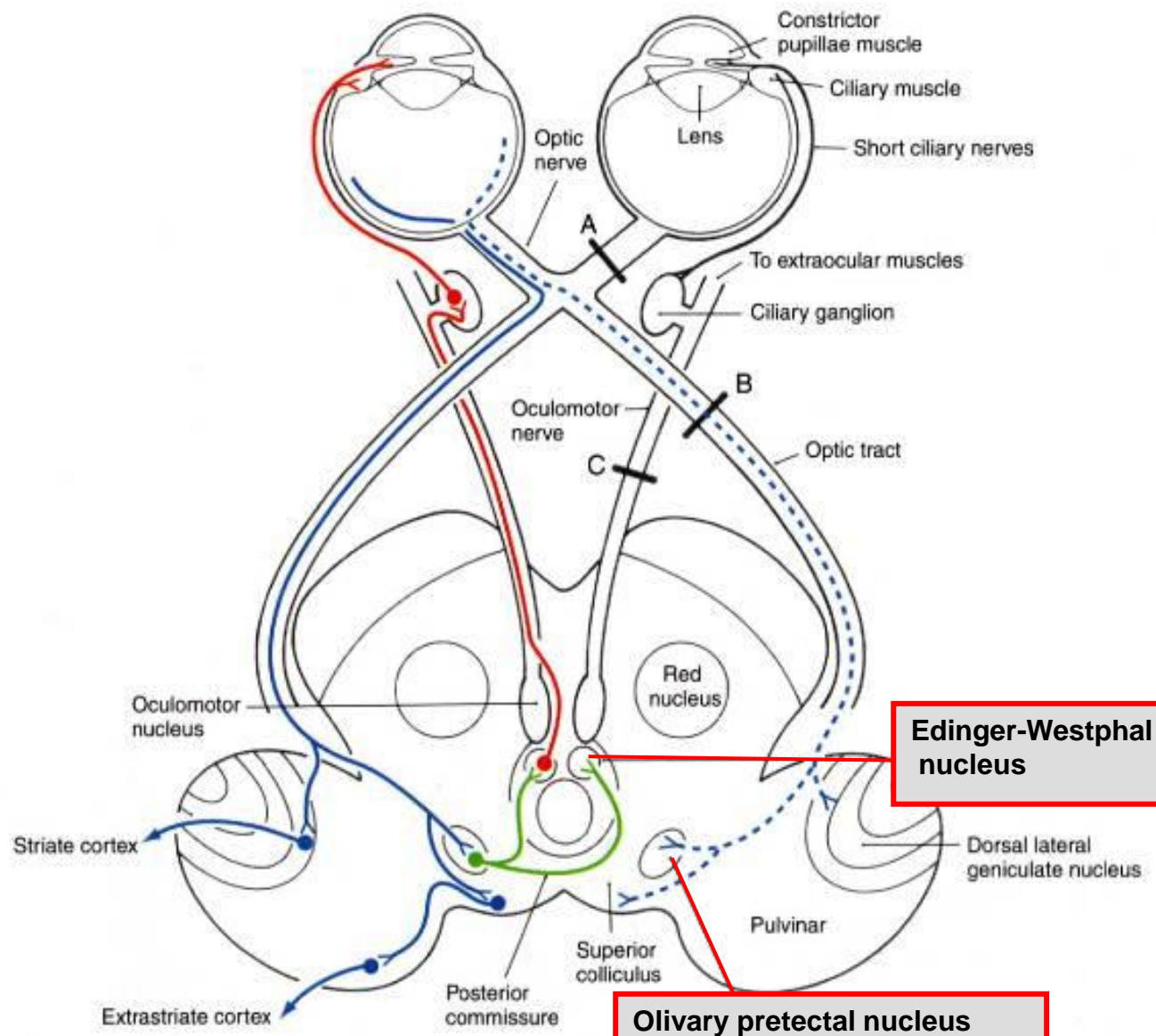
Photopsin : blue, green and red sensitive pigments



# Light Adaptation

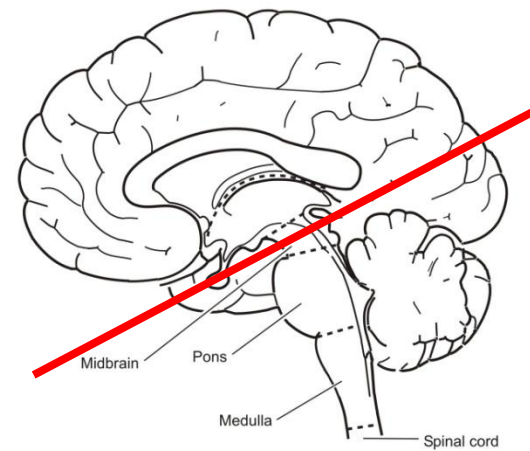
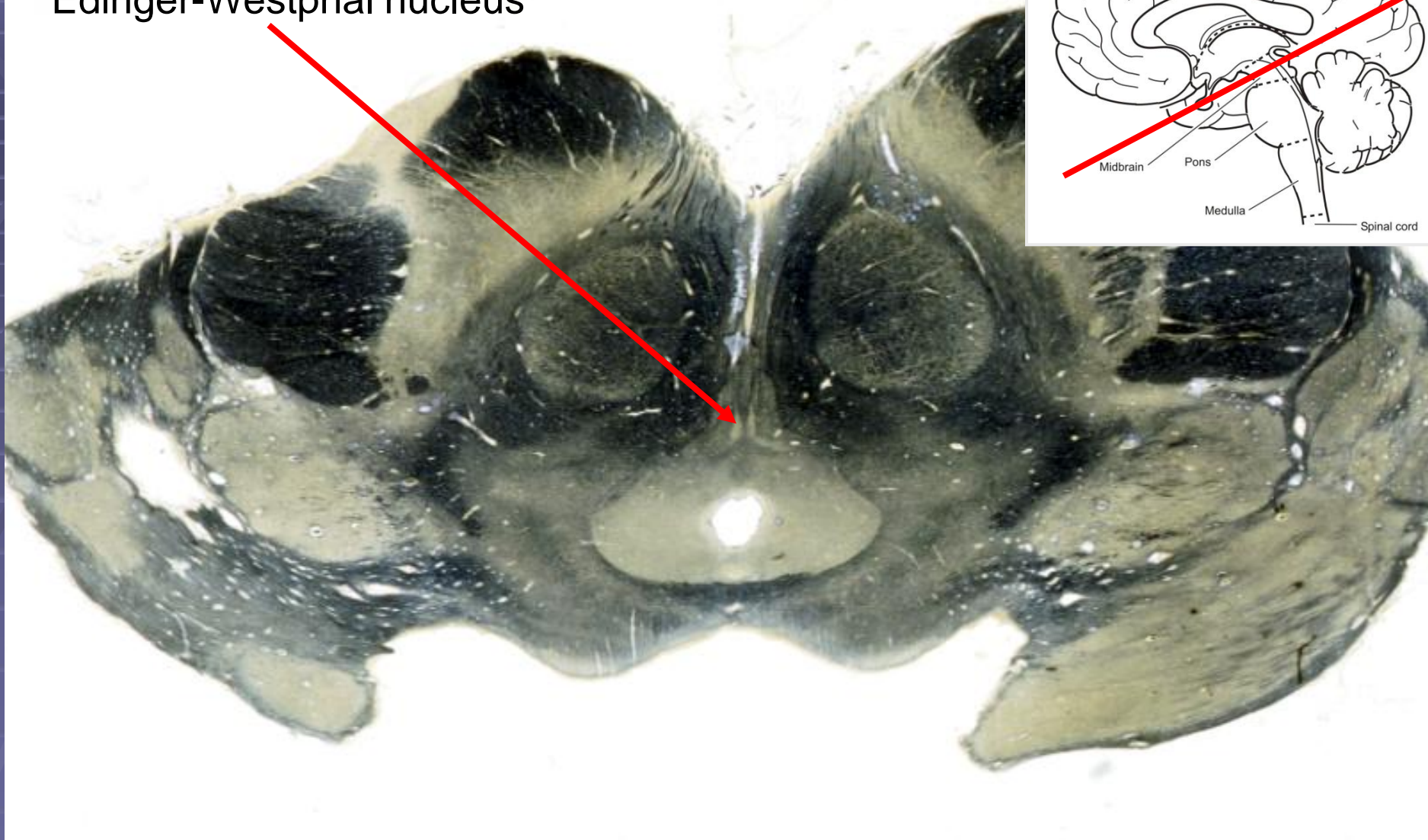
- Pupillary size

# Pupillary Light Reflex





Edinger-Westphal nucleus

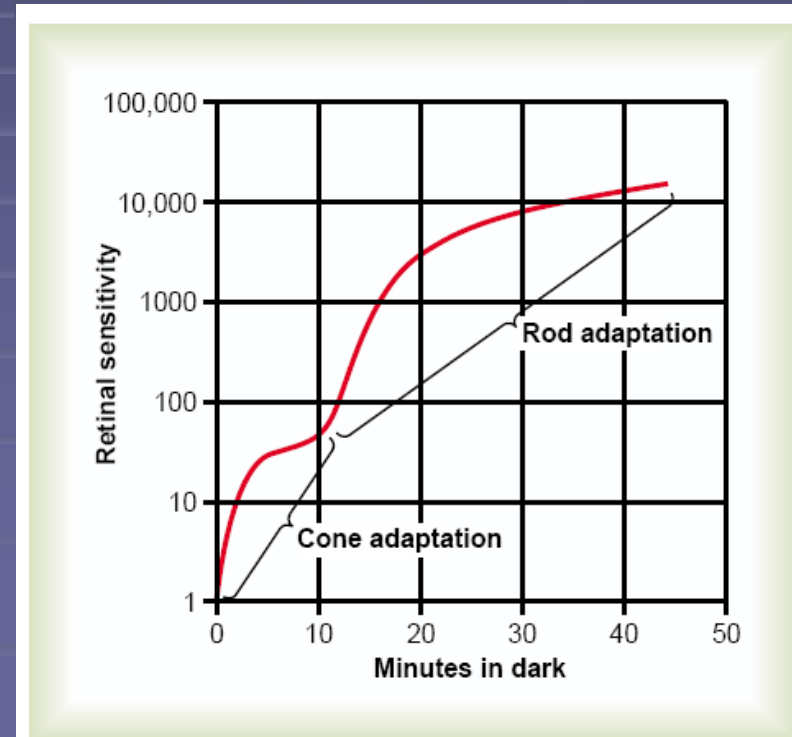
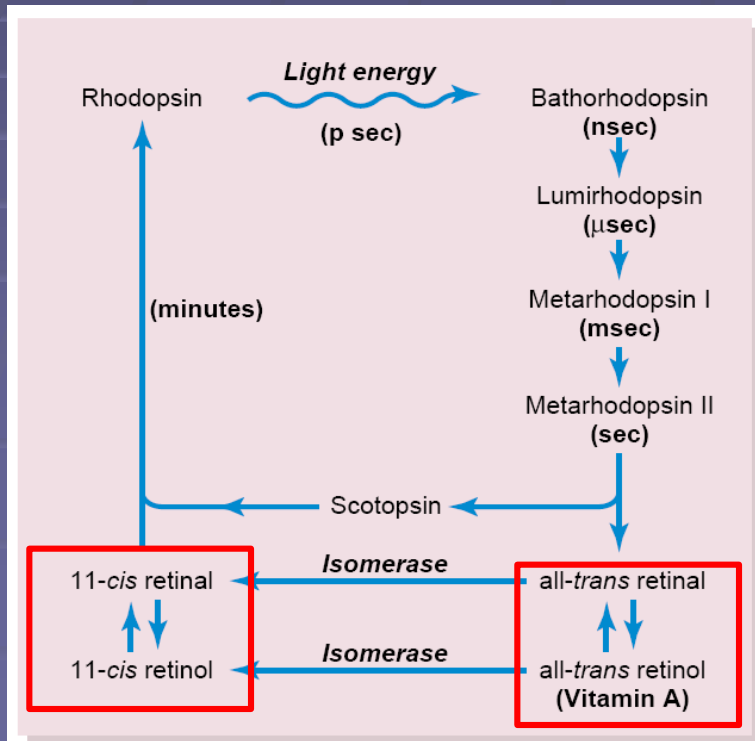


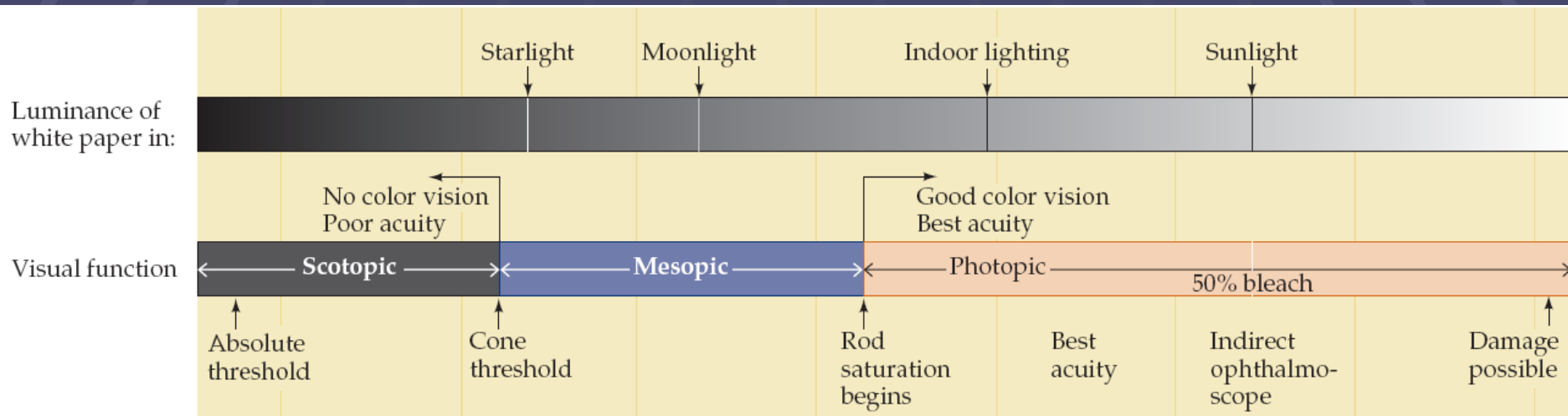
# Light Adaptation

- Pupillary size
- Neural adaptation
- Photoreceptor adaptation

# Light Adaptation

- Pupillary size
- Neural adaptation
- Photoreceptor adaptation







# Night blindness

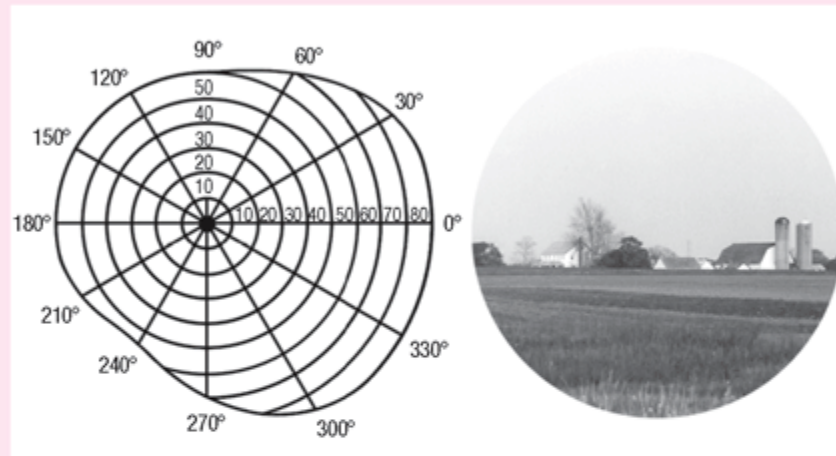
# Retinitis pigmentosa



## Comparing tunnel vision with normal vision

The patient with tunnel vision experiences drastic constriction of his peripheral visual field. The illustrations here convey the extent of this constriction, comparing test findings for normal and tunnel vision.

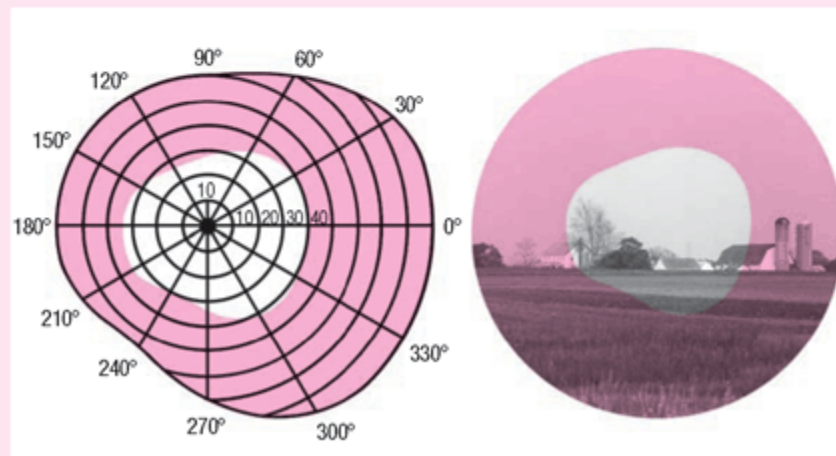
Normal field of vision in the right eye, as shown on a perimetry chart



Normal field of vision in the right eye, as shown on a perimetry chart

Tunnel vision in the right eye, as shown on a perimetry chart

Tunnel vision in the right eye, as seen in advanced glaucoma during perimeter examination





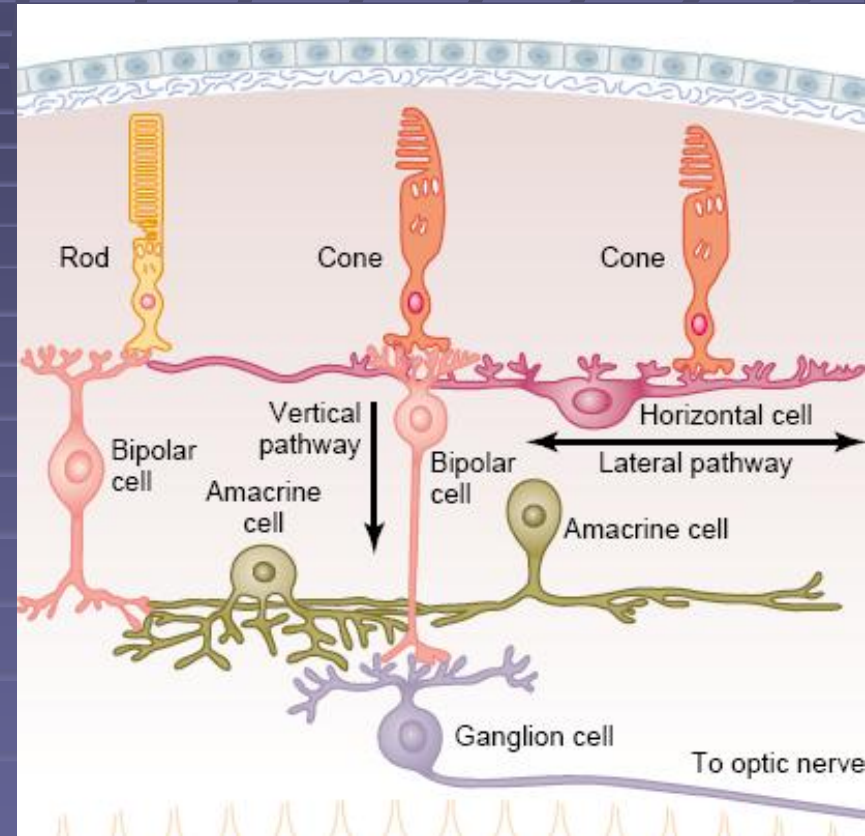


# Visual Processing at Retina

- Graded potential

VS

Action potential

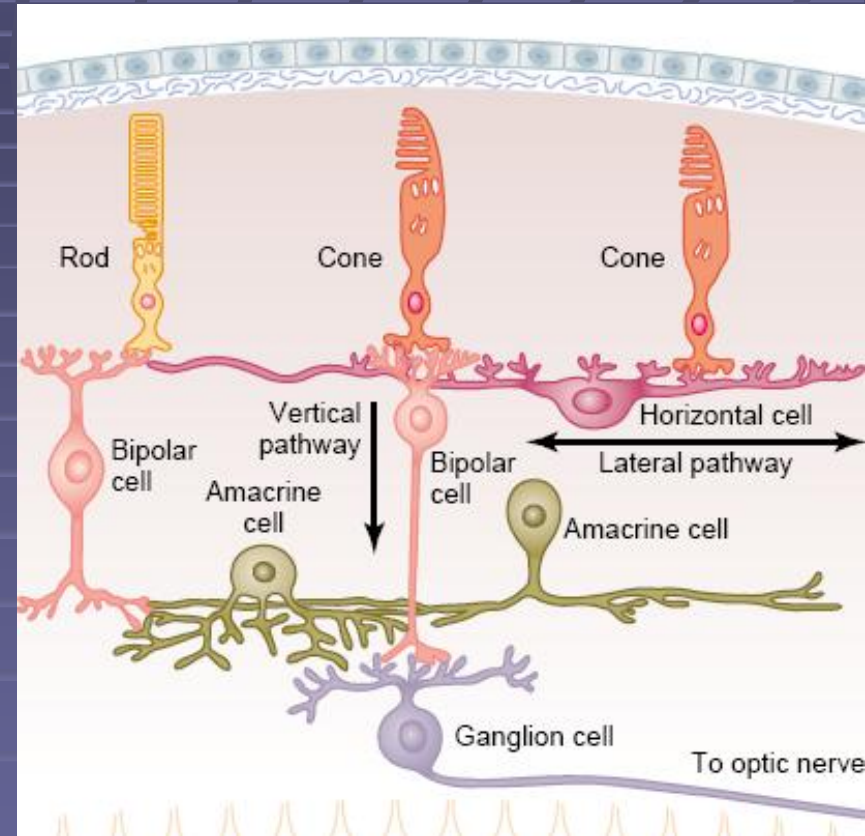


# Visual Processing at Retina

- Horizontal

VS

Amacrine



# Visual Processing at Retina

- Horizontal

Lateral inhibition and lateral interactions /  
maintain sensitivity to luminance contrast

