STRUCTURE AND PHYSIOLOGY OF THE EYE

10Feb10
Martini 10th: pp572-590

THREE LAYERS OF MATURE EYE (p 572)

1) FIBROUS TUNIC

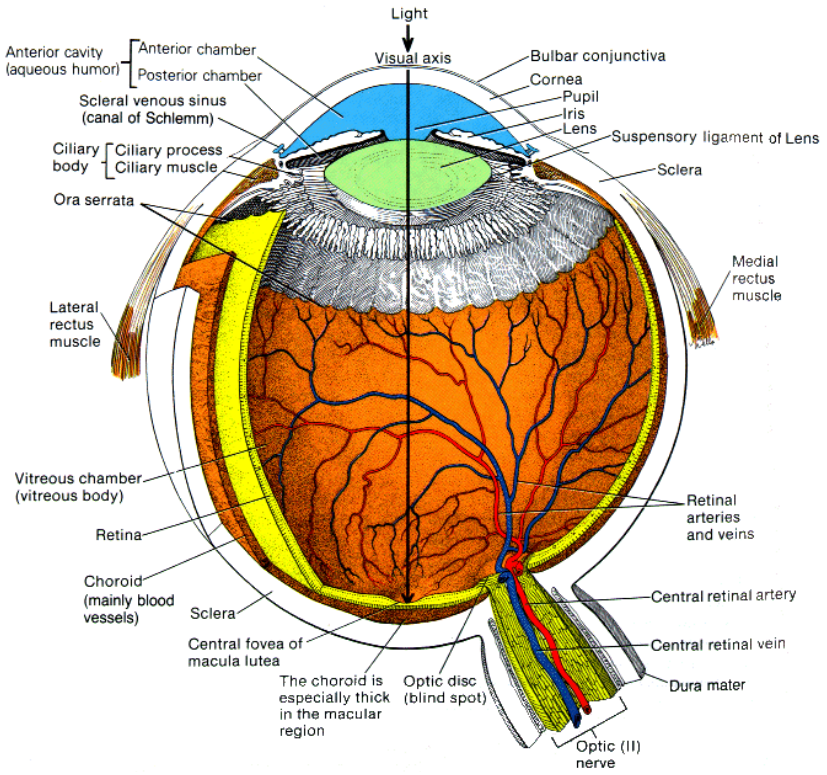
sclera	posterior 5/6ths	darkly pigmented, many vessels , the **limbus** is where it joins the cornea
cornea	anterior 1/5th	greater curvature than sclera, gets O_2 fr air, nutrients fr aqueous humor

2) VASCULAR TUNIC

choroid richly vascularized, outer dark, pigmented layer, cuboidal epithelial cells, reduces reflection

ciliary body

ciliary muscle	smooth m, regul lens shape
ciliary process	manuf. aqueous humor
iris	anterior portion of vascular tunic, muscular diaphragm
pupil (p 574)	adjusted by constrictor (Psymp) and dilator muscles (symp)



3) NEURAL TUNIC (576)

Retina: two layers:

pigmented layer	thin outer single layer of cuboid epithelium, in direct contact with the choroid	
nervous layer	inner of rods & cones, neural interconnections connect with optic nerve	
optic disc	blind spot	where axons exit, circulatory system enters and exits
macula lutea	optic center	yellowish disc, center of it is **fovea centralis**, conc of cones

LENS outer epithelial layer, enveloping protein capsule inside thick gel-like fluid: 25%protein, 10% lipid

Cataract defective metabolism of lens, reducing agent glutathione may help.

Astigmatism irregularities of lens or cornea

Lens held in place by **suspensory ligaments**, tied to **ciliary muscle**

ANTERIOR CAVITY two chambers : **anterior chamber**, **posterior chamber** (p 578)

5-6 mL/day, filled with **aqueous humor** nourish the cornea

Canal of Schlemm drains back to the blood stream: intraocular pressure:

glaucoma hyper intraocular pressure, presses on optic nerve and blood vessels

POSTERIOR CAVITY filled with **vitreous humor**, transparent, semifluid, jelly-like

PHOTORECEPTORS: retina has highest O_2 consumption in body (p 583)

	resolving power	sensitivity	function	number/retina
Rods:	Low	high	B&W	125 mil/retina
cones:	high	low	color	7 mil/retina

Auxiliary pigments in cones: **erythrolabe; chlorolabe; cyanolabe**

fovea centralis, **macula lutea** high conc. of cones:

resolving power high, sensitivity low.

