

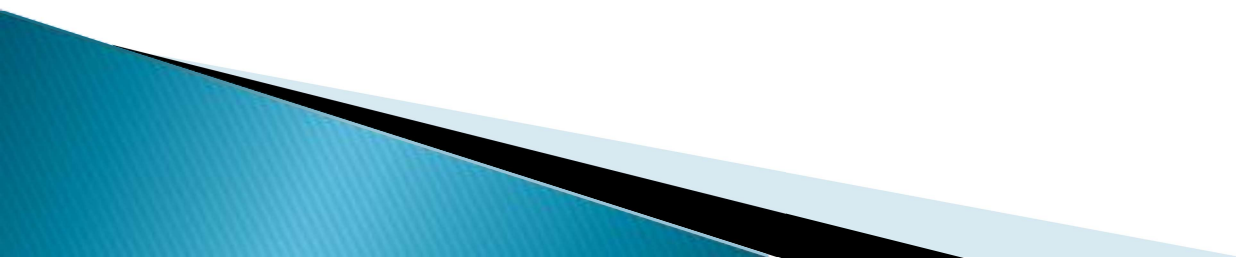
# Clinical Ocular Concepts for Opticians, Technicians, and Ancillary Staff

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Vision Expo East 2022

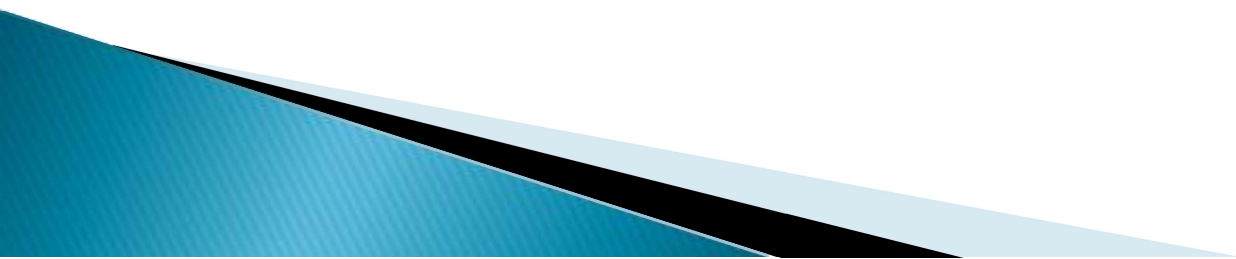
# Financial Disclosure

- ▶ The speaker has no financial interests or relationships to disclose.



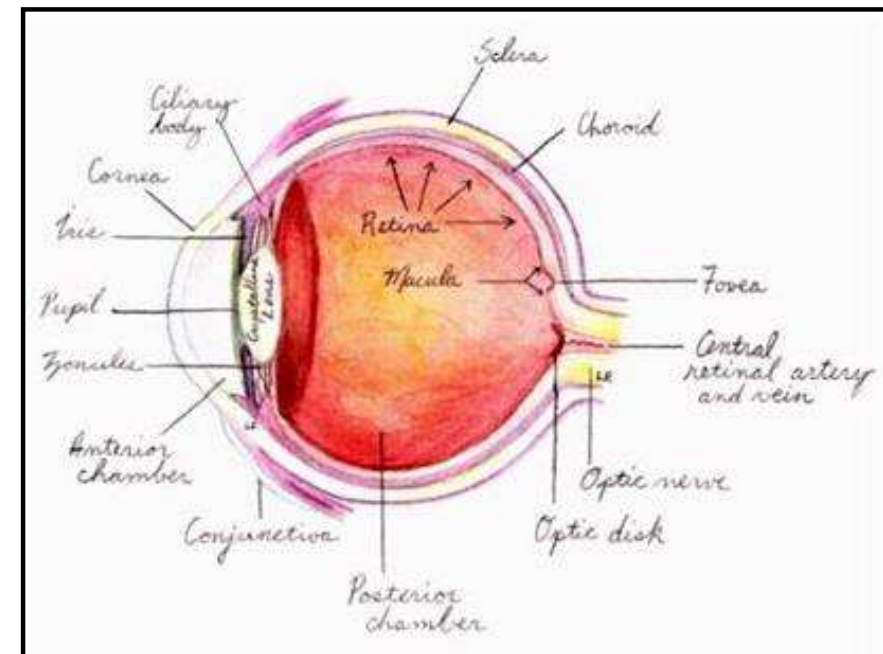
# In every ophthalmic practice

- ▶ Basics that every member should know
  - Normal anatomy and function
  - What can go wrong
  - Signs and symptoms of emergency conditions
  - Why the docs do what they do
  - What patients should know about their eye care
  - Understanding of in-office tests
  - Commonly prescribed meds and their functions



# Goals

- ▶ Basic anatomy and physiology of the eye
  - What are the structures and what do they do
- ▶ Ocular pathology
  - What can go wrong
- ▶ Clinical signs and symptoms
  - What the patient experiences
  - Examination techniques
- ▶ Treatment of disease
  - Medical, surgical, refractive
- ▶ Terminology