- Amacrine

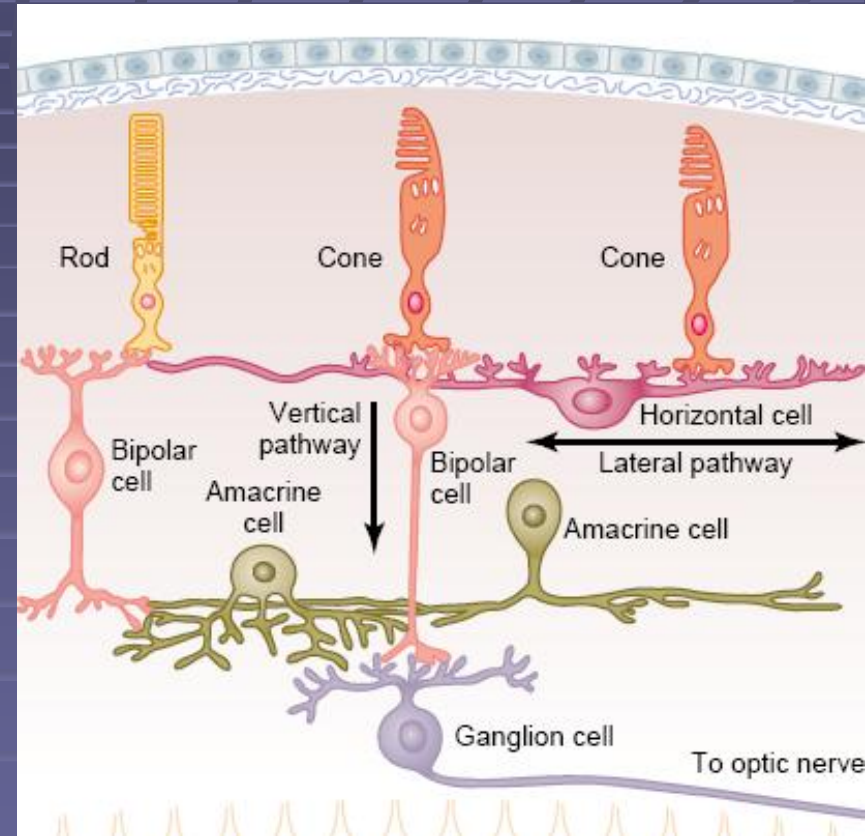
- Transform changes in light intensity
- Some types are the only pathway to transmits information from photoreceptors to ganglion cells

# Visual Processing at Retina

- Inhibited Bipolar

VS

## Activated Bipolar



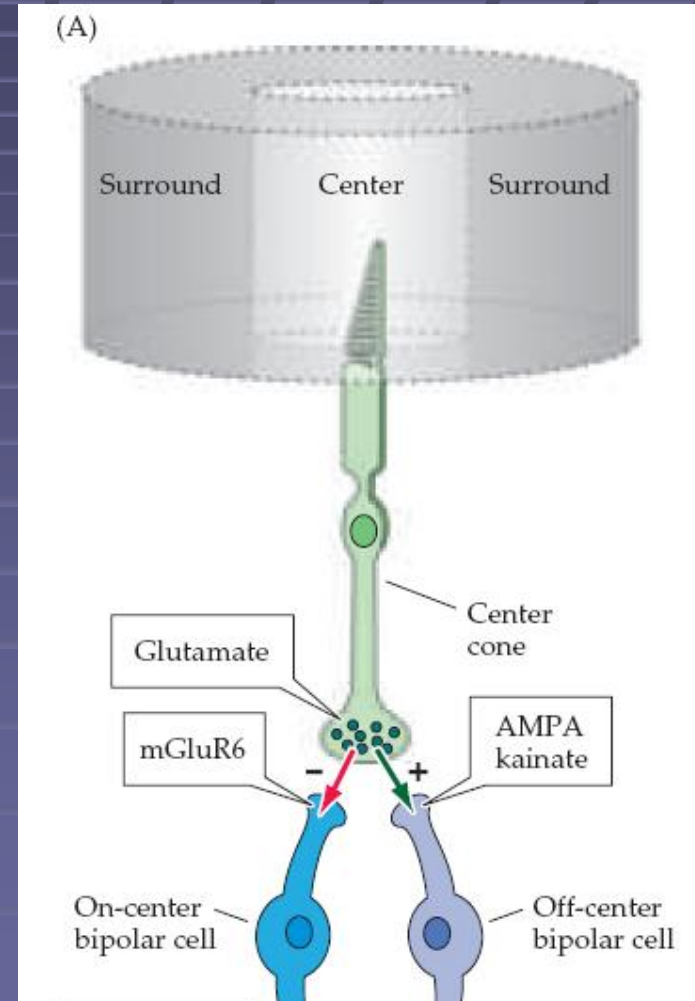


# Visual Processing at Retina

- Inhibited Bipolar

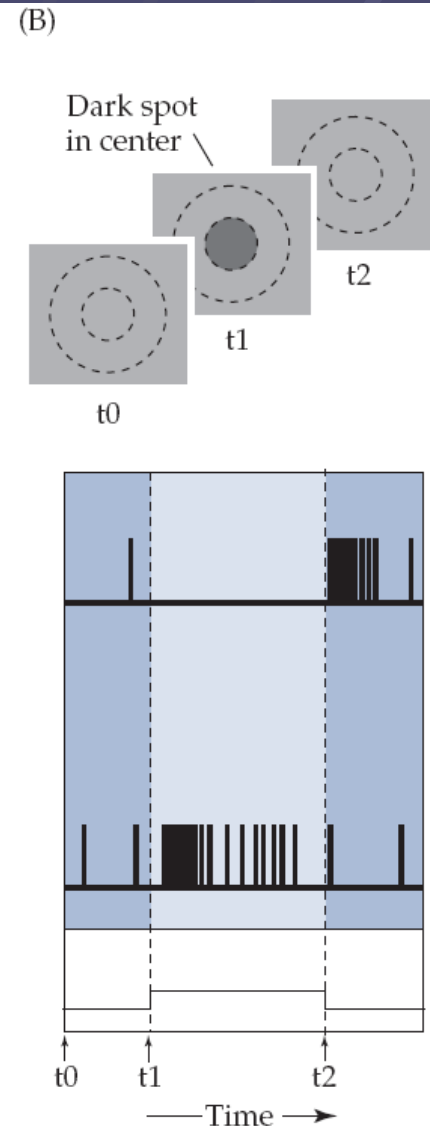
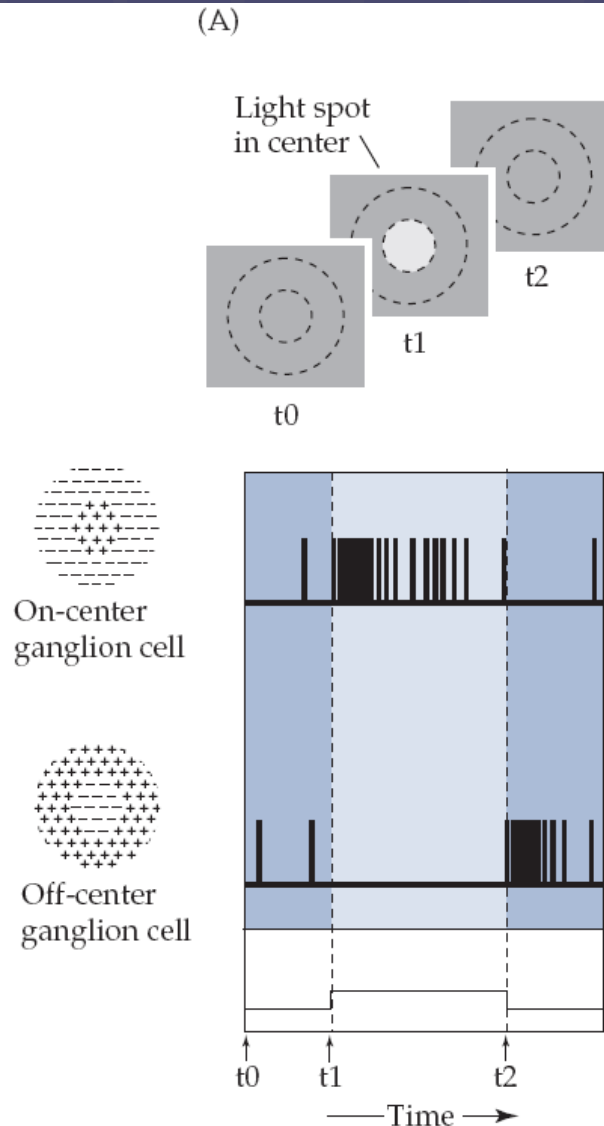
VS

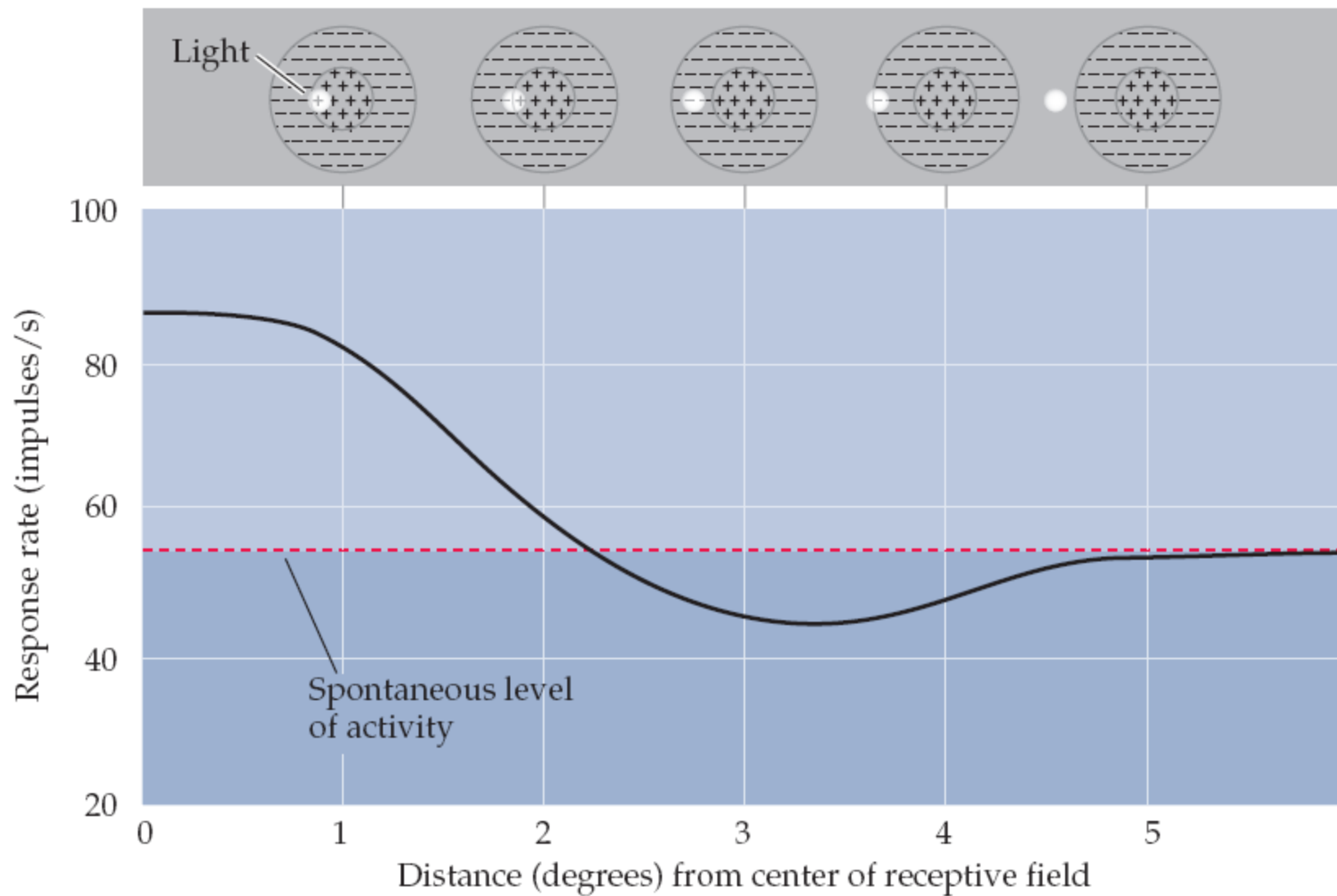
## Activated Bipolar



# Visual Processing at Retina

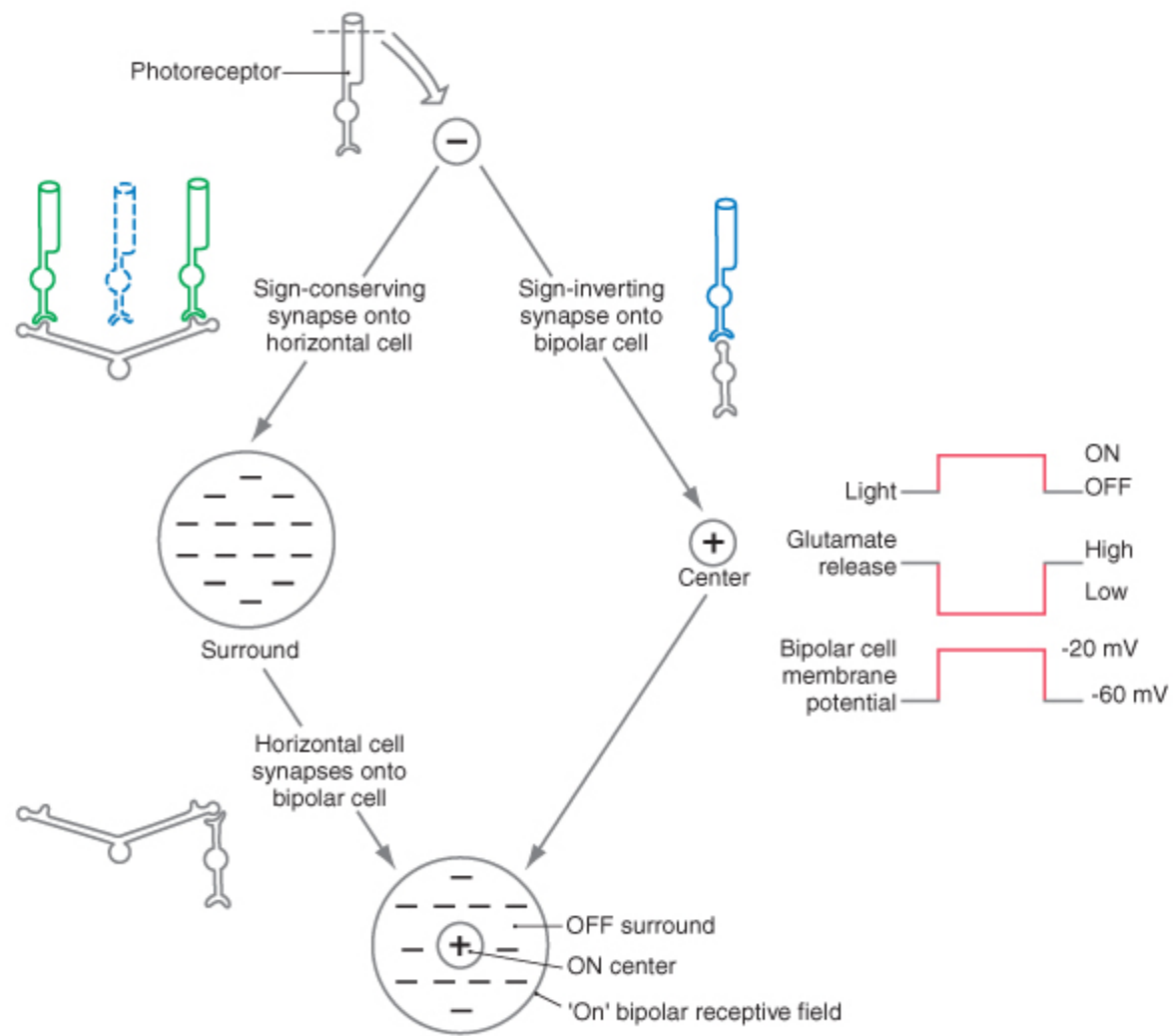
- On Center Ganglionic VS Off center Ganglionic