Neural arrangement:

many rods per bipolar, many bipolar per ganglion low resolv, high sens
perhaps single cone per bipolar, single per ganglion, high resolv, low sensitivity

Rhodopsin: complex of opsin and *cis* retinal (586)

light converts *cis* to *trans* retinal, dissociation of rhodopsin

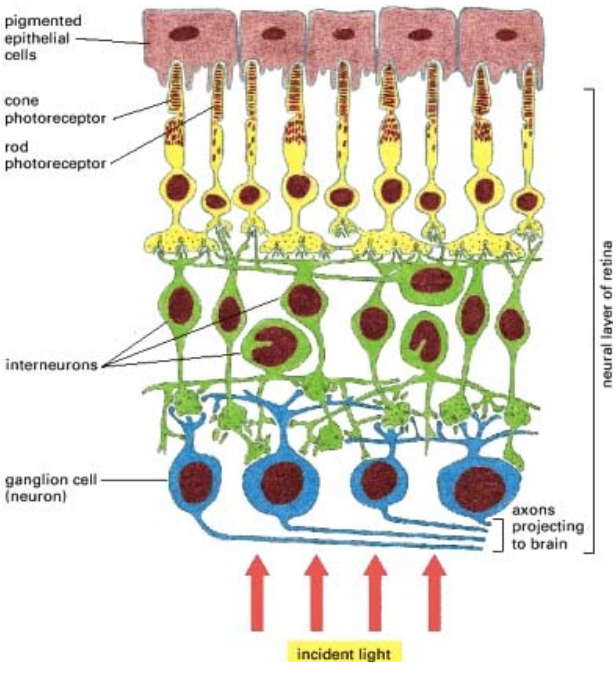
dissociation causes generation of a nervous impulse.

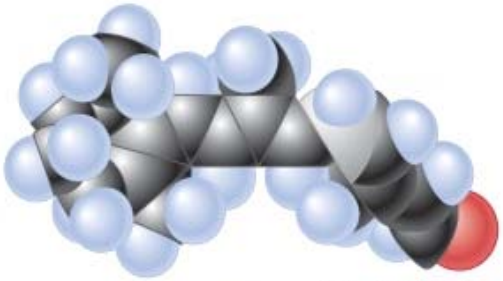
uses ATP to convert *trans* back to *cis* retinal

Inadequate vitamin A leads to night blindness

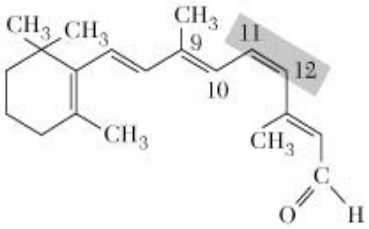
Three kinds of visual accommodation:

1) pupil, for adjusting quantity of light to retina
2) conversion of trans to cis retinal in the dark: dark adaptation
3) lens, for focusing near or far



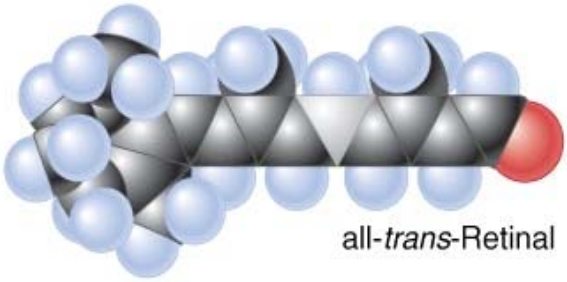


11-*cis*-Retinal

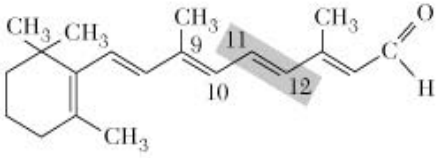


11-*cis*-Retinal

Light



all-*trans*-Retinal



all-*trans*-Retinal

Here is an excellent video of the whole sequence leading to the perception of light. It will get challenging when they talk about the chemical processes ultimately leading to a nervous impulse... But my students should be able to understand many of the stages of the process:
https://www.youtube.com/watch?v=AuLR0kzfwBU