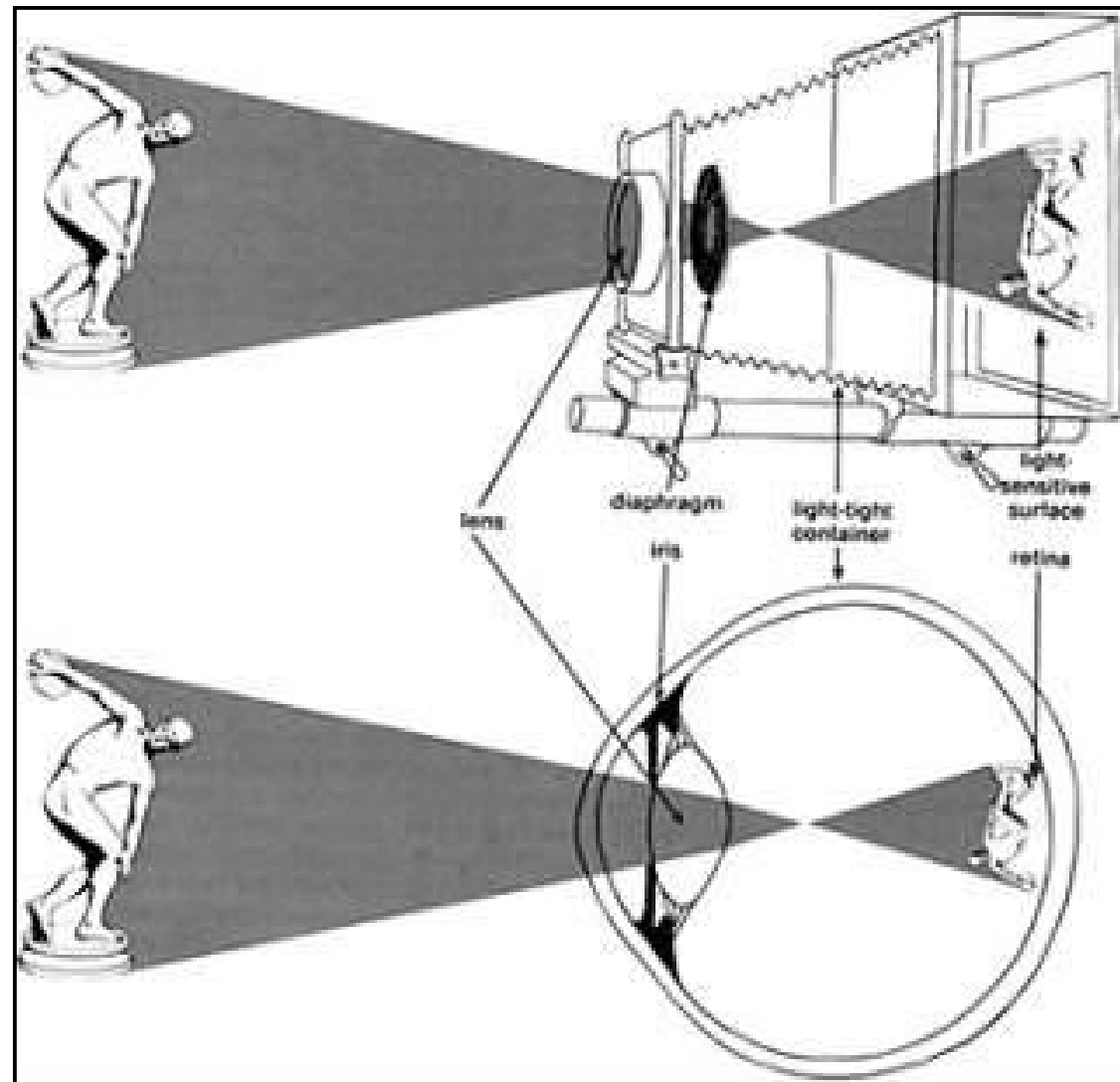


# Terminology (abbreviations)

- ▶ OD – right eye
- ▶ OS – left eye
- ▶ OU – both eyes
- ▶ IOP – intraocular pressure
- ▶ RD – retinal detachment
- ▶ PVD – posterior vitreous detachment
- ▶ VA – visual acuity
- ▶ ET – esotropia
- ▶ XT – exotropia
- ▶ IOL – intraocular lens
- ▶ POAG – primary open angle glaucoma
- ▶ SLT – selective laser trabeculoplasty
- ▶ ION – ischemic optic neuropathy
- ▶ NAG – narrow angle glaucoma
- ▶ BIO – binocular indirect ophthalmoscope
- ▶ NV – neovascularization

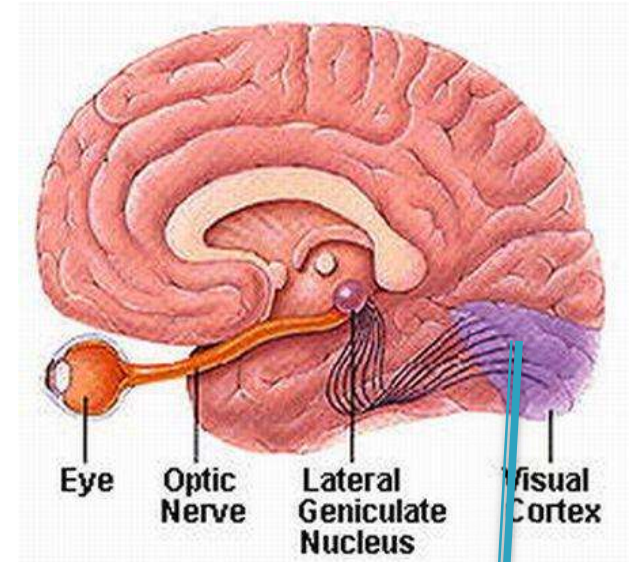
# The eye works like a camera

- ▶ The cornea and crystalline lens are like the lens of a camera
- ▶ The iris is like the f-stop
- ▶ The retina is like the photographic film