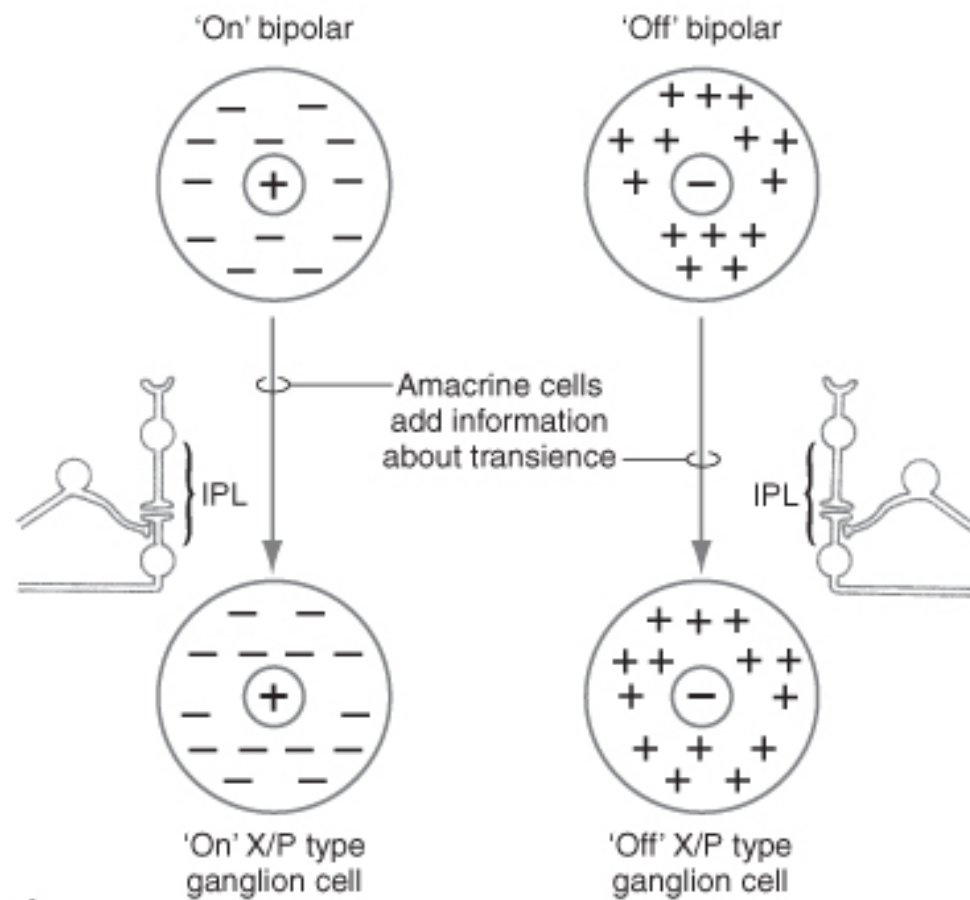




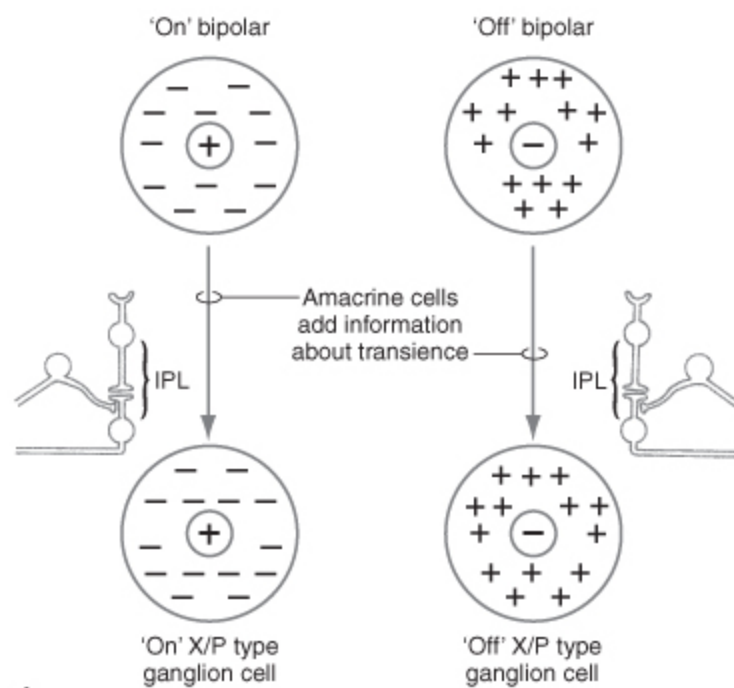




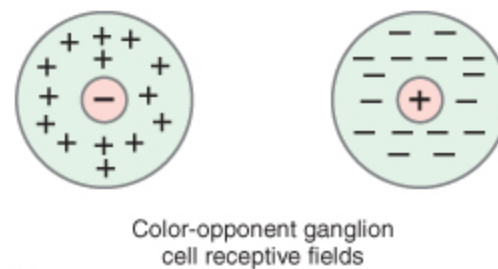




A

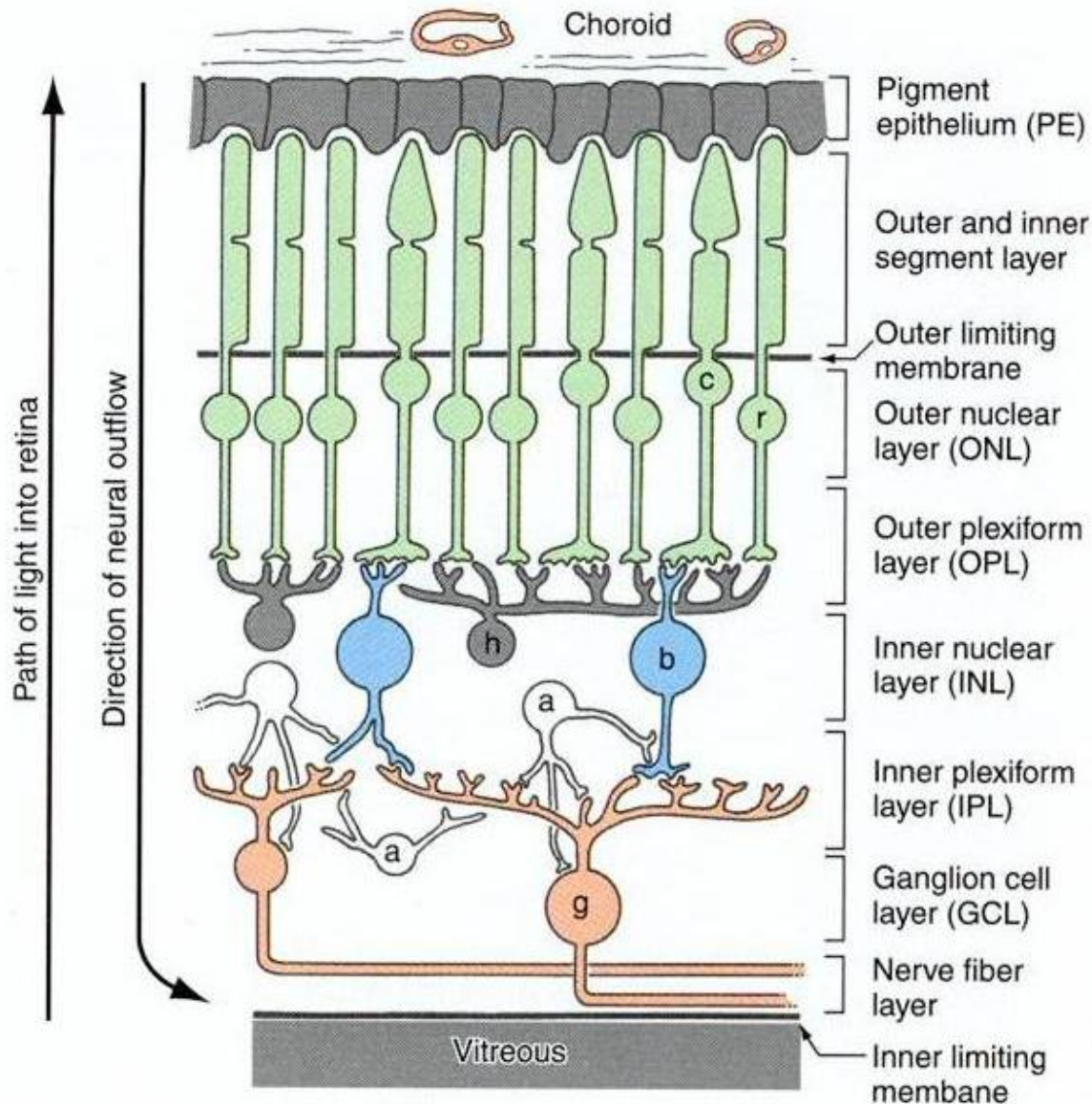


A



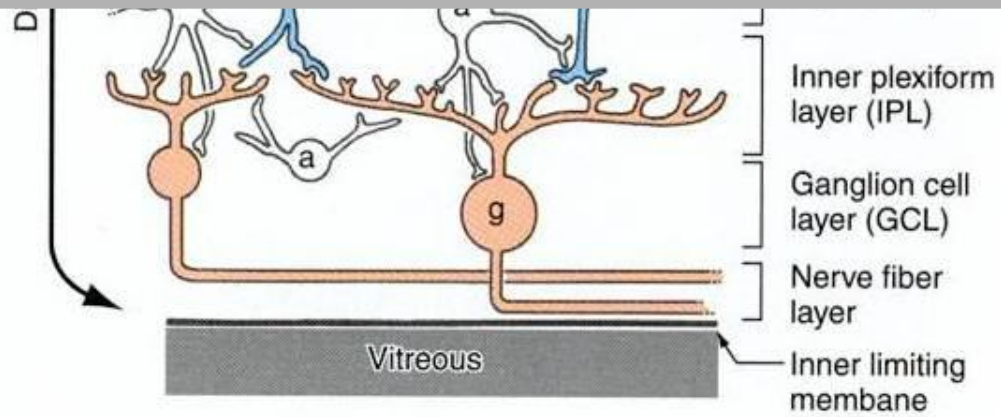
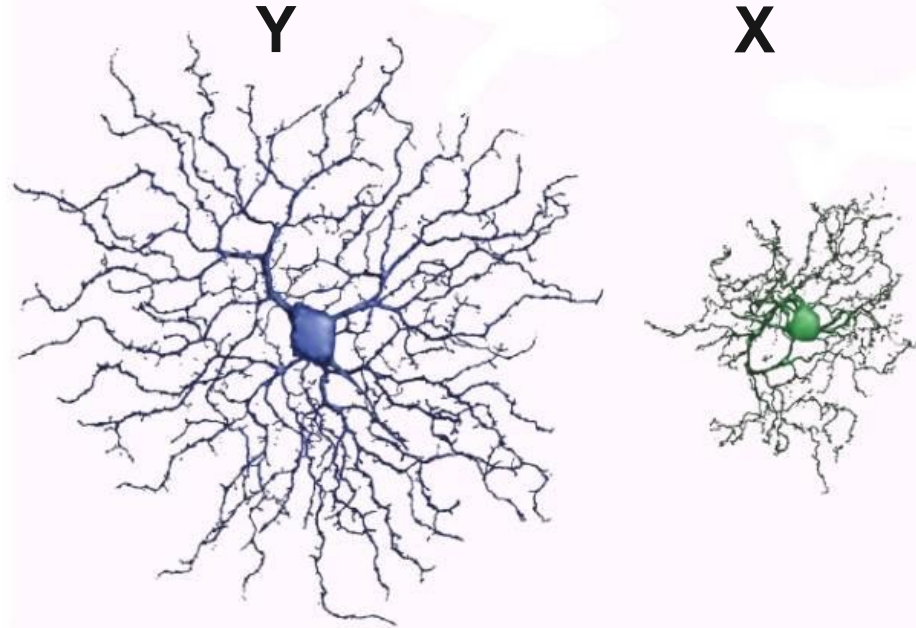
C

# Ganglionic Cells Subtypes

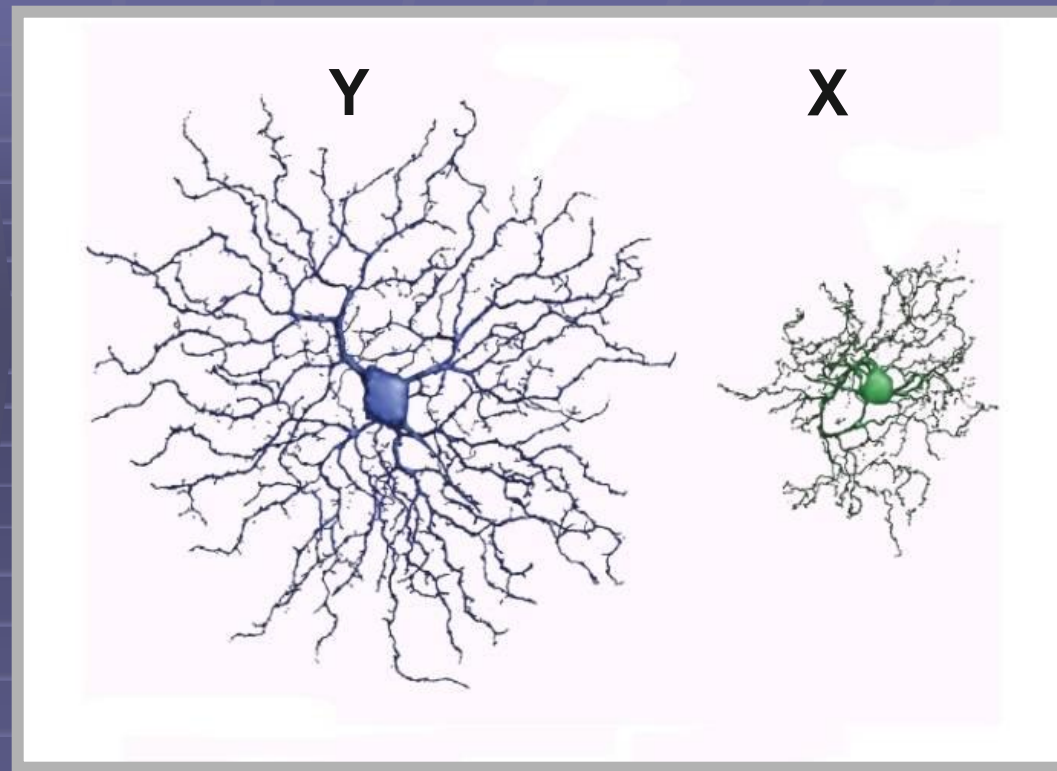




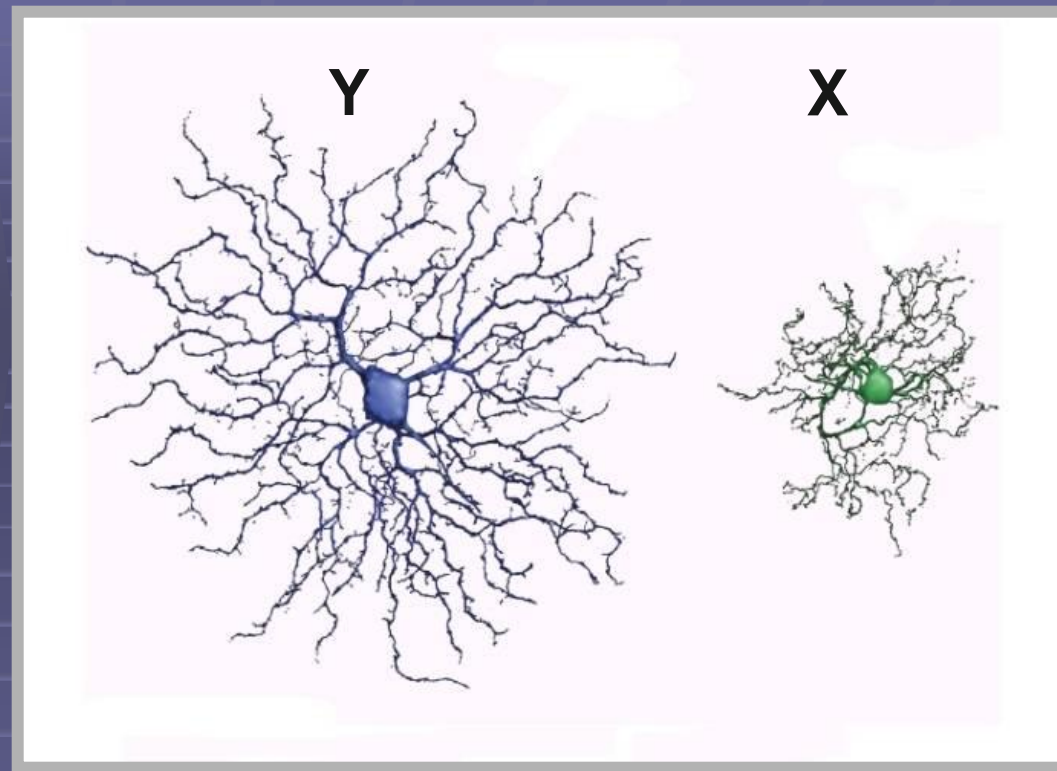
Path of light into retina



- Position
- Receptive field
- Details
- movement

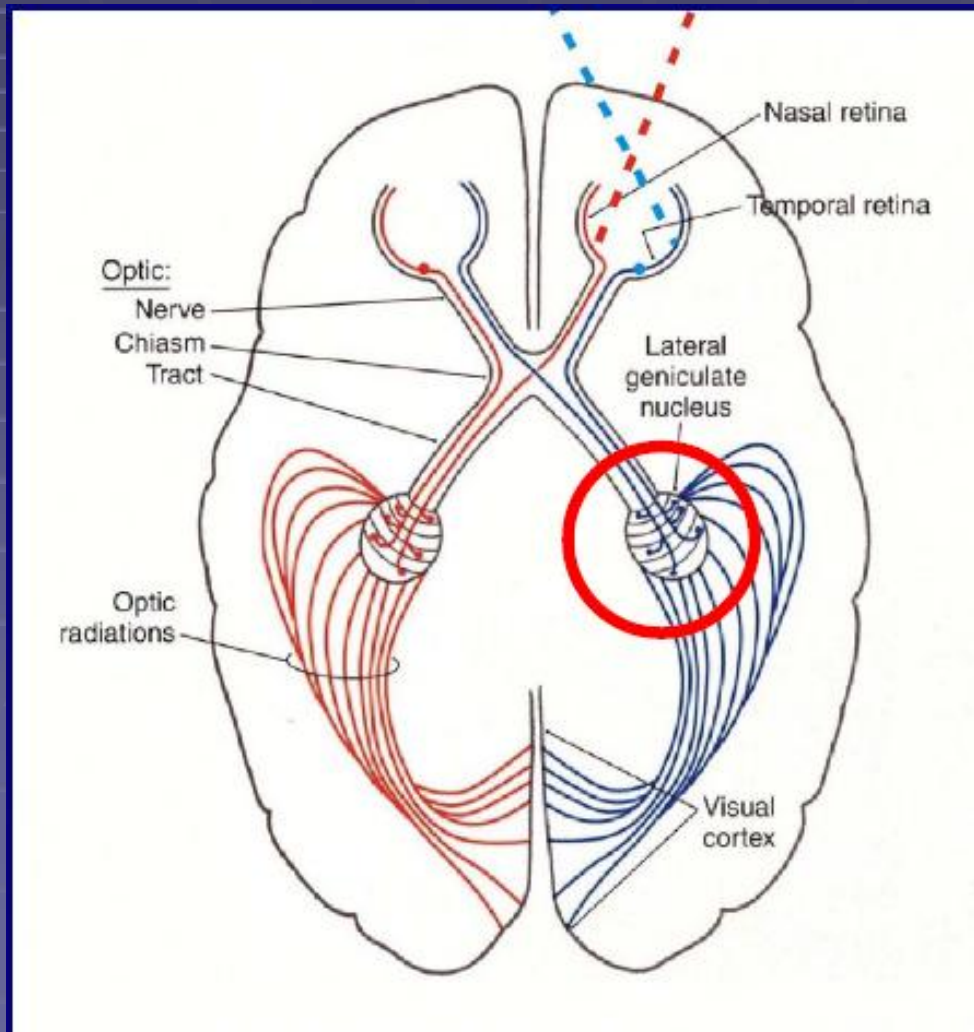


- Position
- Receptive field
- Details
- movement



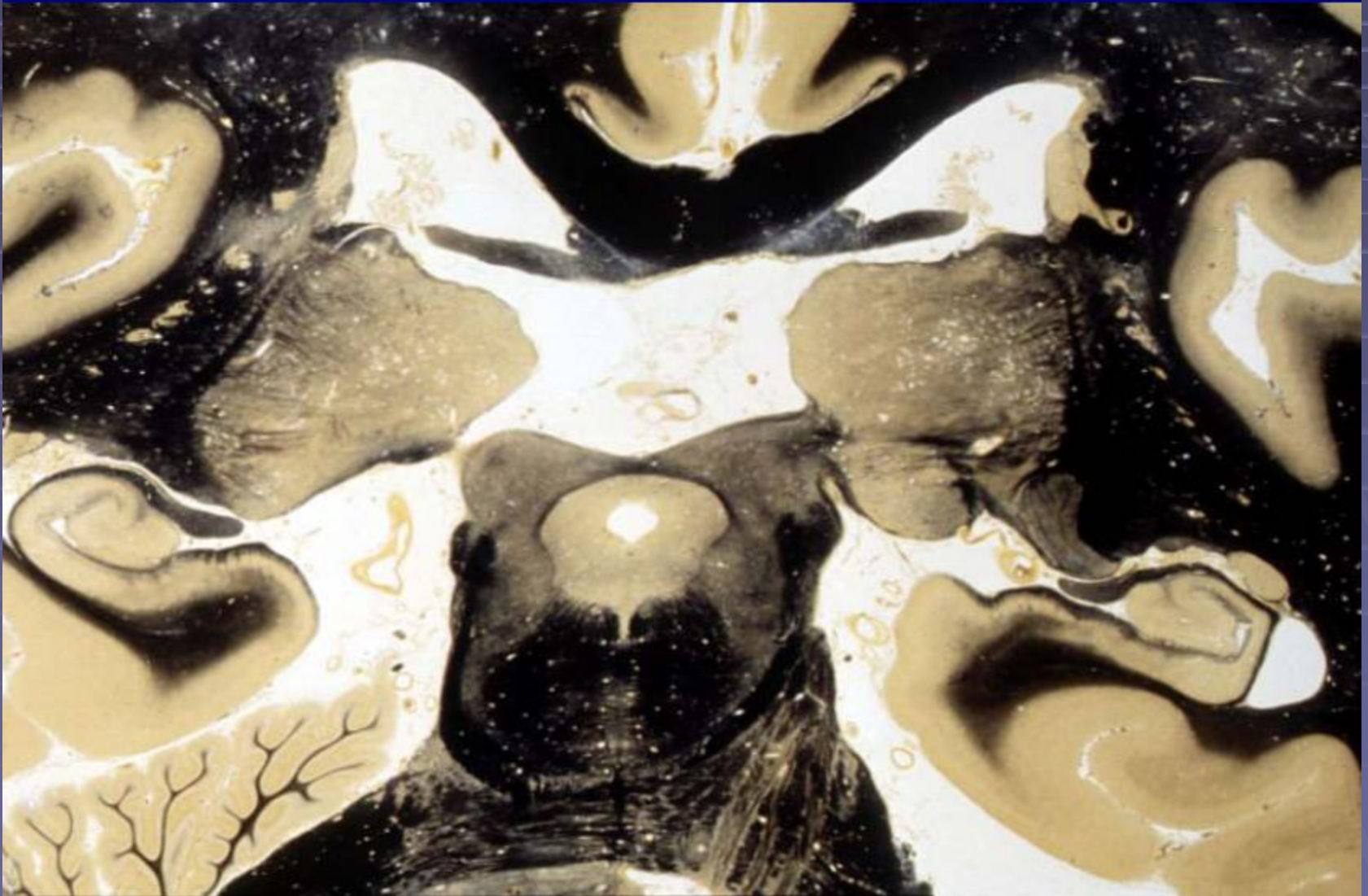
W

# Lateral geniculate nucleus

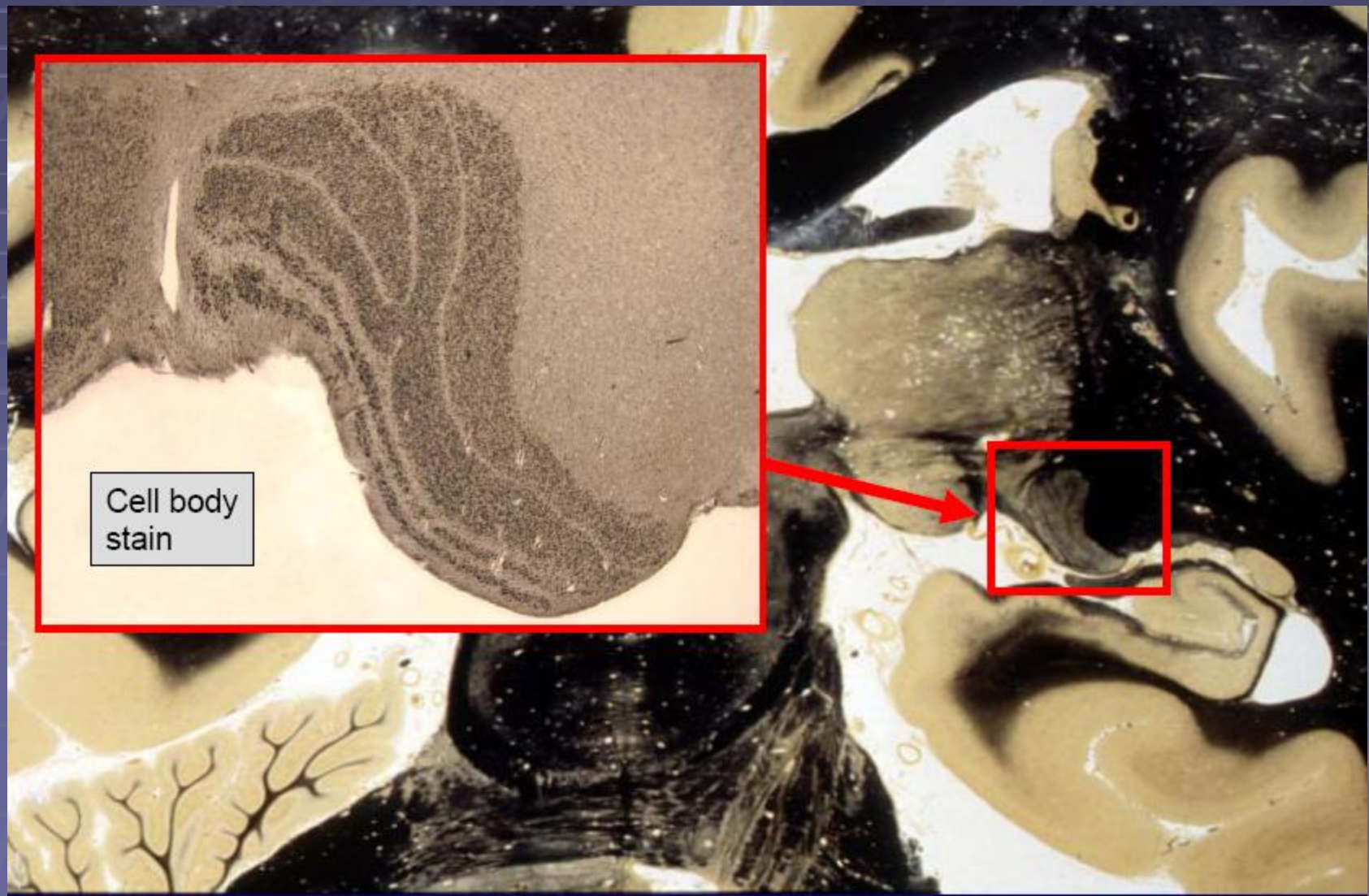




# Lateral geniculate nucleus

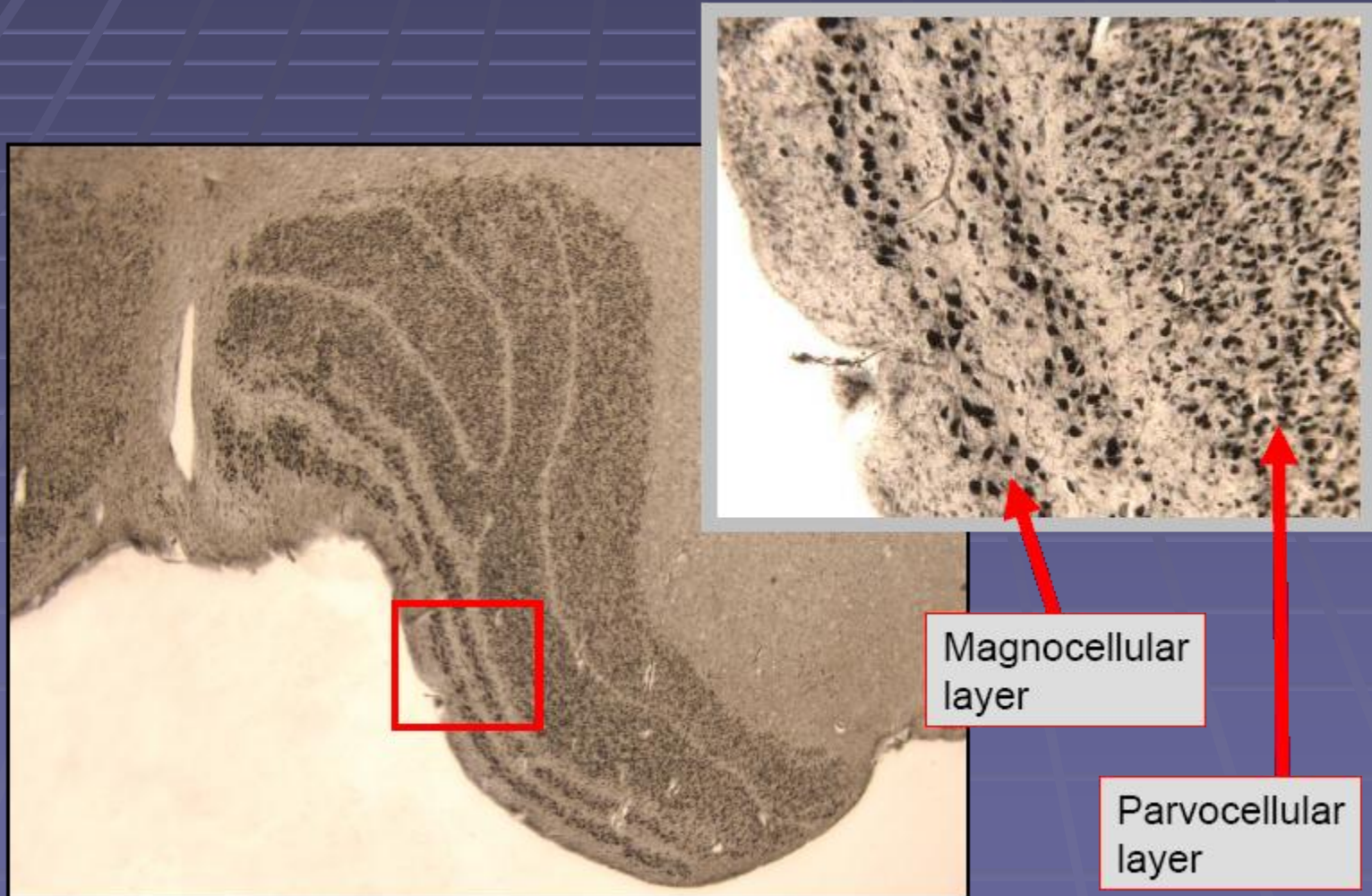


# Lateral geniculate nucleus

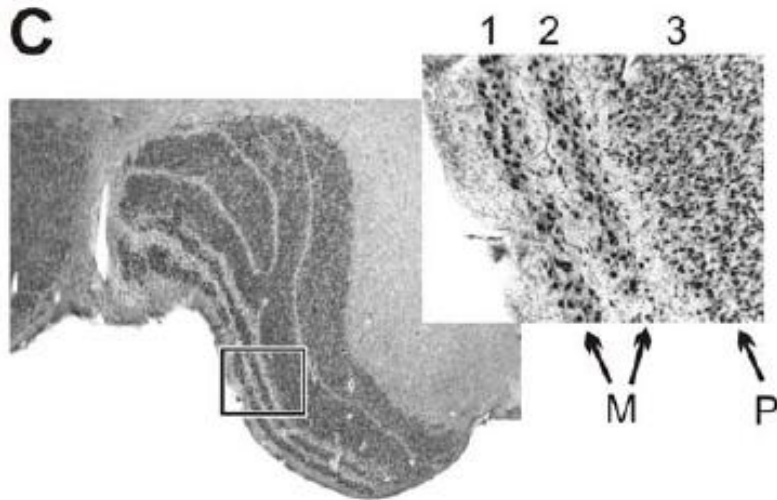




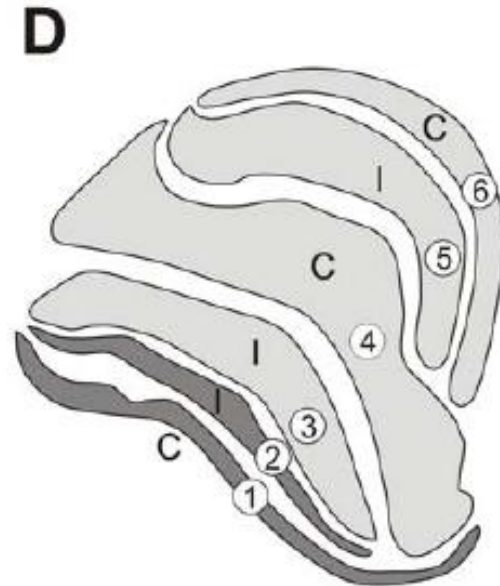
# Lateral geniculate nucleus



# Lateral geniculate nucleus



Left Lateral geniculate nucleus  
(coronal plane, posterior part of nucleus)  
M: magnocellular layers  
P: parvocellular layers



Left Lateral geniculate nucleus  
(coronal plane, middle of nucleus)  
Layers 1 and 2: magnocellular layers  
Layers 3-6: parvocellular layers  
C: layer receives input from contralateral eye  
I: layer receives input from ipsilateral eye