# The visual pathway

- ▶ Information from the retina travels along the optic nerve to the occipital lobe of the brain
- ▶ Like the film processing center
- ▶ Half of the brain is involved with vision



# Ocular adnexae



Eyelids

Eyelashes

Lacrimal system (tear ducts)

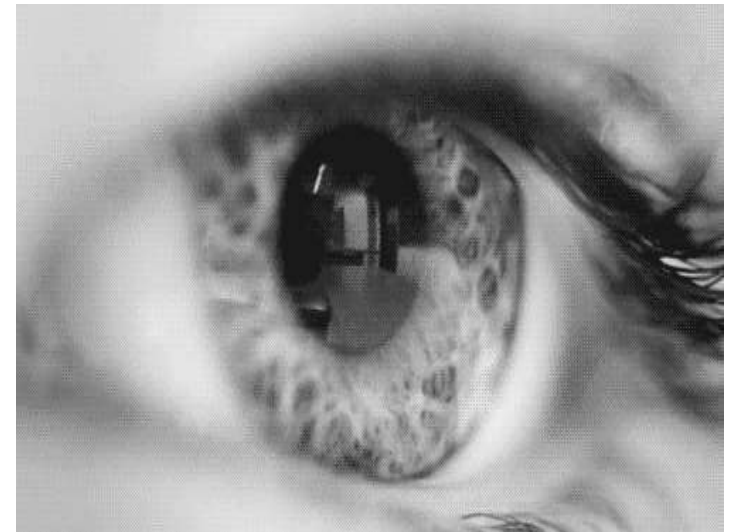
Conjunctiva

Tear film

## Protection

# Eyelids

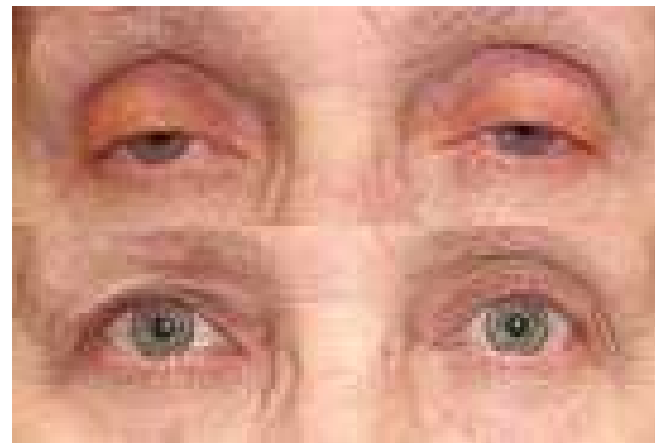
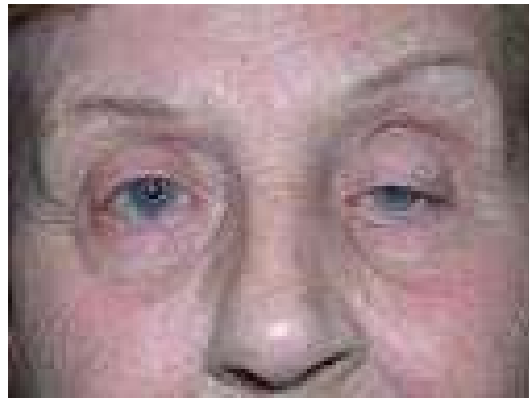
- You blink about 10,000 times a day
- Speed of a single blink is 100 to 400 milliseconds
- We blink 15 – 20 times per minute
- The thinniest skin in the body
- Eyelid surgery is called a blepharoplasty – cost, about \$2500
- Blinking offers a period of wakeful rest so that our brains can focus
- Blinking lubricates the cornea by spreading tears onto the surface