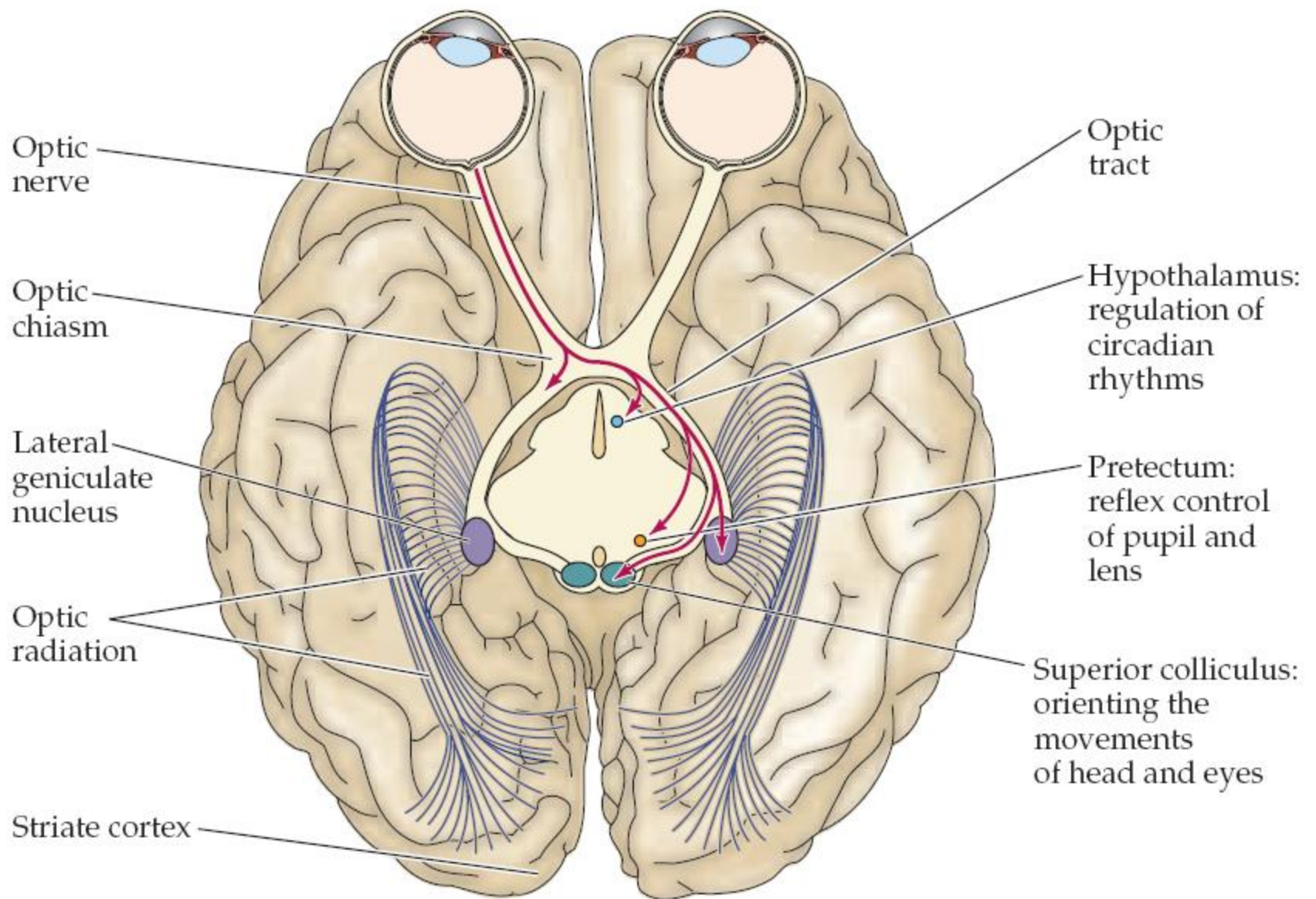
**Magnocellular system**



**Parvocellular system**

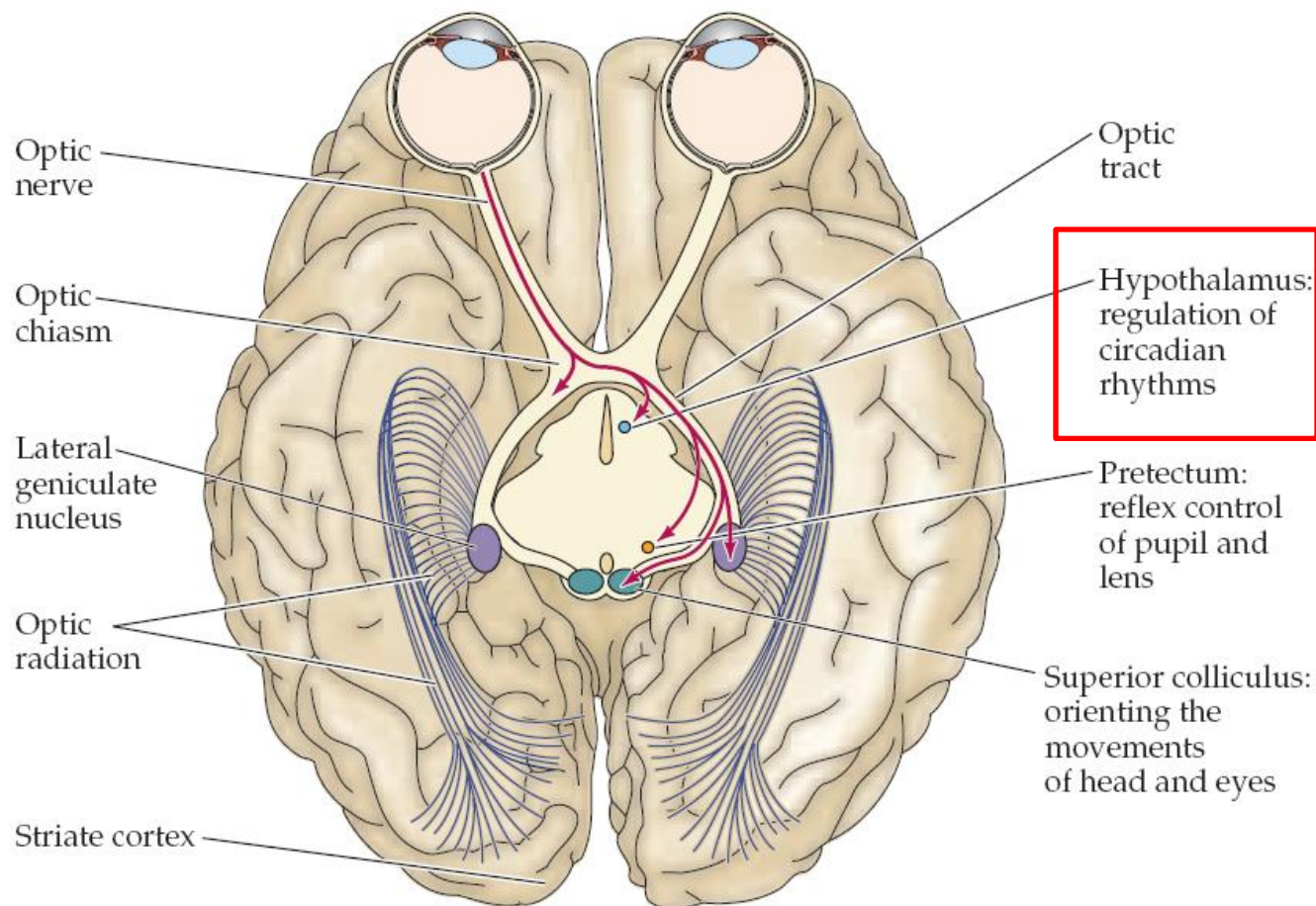


# **VISUAL PATHWAY**



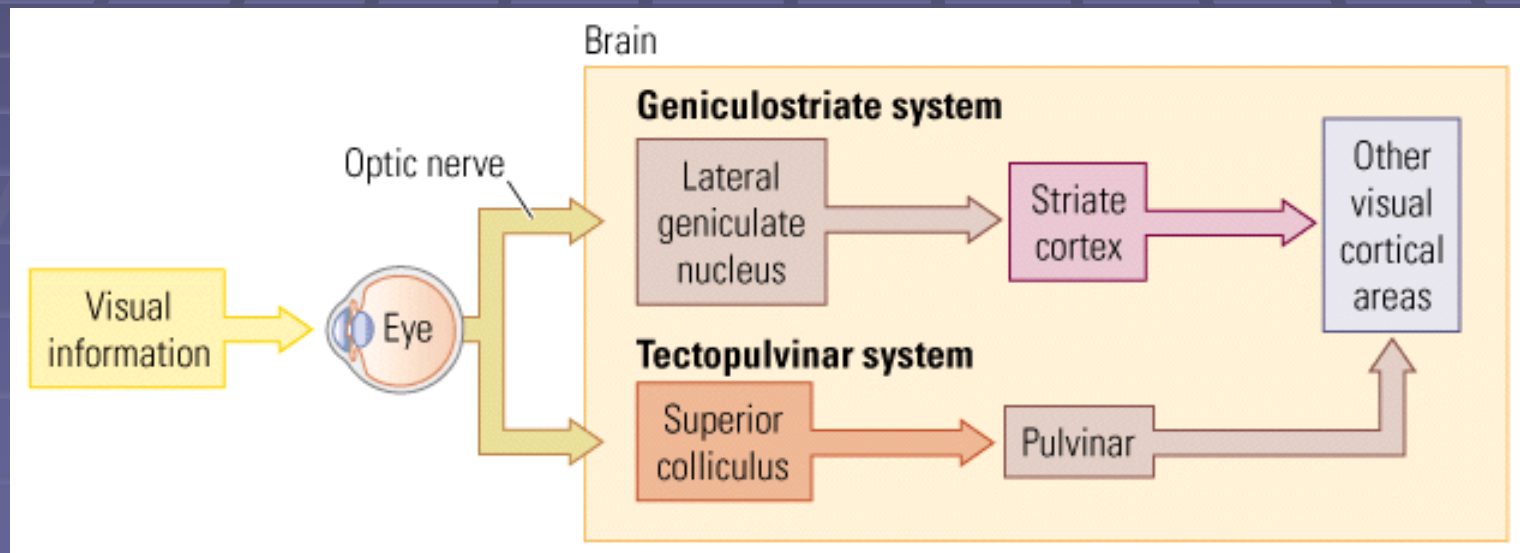
# The retinohypothalamic pathway

- day/night cycle
- Melanopsin ganglionic cells



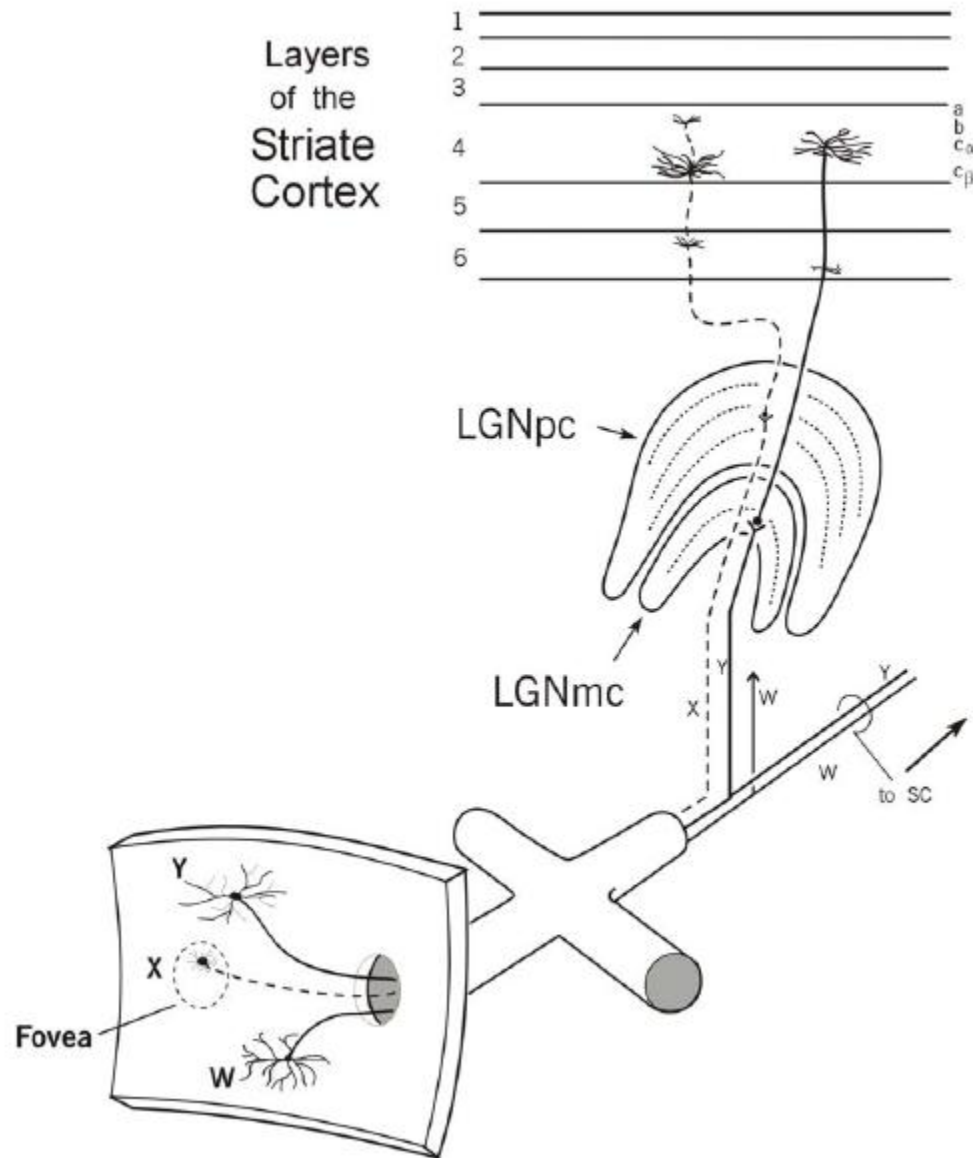
# Visual Pathways

The optic nerve has two principle branches

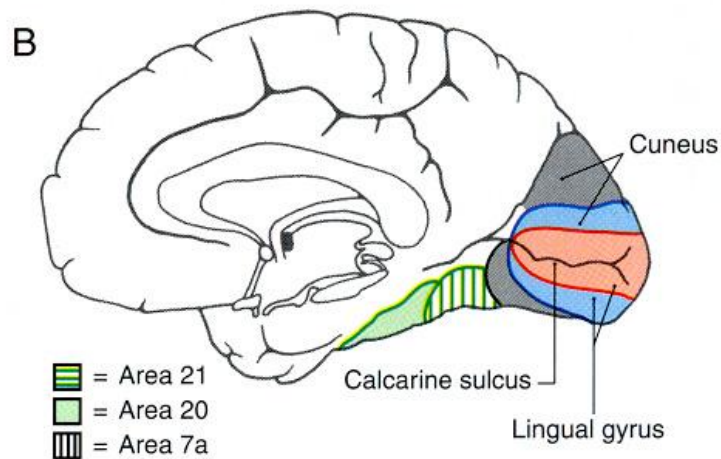
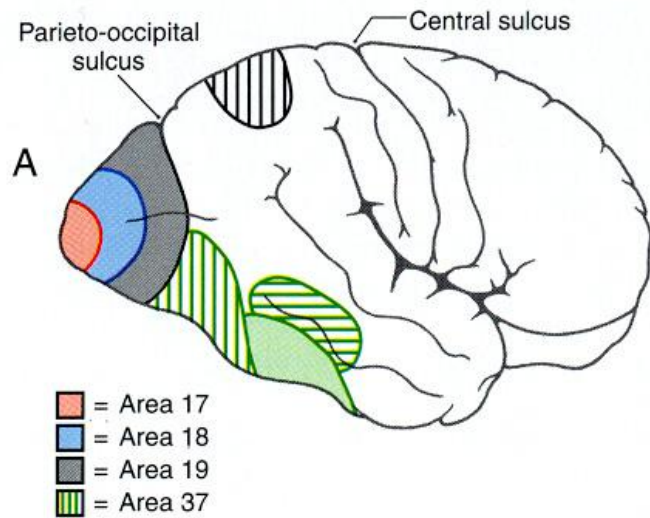




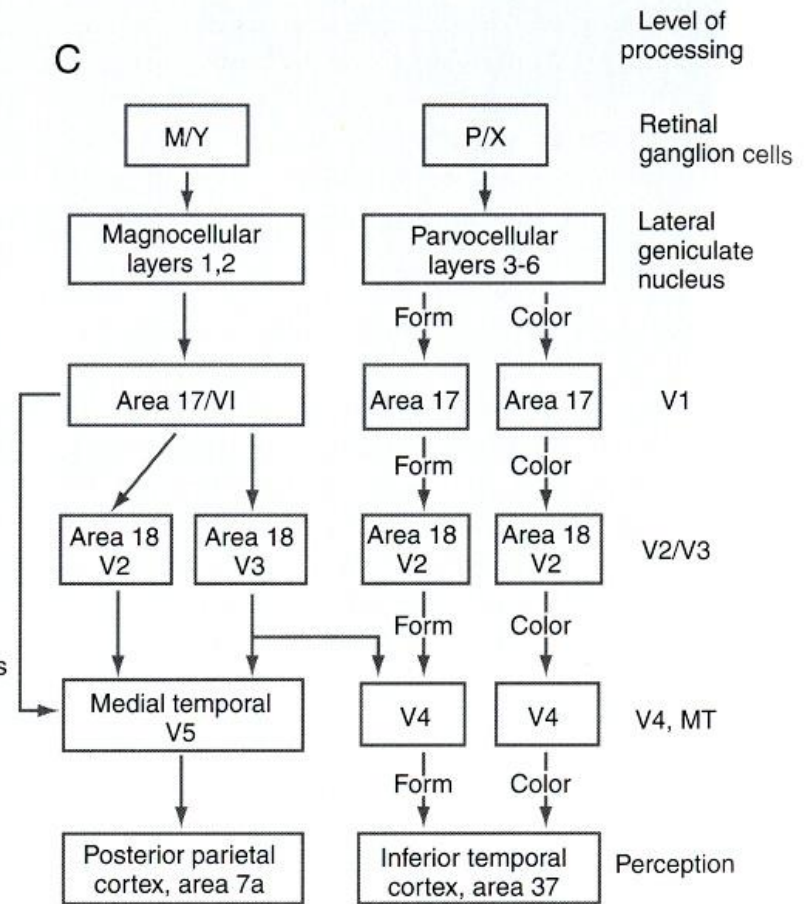
# Primary visual cortex

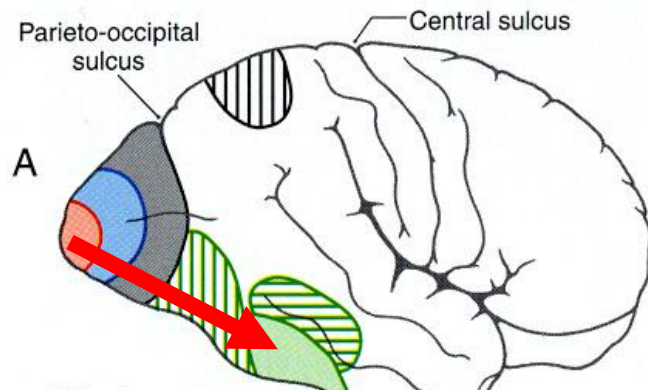






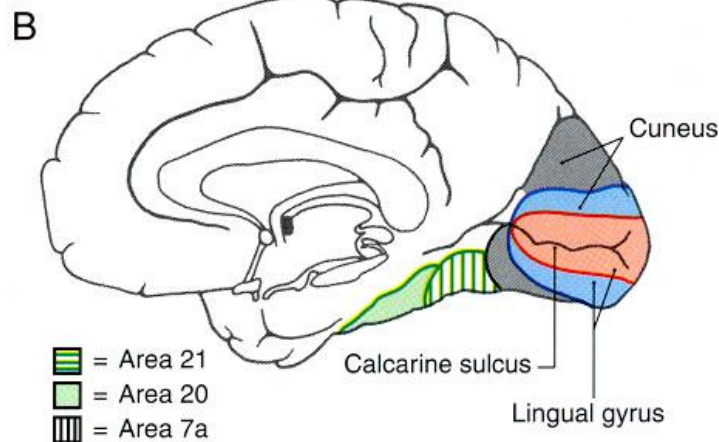
**C**





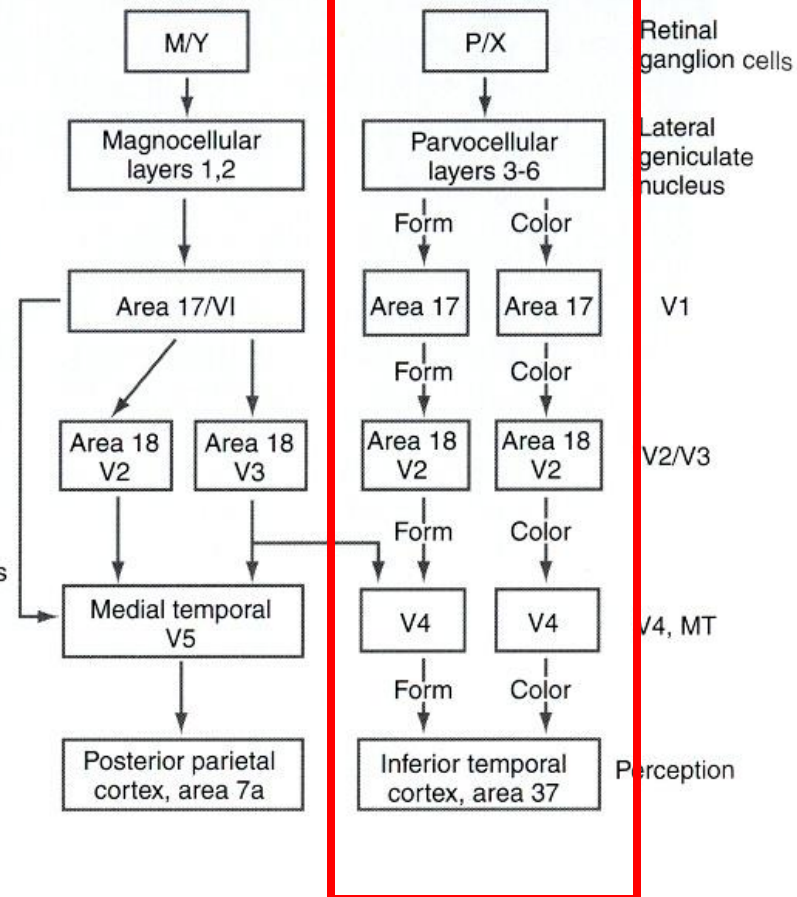
## Ventral "What" pathway

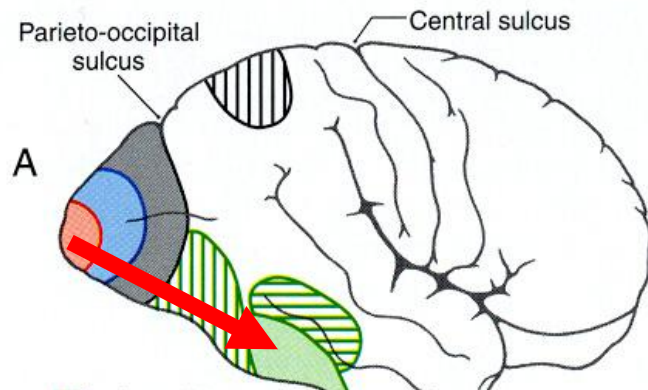
■ = Area 17  
■ = Area 37



■ = Area 21  
■ = Area 20  
■ = Area 7a

C



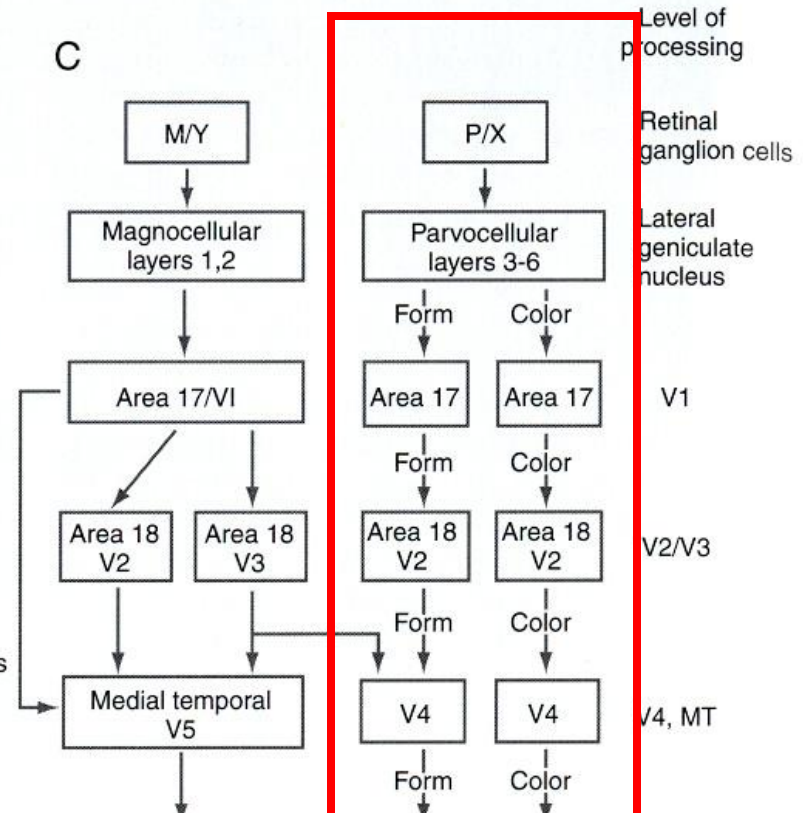


Ventral “What” pathway

■ = Area 18  
■ = Area 37



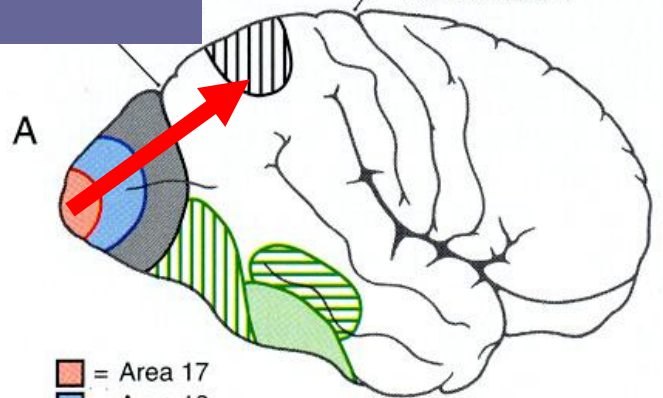
C



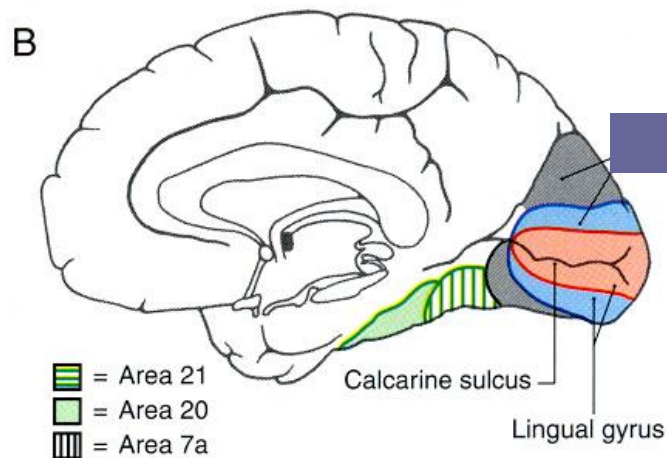
- Carries information about **static object properties** such as **colour, luminance, stereopsis and pattern recognition.**
- Slow pathway from P-ganglion cells (through laminae 3-6 of LGN, V1) to V2, V4 and **inferior temporal cortex**



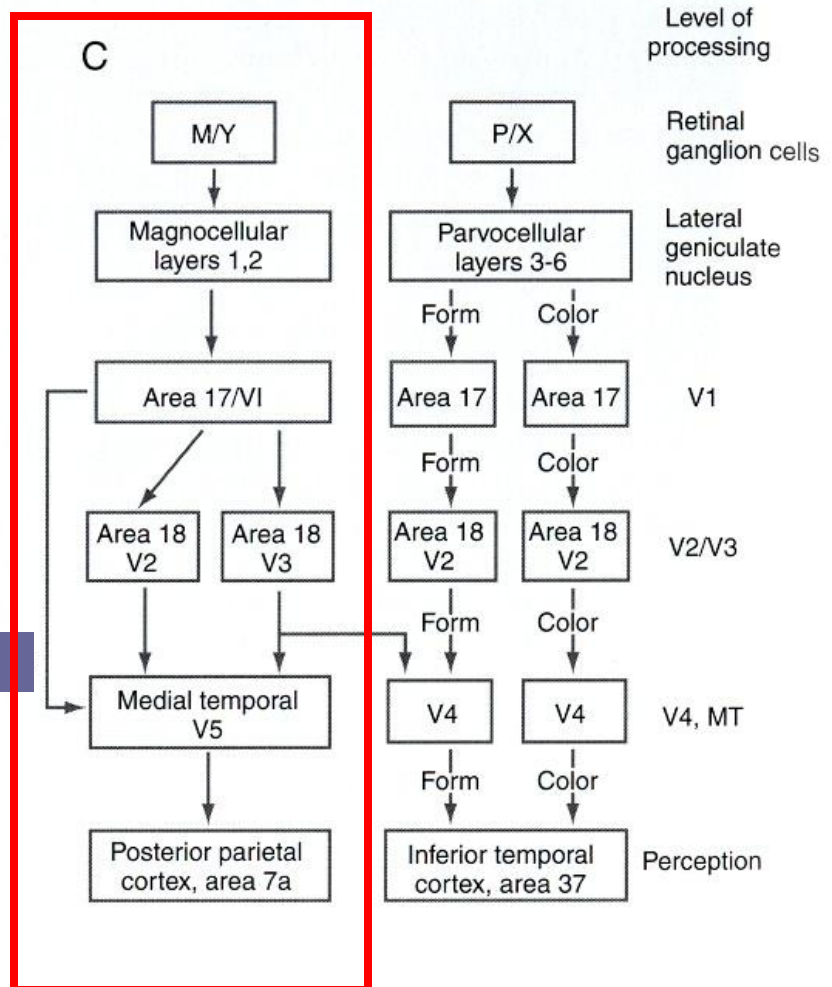
# Dorsal "Where" pathway



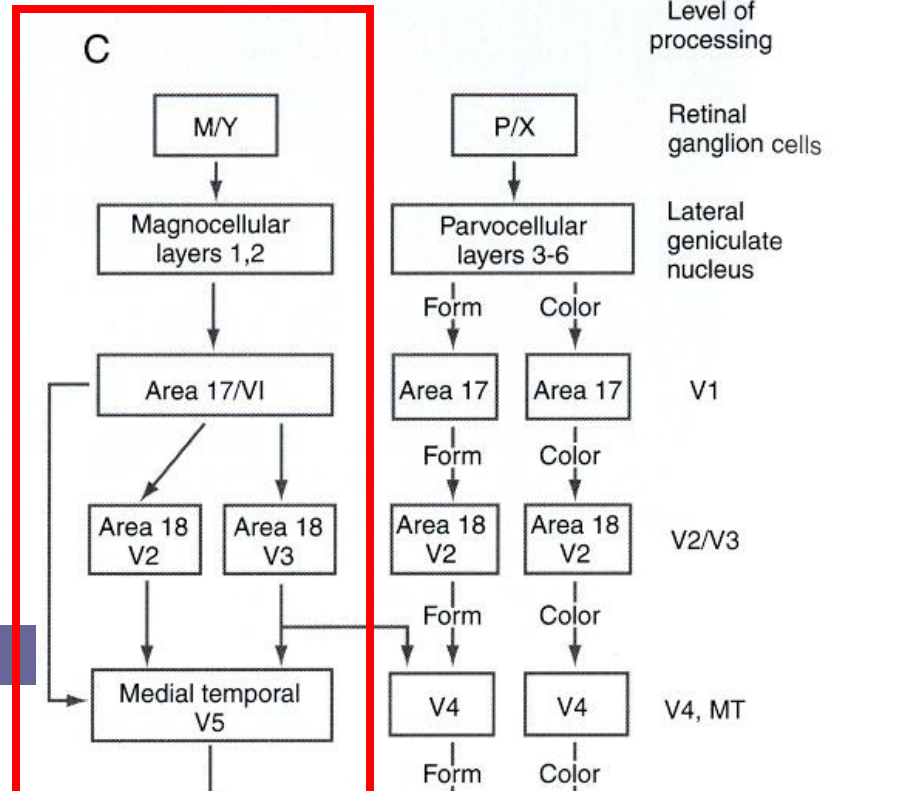
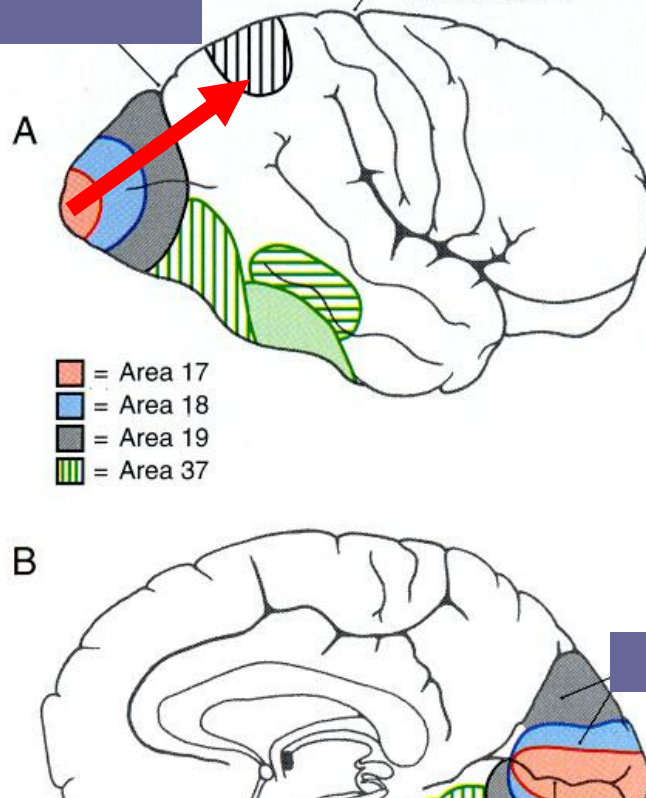
- = Area 17
- = Area 18
- = Area 19
- = Area 37



- = Area 21
- = Area 20
- = Area 7a



## Dorsal “Where” pathway



- Information about **dynamic object properties- motion and spatial relationships**
- Fast pathway for transient visual signals
- Pathway to V1, V2, MT, medial superior temporal and parietal lobe



# **VISUAL PATHWAY**

## Visual pathway:

Optic (II) nerve



Optic chiasm



Optic tract



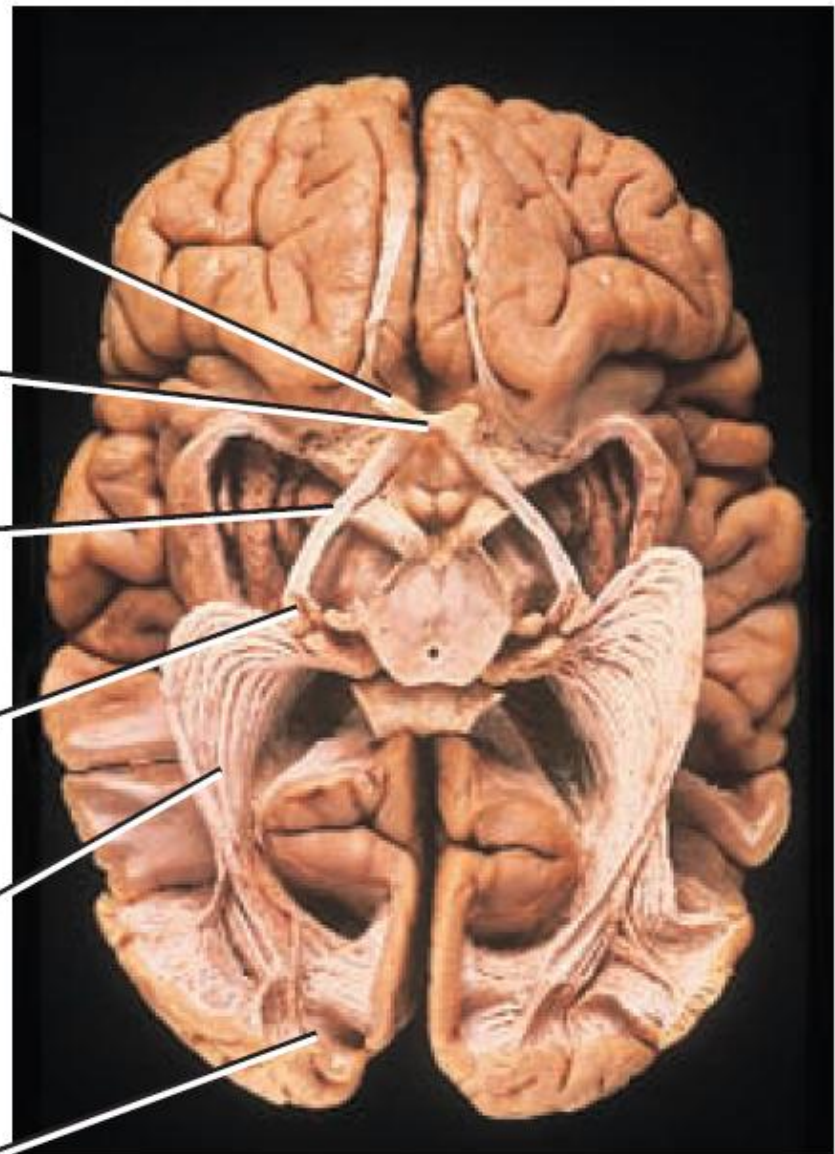
Lateral geniculate  
nucleus of thalamus



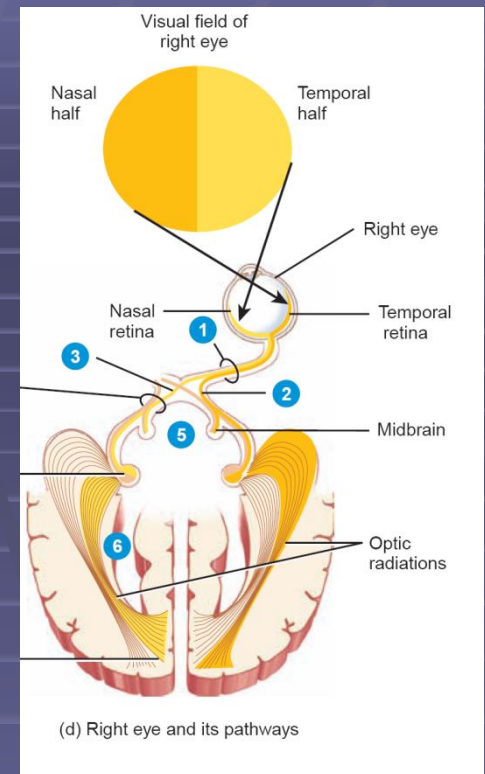
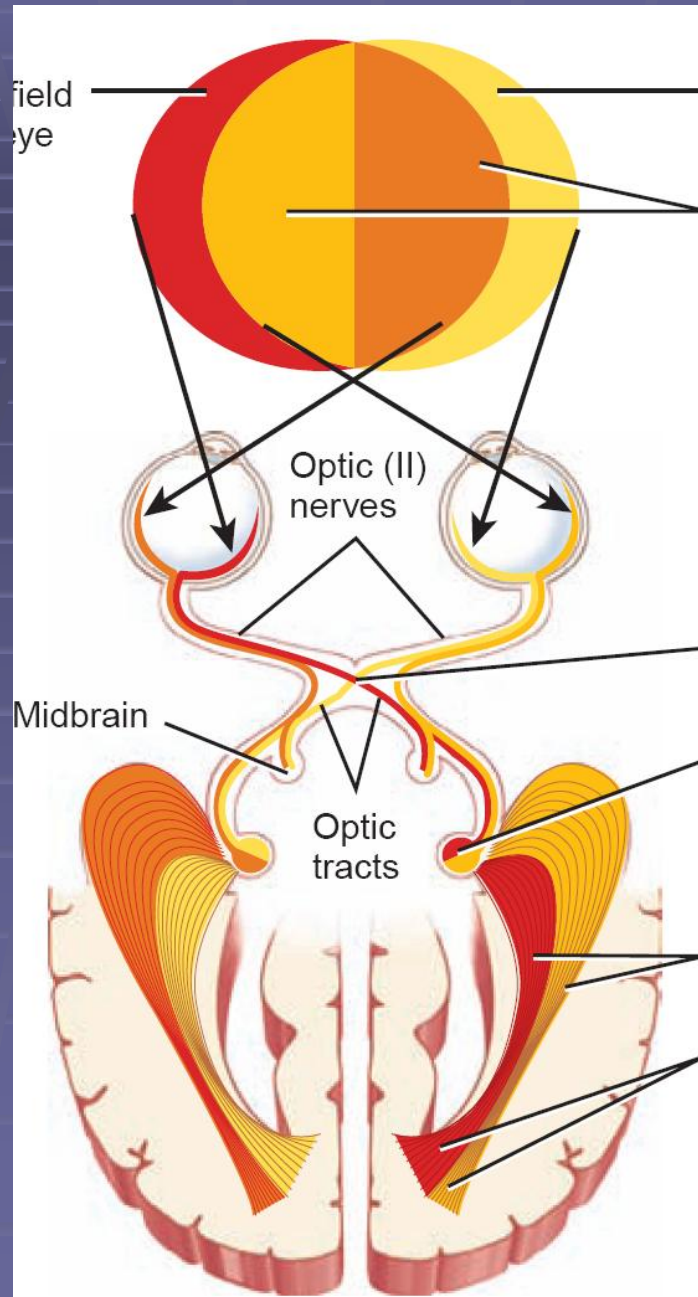
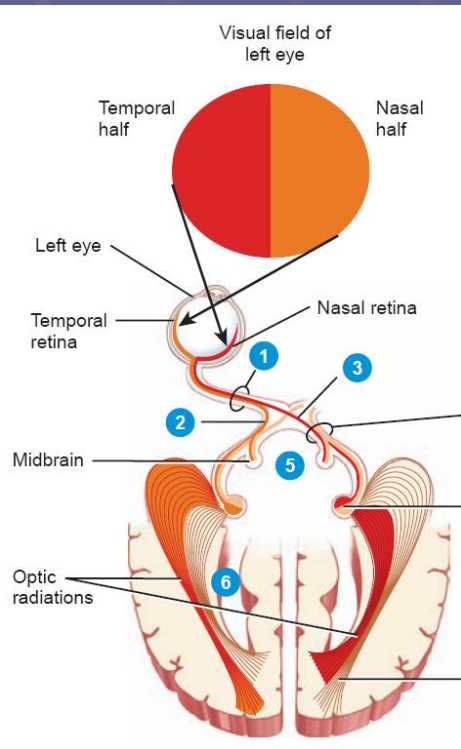
Optic radiations

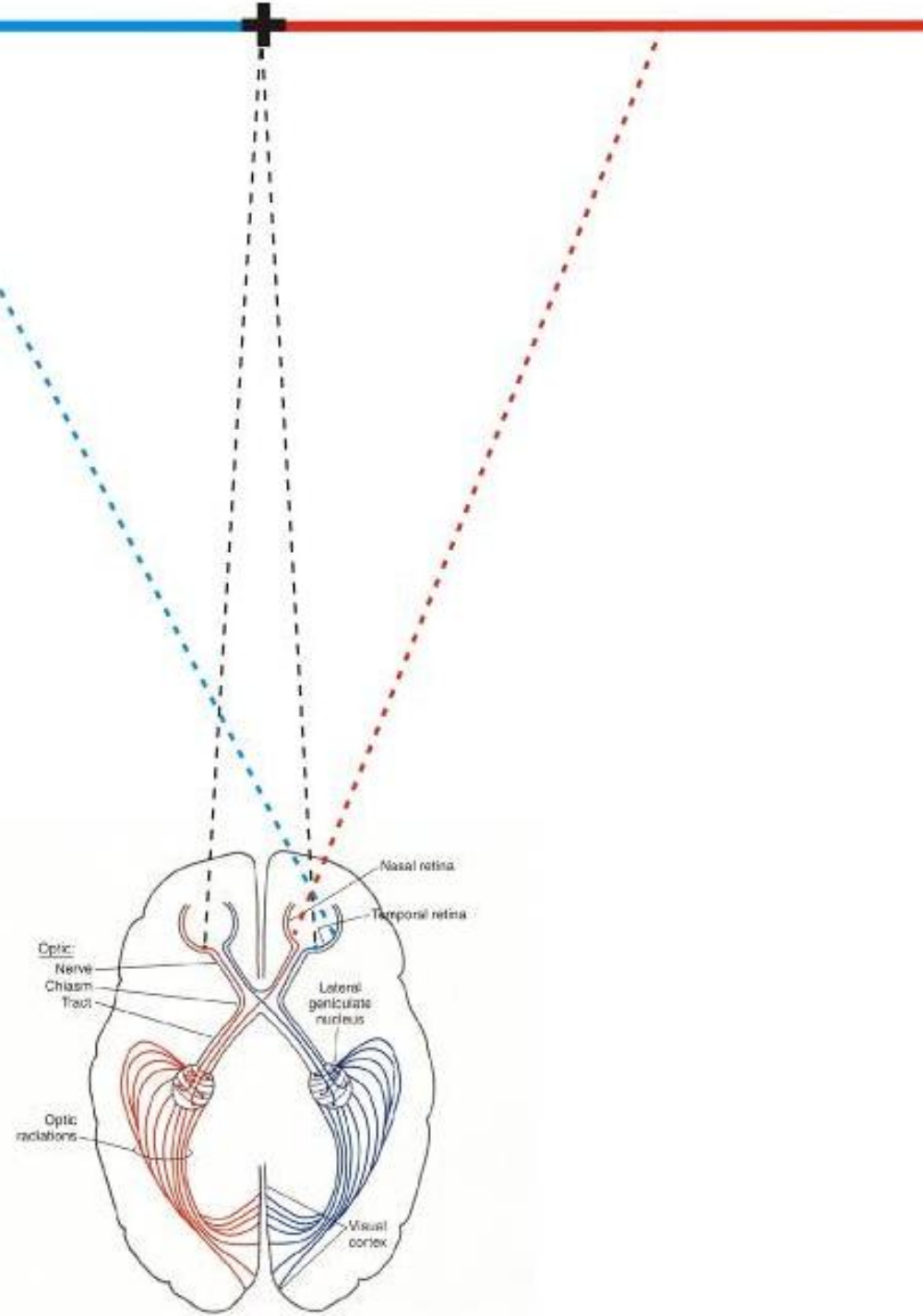


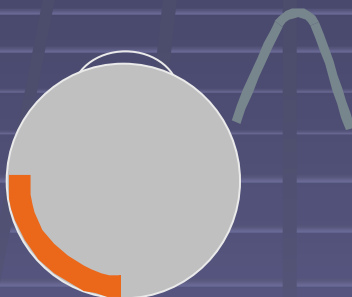
Primary visual area  
of cerebral cortex  
(area 17) in occipital  
lobe