# Eyelid disorders

- ▶ Ptosis – drooping lid



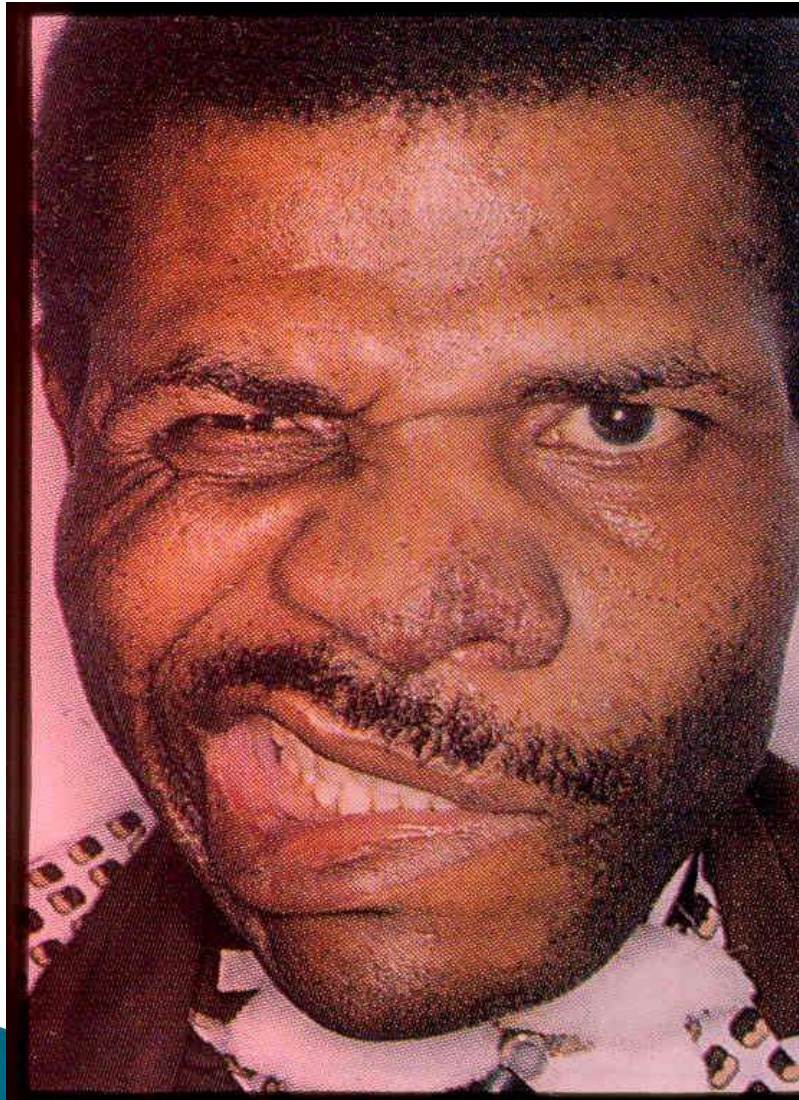
# Eyelid disorders

- ▶ Lagophthalmos – incomplete closure
- ▶ 7<sup>th</sup> cranial nerve palsy (Bell's palsy)





# 7<sup>th</sup> Nerve Palsy





# Eyelid Disorders – thyroid disease



- Bilateral lid retraction
- No associated proptosis



- Bilateral lid retraction
- Bilateral proptosis



- Unilateral lid retraction
- Unilateral proptosis



- Lid lag in downgaze

# Eyelid disorders – cellulitis

- ▶ Preseptal – local infection spread from skin, sinus, or tear duct; bug bite, trauma
- ▶ Orbital – infection spread to eye socket; decreased vision and motility, pain; life-threatening



# Eyelid disorders

## Entropion



## Trichiasis



## Ectropion



## Blepharitis



### Seborrheic



### Meibomian Gland Dysfunction



# Eyelid disorders

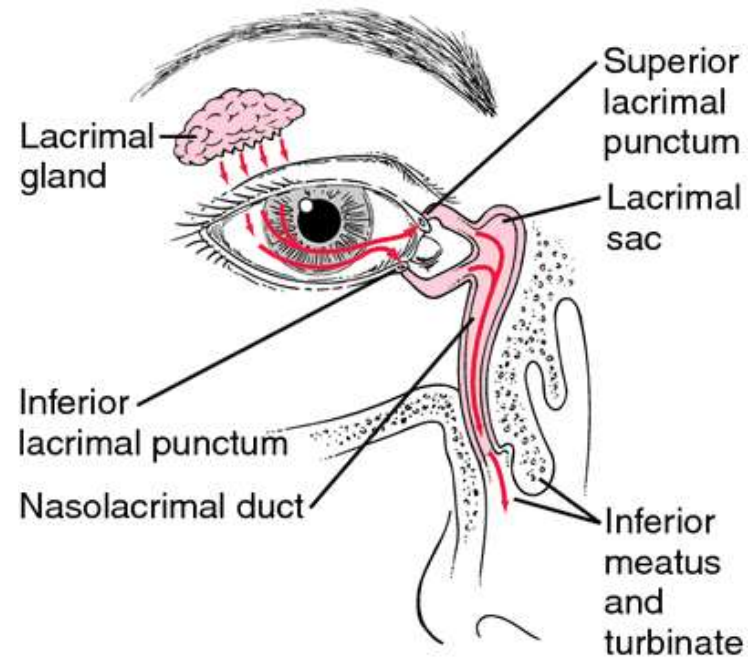
- ▶ Internal hordeolum (stye): acute inflammation
  - Painful, tender
  - Hot compresses
  - Antibiotic ointment
- ▶ Chalazion: chronic inflammation – blockage
  - Nontender
  - Amblyogenic in infants
  - Surgical I & D
  - Steroid injection



# Pre-corneal tear film

- ▶ 3 layers

- Outer – meibomian
- Middle – aqueous
- Inner – mucin



- ▶ Blockage of tear outflow results in tearing (epiphora)
- ▶ Deficiency of any of the layers results in DRY EYE SYNDROME (bad name)

# Dry Eye Syndrome

## ▶ Symptoms

- Tearing!
- Dry, gritty sensation
- Fluctuating vision

## ▶ Causes

- Sjogren's, RA
- Blink abnormalities
- Medications
- Environmental factors
- Contacts, LASIK