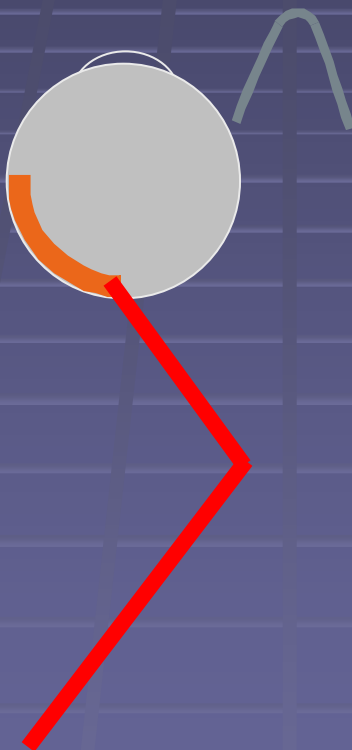
POSTERIOR

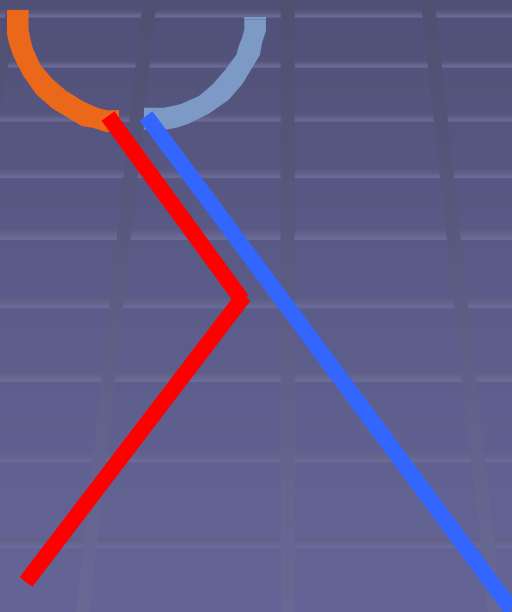


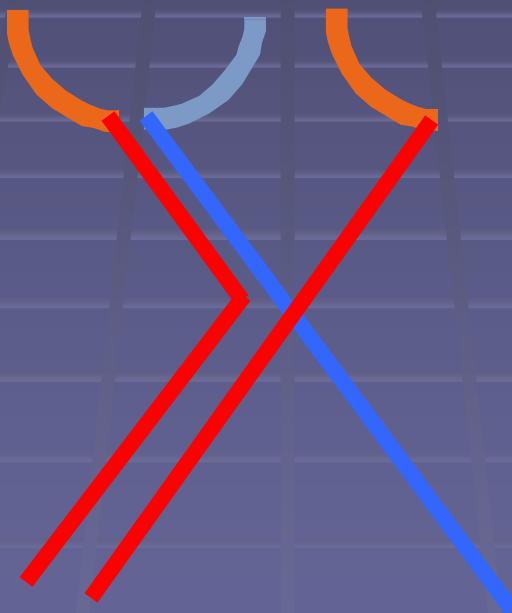


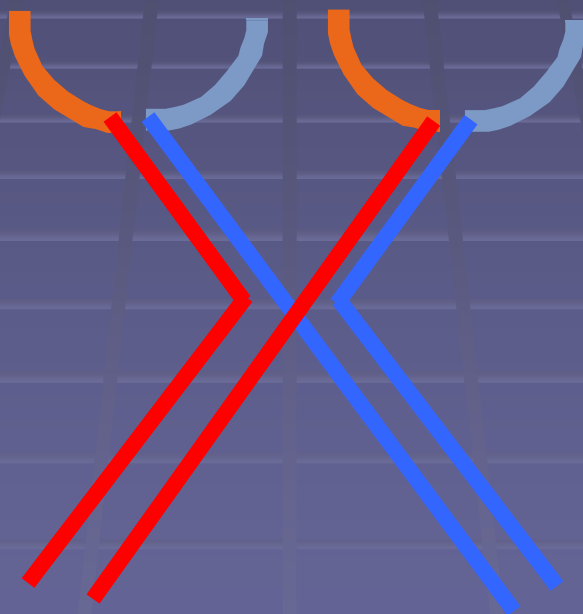




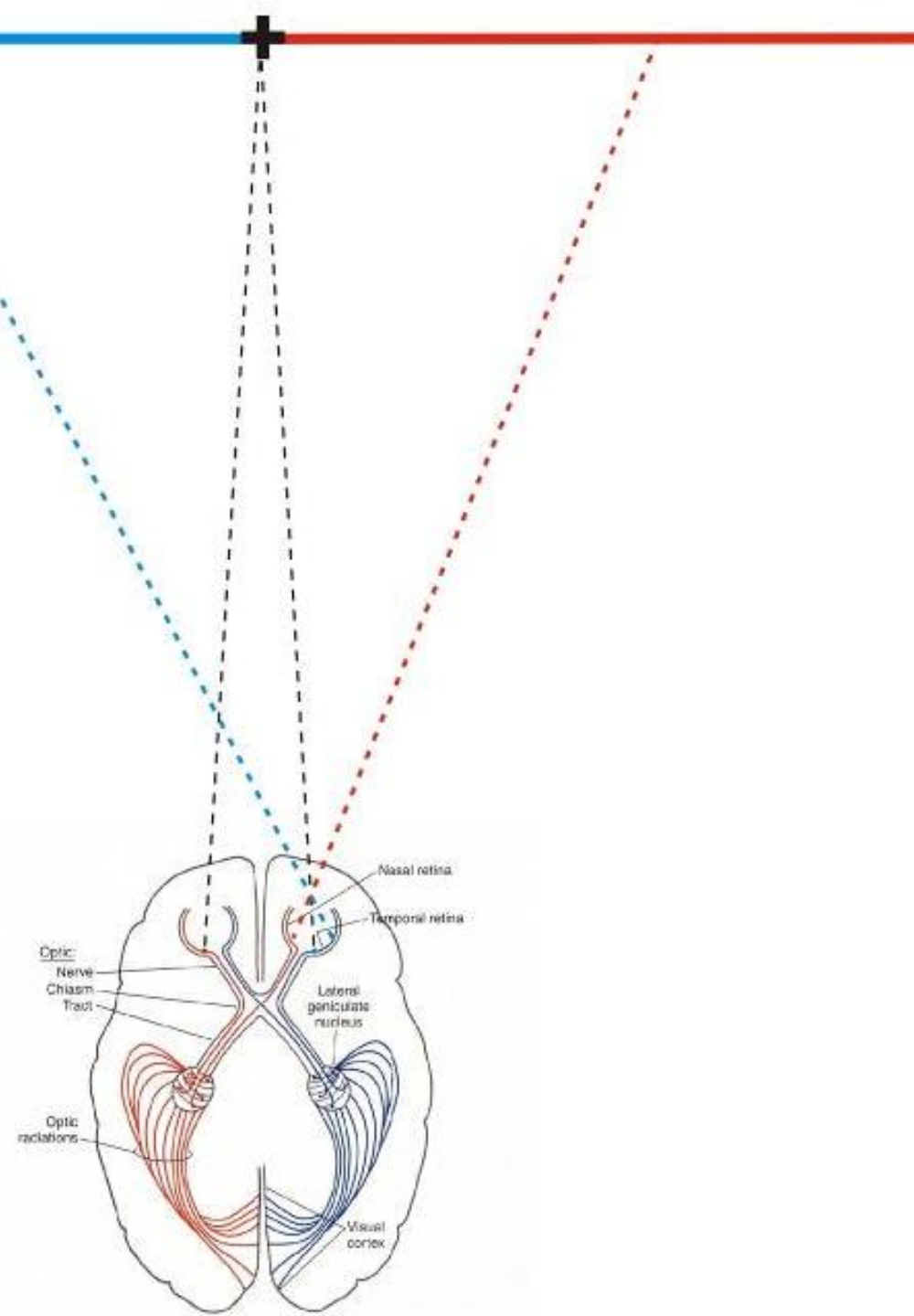


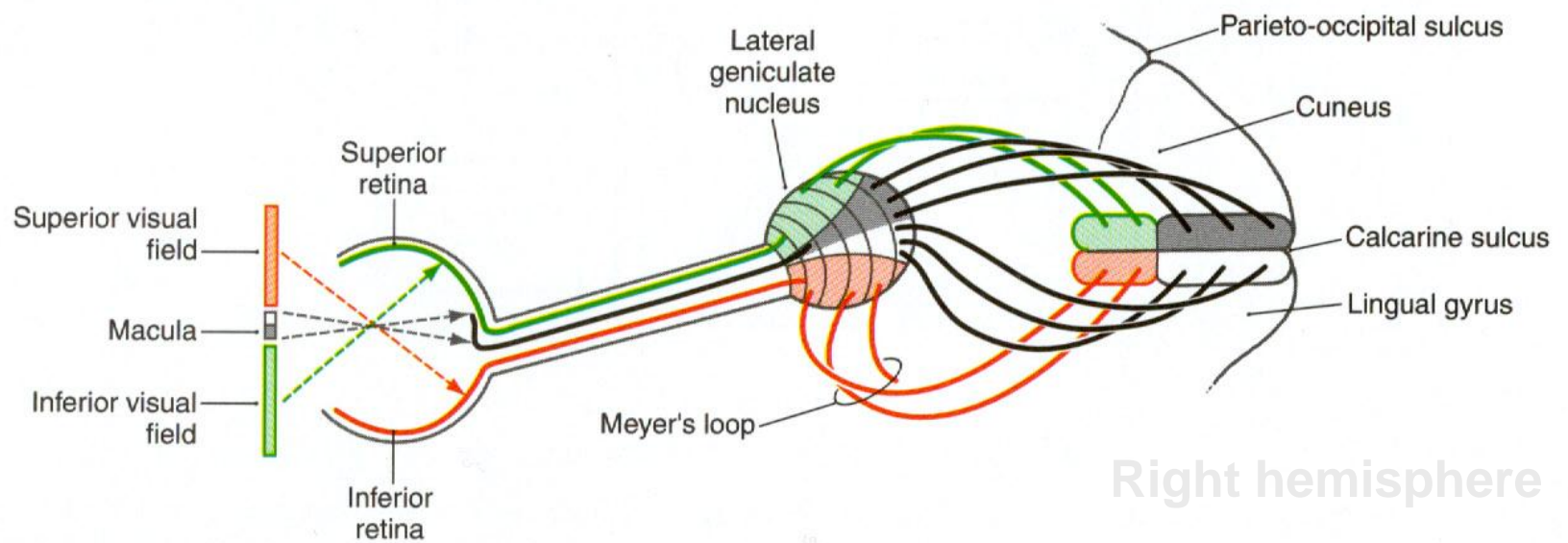




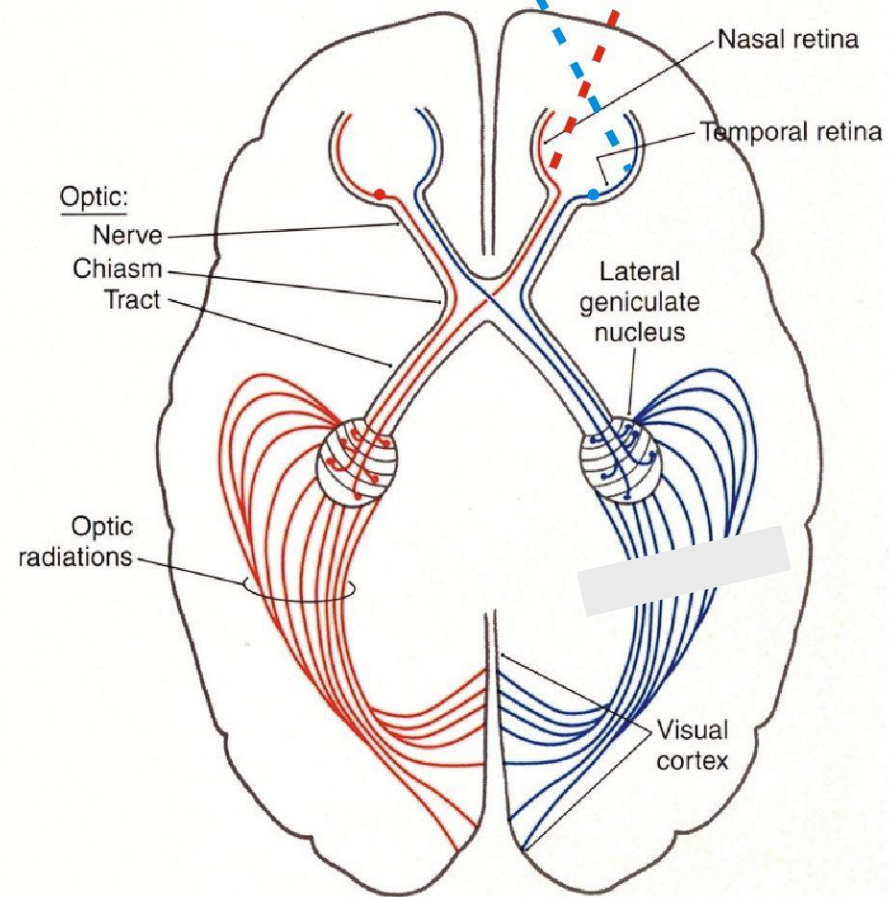








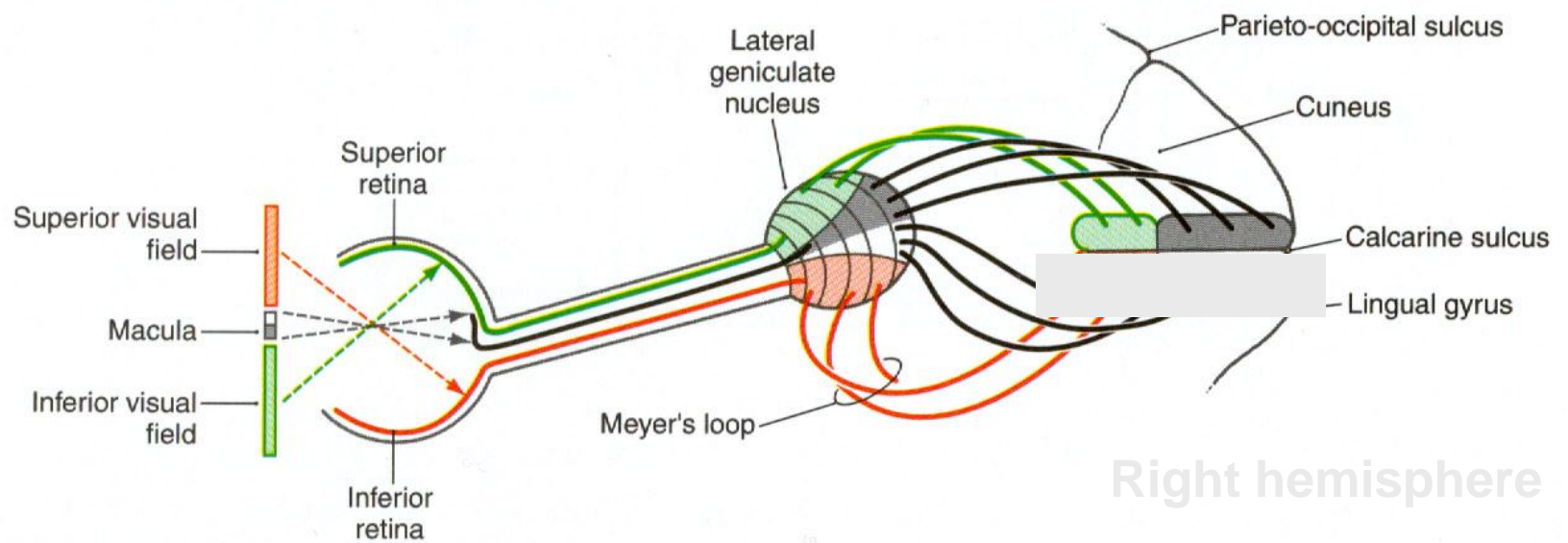
Right hemisphere



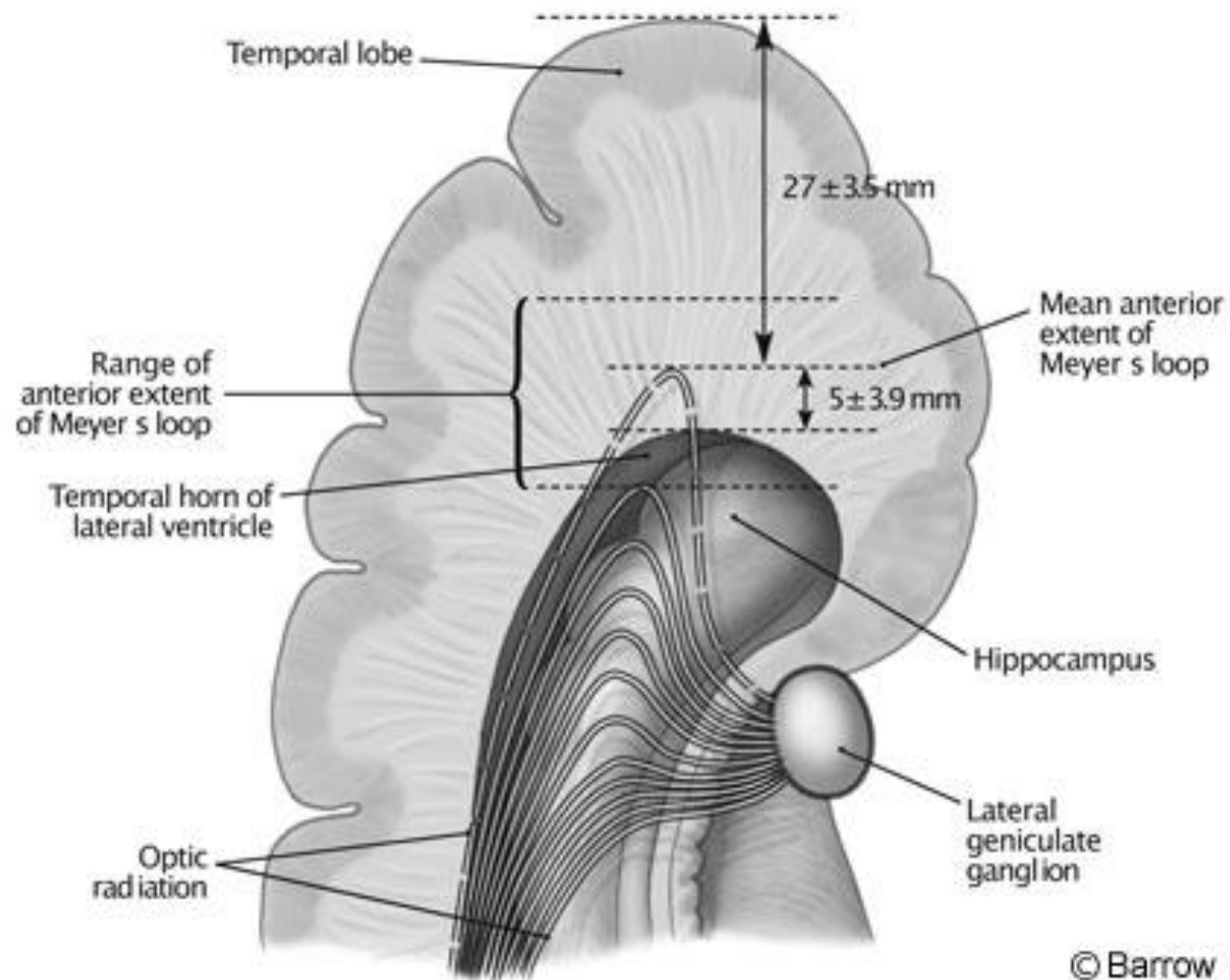