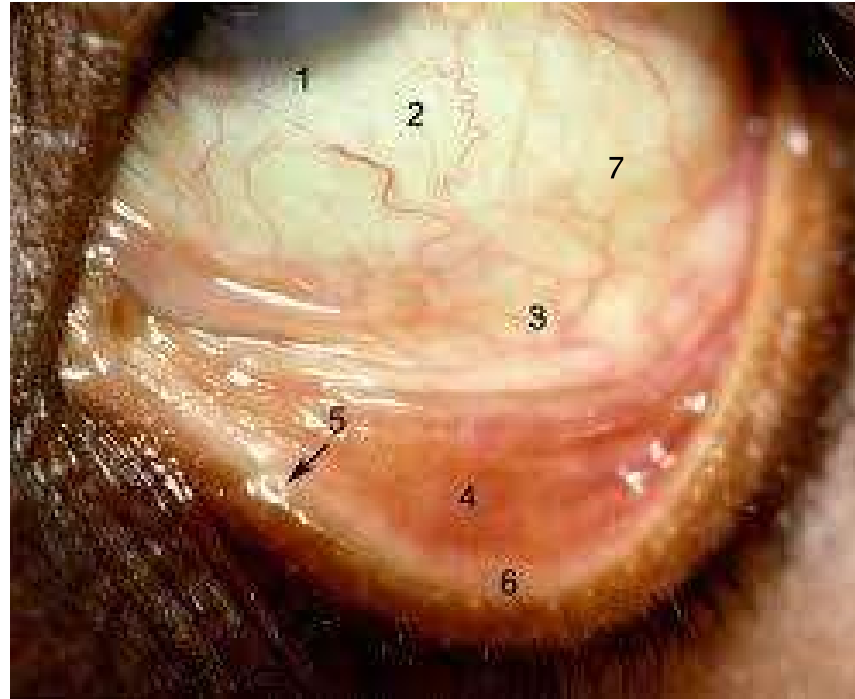


## ▶ Treatments

- Artificial tears
- Restasis
- Nutritional supplements
- Meibomian expression
- Punctal occlusion

# Conjunctiva and Sclera

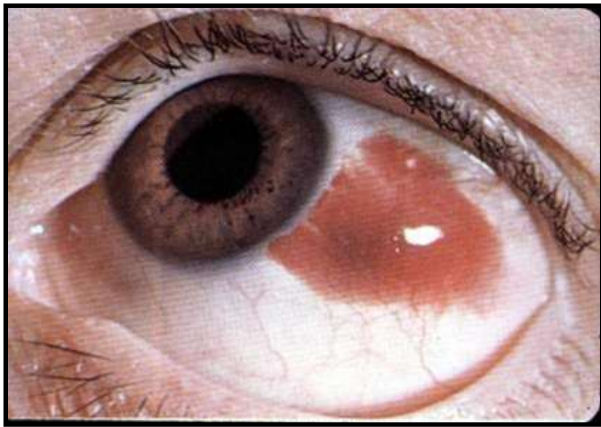
- ▶ Outer coats of the eye
- ▶ Serve protective function
- ▶ Sclera and the clear cornea are same cells arranged differently



1. Limbus
2. Bulbar conj
3. Fornix
4. Palpebral conj
5. Punctum
6. Gray line
7. Sclera

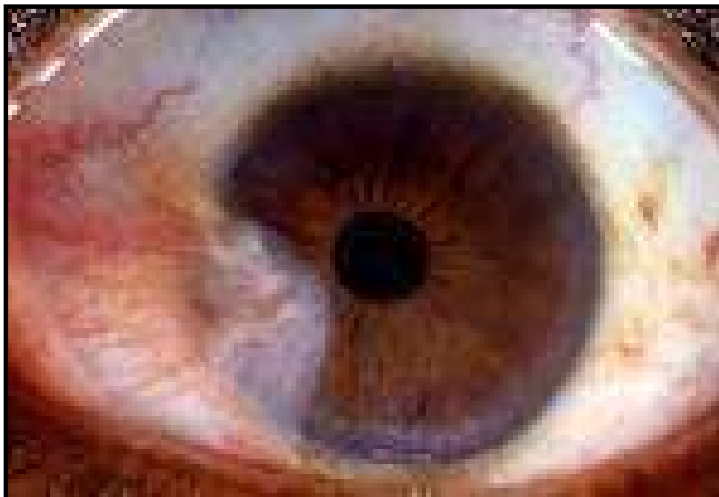
# Conjunctival disorders

- ▶ Subconjunctival hemorrhage



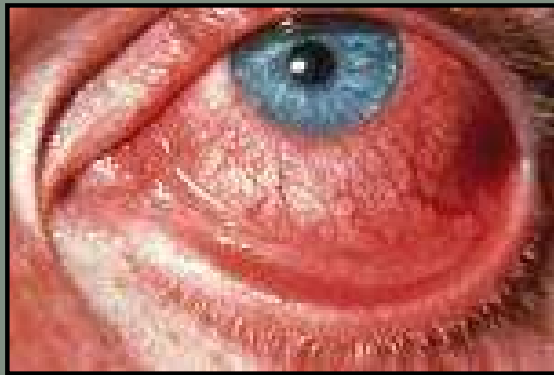
- ▶ Pingueculum

Pterygium





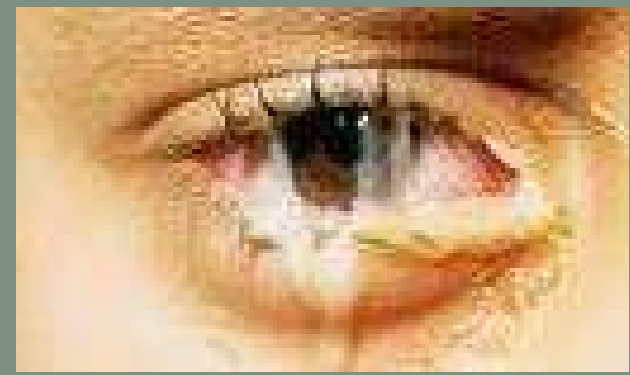
# Conjunctivitis – “Pink Eye”



Viral = clear discharge,  
URI, contagious;  
supportive care



Allergic = giant  
papillary, itch;  
antihistamines,  
steroids



Bacterial=  
green/yellow  
discharge, antibiotics

# Scleritis

- ▶ Inflammation
  - Often associated with systemic diseases such as RA
  - Painful
  - Can lead to perforation



# Scleral rupture

- ▶ Blunt or penetrating trauma
  - Breaks occur where sclera is thinnest
  - Prognosis for visual recovery is poor, but possible with surgery



# Anterior Segment



Cornea

Anterior Chamber

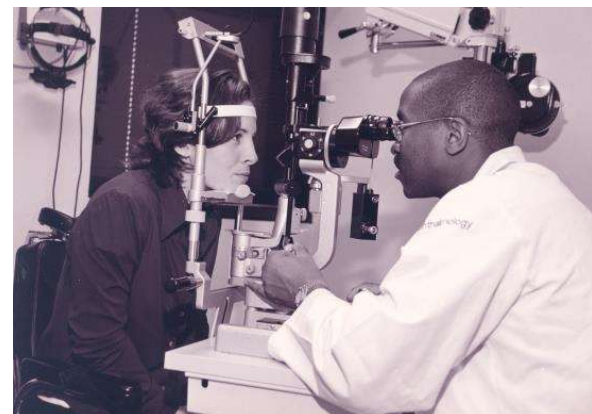
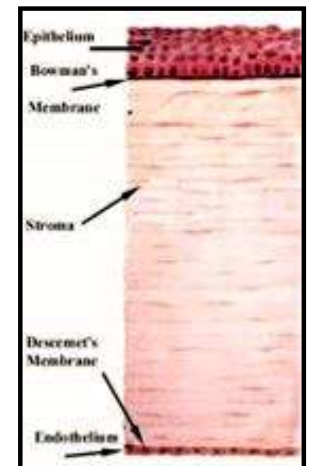
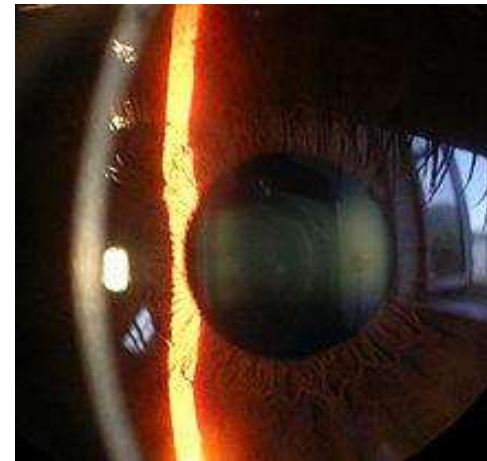
Iris

Lens

## Focusing

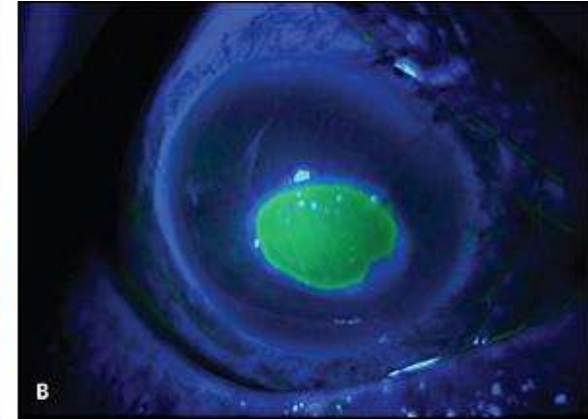
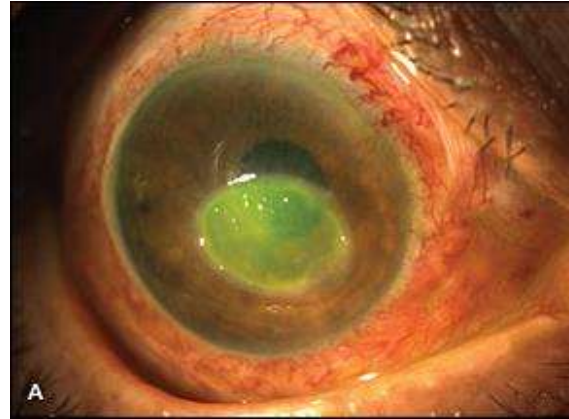
# Cornea

- ▶ Transparent window of the eye
- ▶ 45 Diopters of refractive power
- ▶ Avascular
- ▶ 5 layers – slit lamp
- ▶ LASIK surgery
  - Reshapes cornea by ablating a portion of the stroma