**Hemi - anopia**

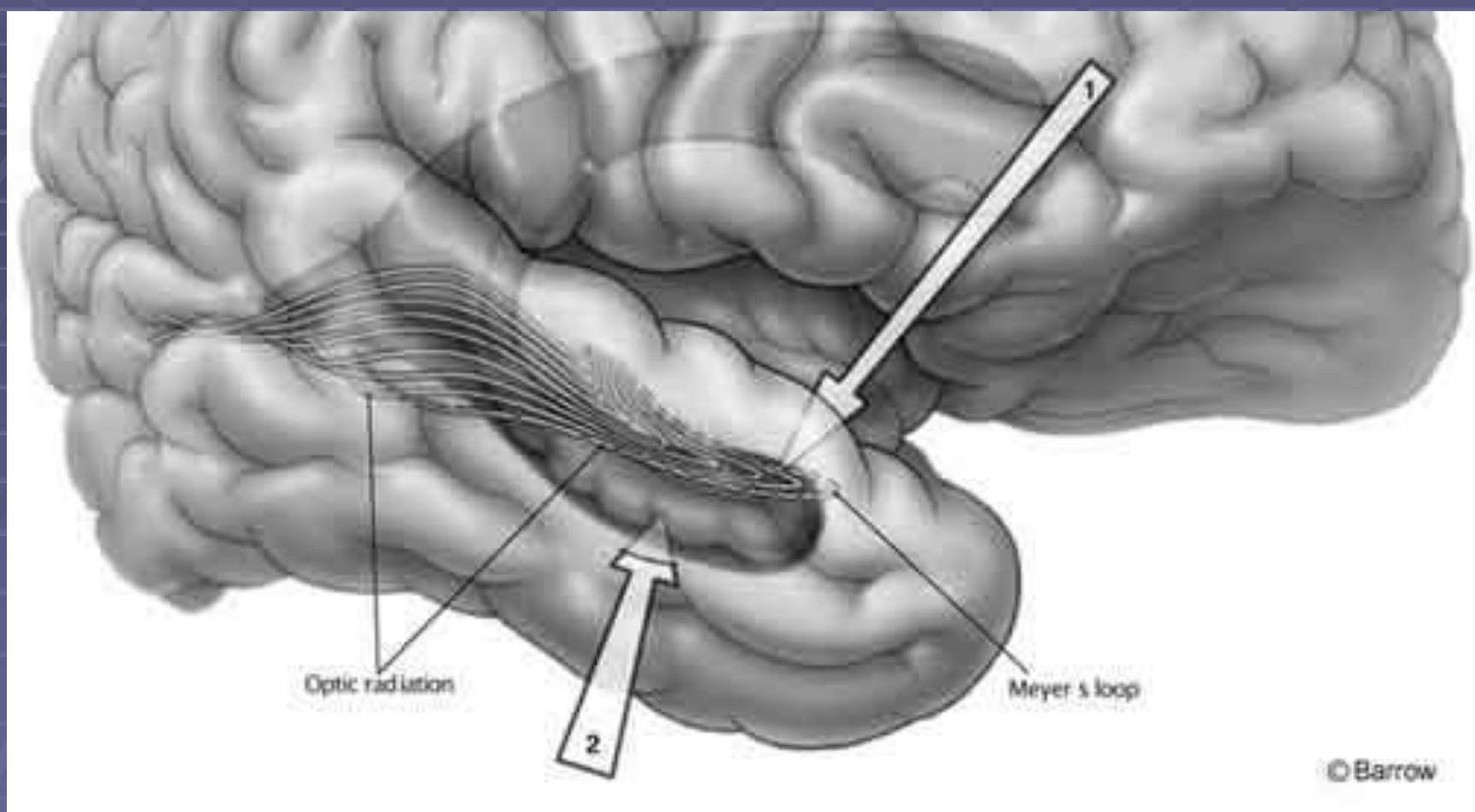






Right hemisphere

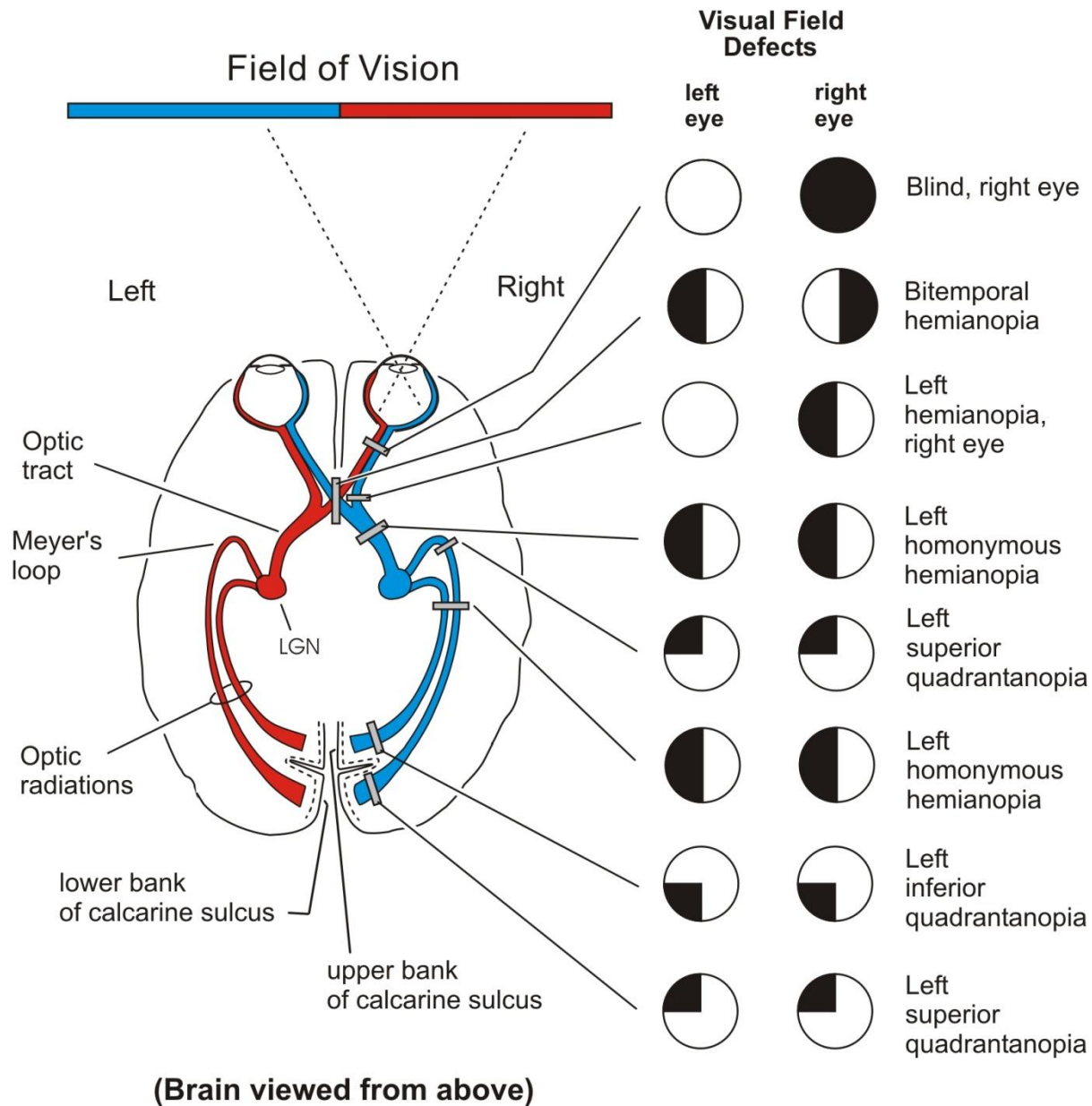




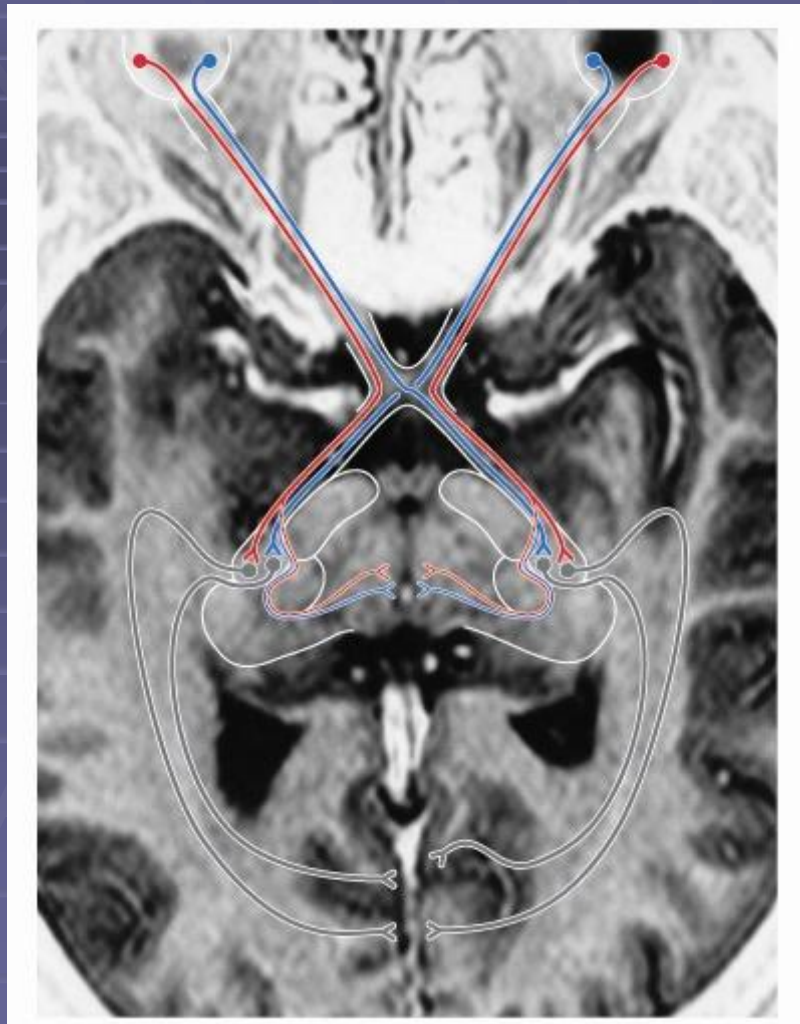
**Quadrant - anopia**





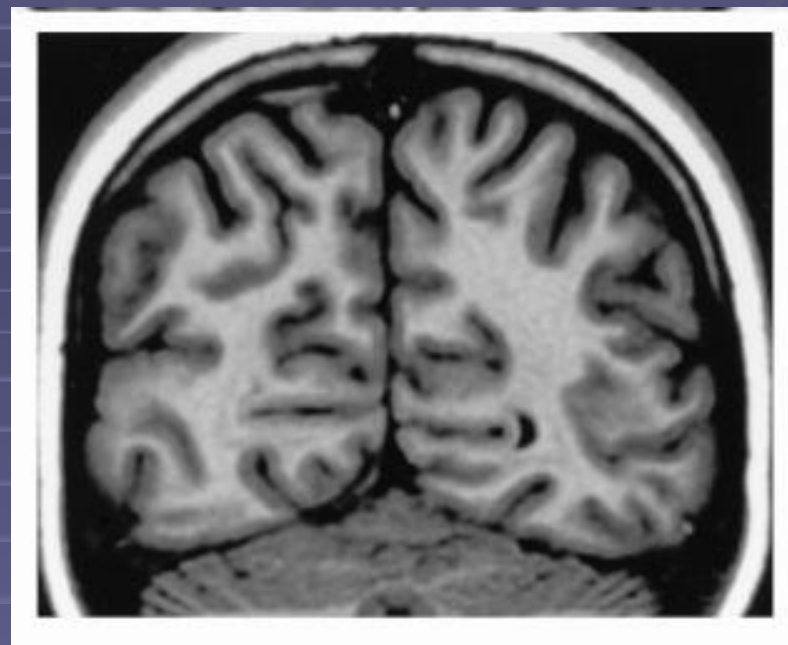






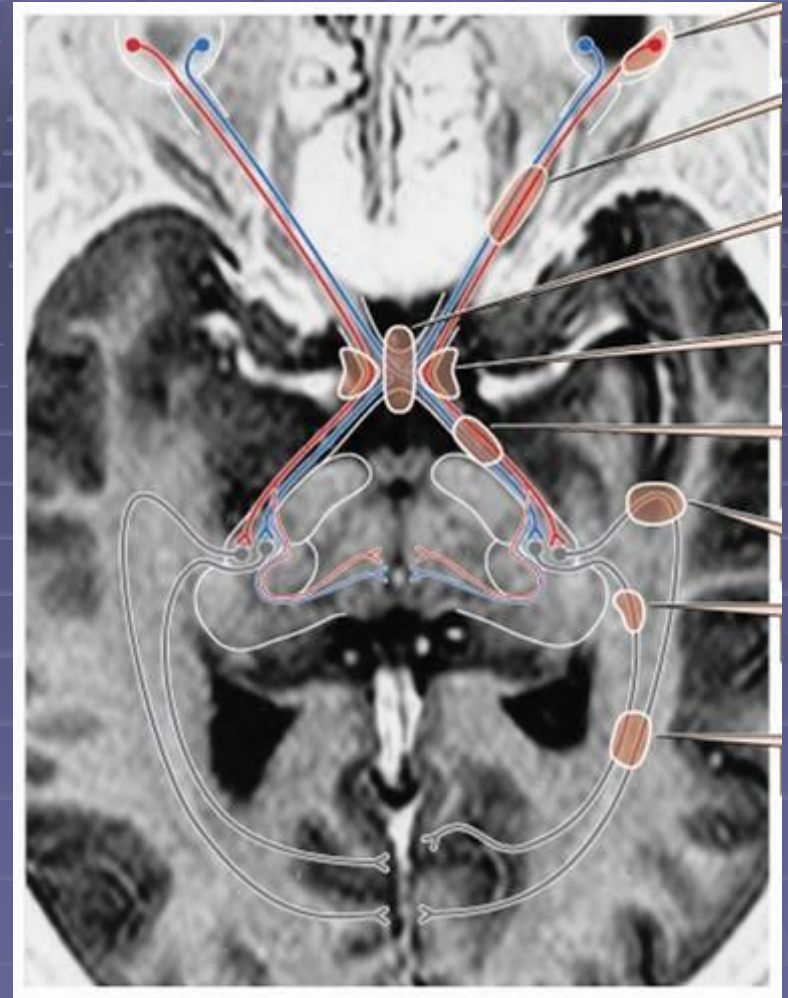
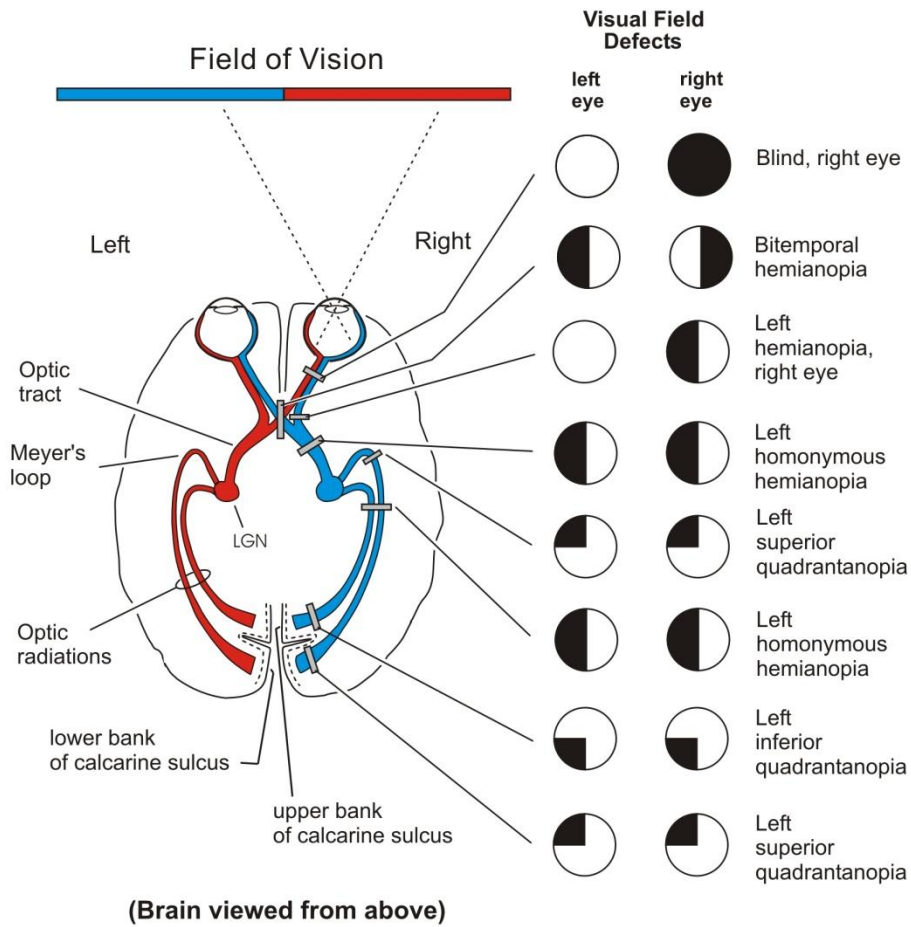
R

L



R

L

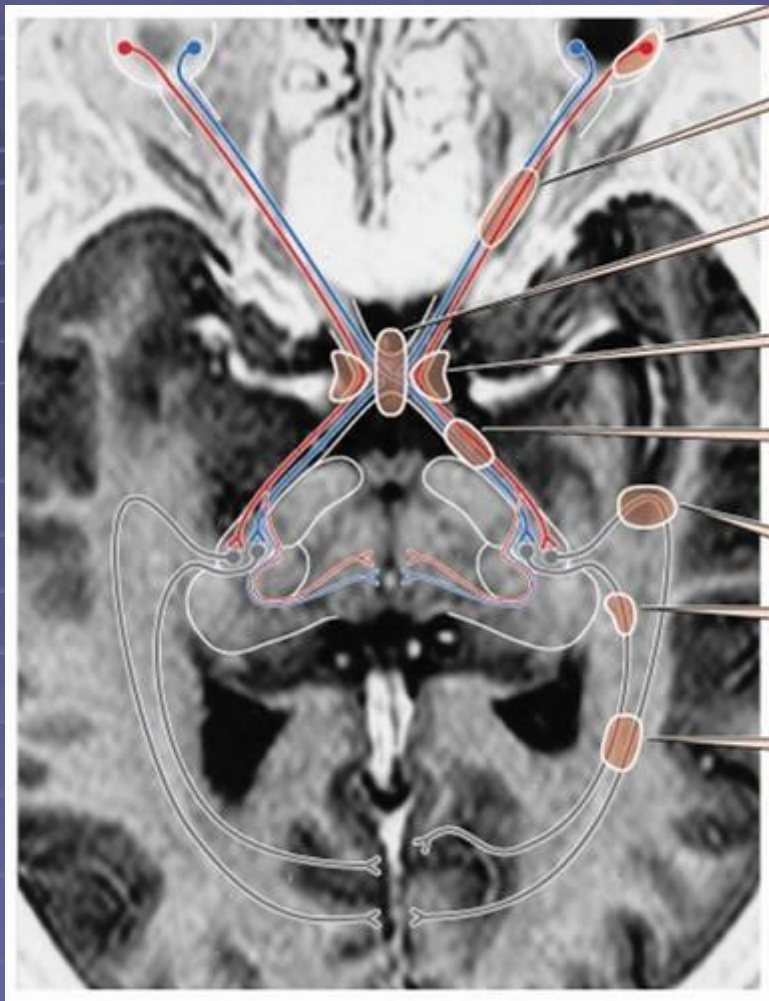


L

R

R

L



R

L



R

L