# Corneal Disorders

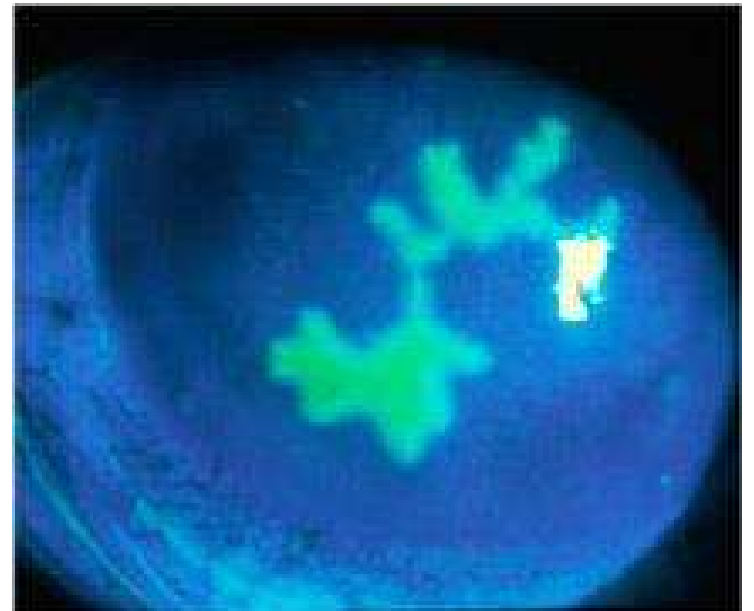
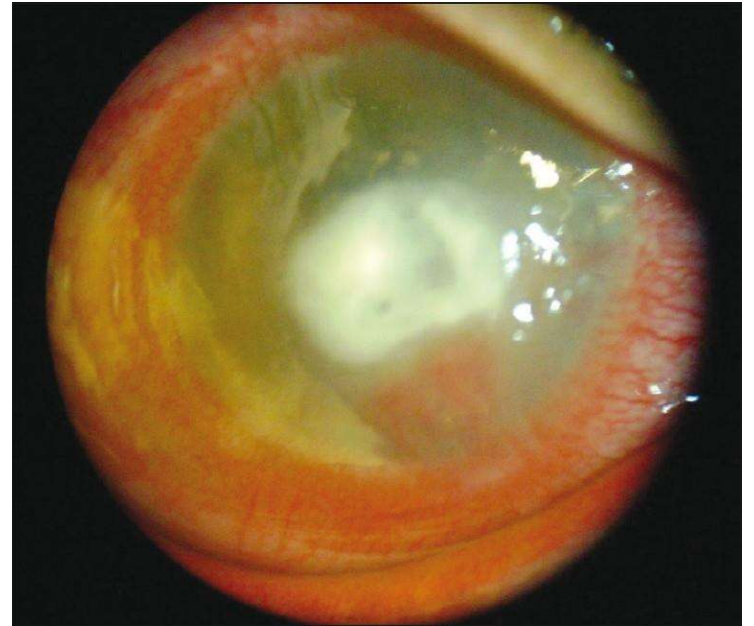
- ▶ Corneal Abrasion – trauma, contact lens overwear, foreign body
- ▶ Signs and symptoms of corneal problems
  - Pain
  - Tearing
  - Decreased vision
  - Photophobia
  - Foreign body sensation
- ▶ Treatment – antibiotics, bandage contact lens





# Corneal disorders

- ▶ Corneal ulcers – a true emergency
  - Usually infectious
  - Usually require trauma
    - Viral – intact epithelium
  - Vision loss results from scarring, perforation
  - CONTACT LENS OVERWEAR!



# Corneal disorders

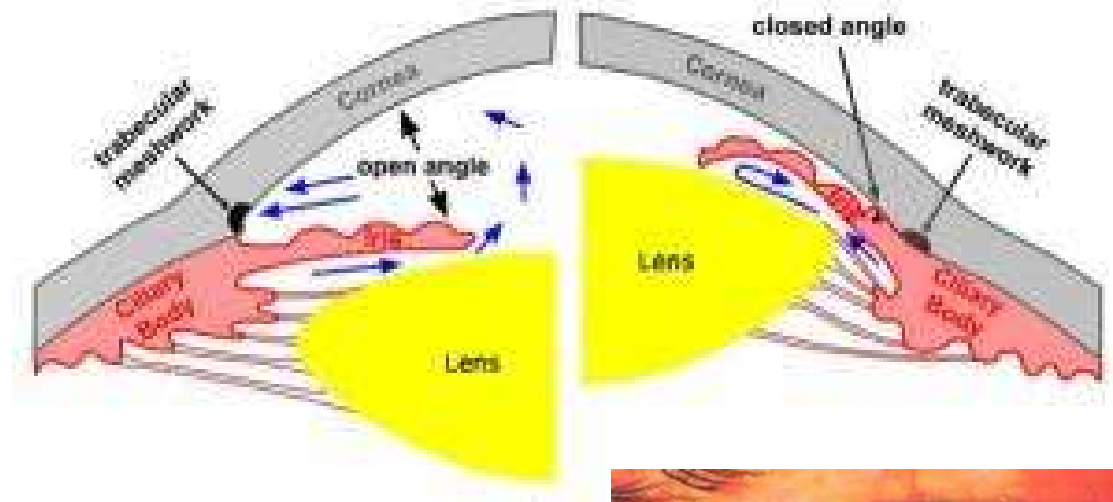
## ► Chemical instillation

- Alkali burns – lime, lye, ammonia
- Acid burns – car battery explosions
- COPIOUS irrigation
- Antibiotics
- Triage



# Anterior chamber

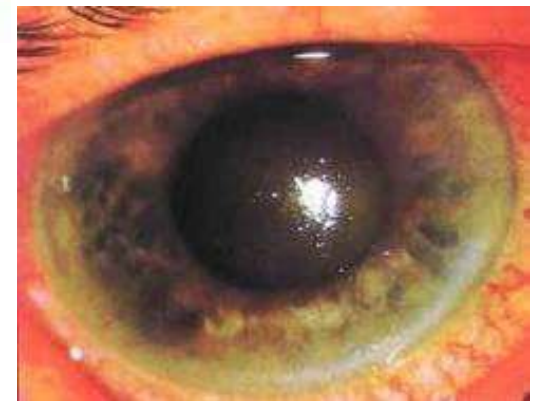
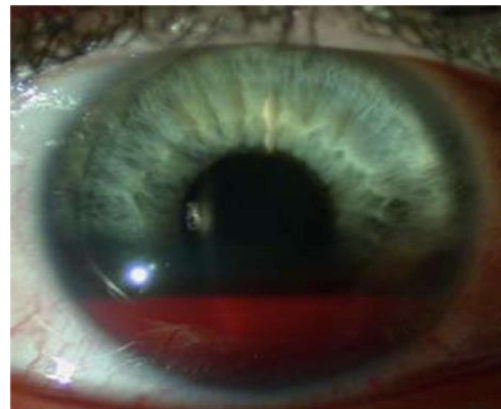
- ▶ Space between cornea and iris
  - Aqueous humor
  - Deep vs. shallow



- ▶ Angle closure glaucoma
  - Redness
  - Pain
  - Blur with haloes
  - Nausea/vomiting

- ▶ Hyphema

- Blood



- ▶ Hypopyon

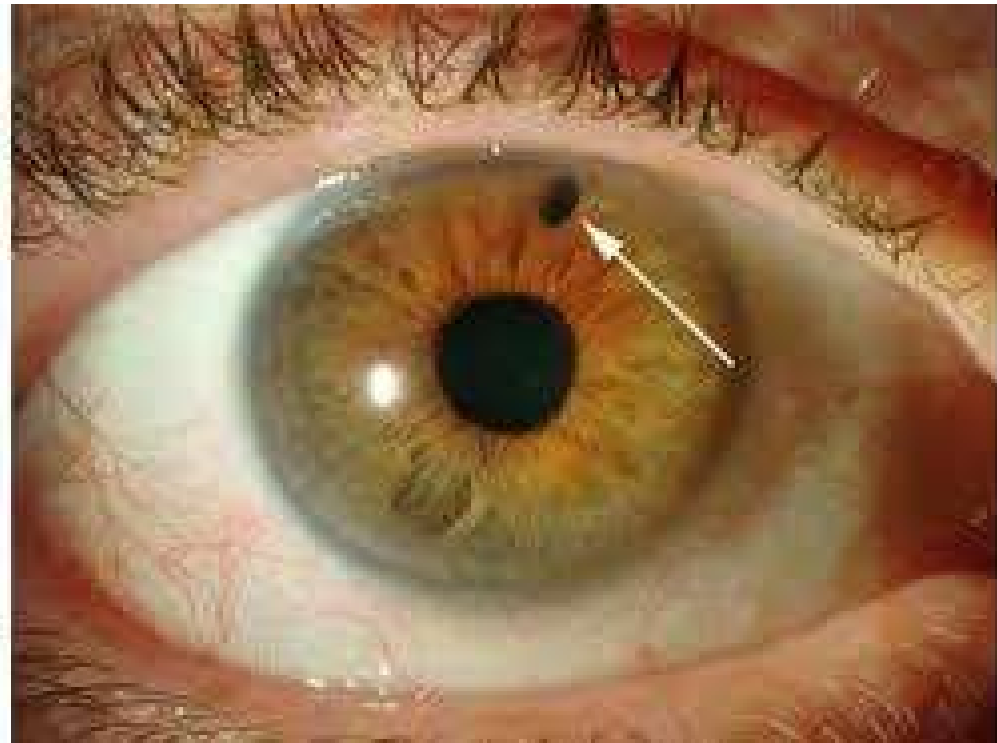
White blood cells





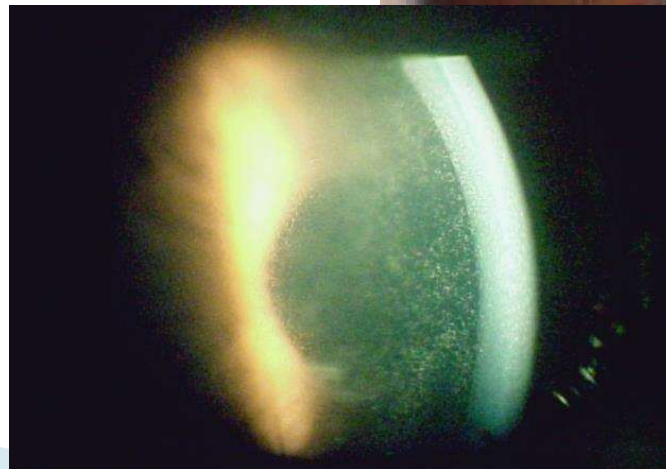
# Laser peripheral iridotomy

- ▶ Painless, in office procedure
- ▶ Reduces risk of attack of angle closure glaucoma
- ▶ Cures ACG attack
- ▶ Sometimes necessary in order to dilate the pupil safely



# Iris

- ▶ Colored muscular ring – controls the size of the pupil
  - Determines how much light enters eye
- ▶ Part of uveal tract with ciliary body, choroid
  - When inflamed, white blood cells are shed into the anterior chamber – iritis or anterior uveitis



# Iritis

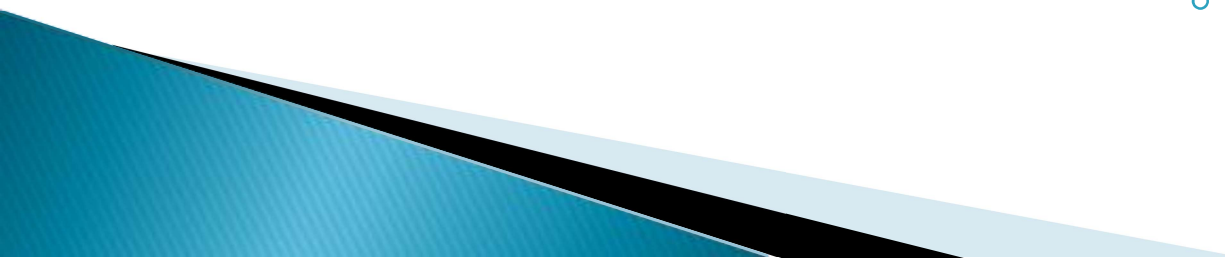
## ▶ Causes

- Blunt trauma
- Inflammatory
  - Sarcoidosis
  - Ankylosing spondylitis
  - IBD e.g., Crohn's
- Infectious
  - Herpes zoster
  - Tuberculosis

## ▶ Signs / symptoms

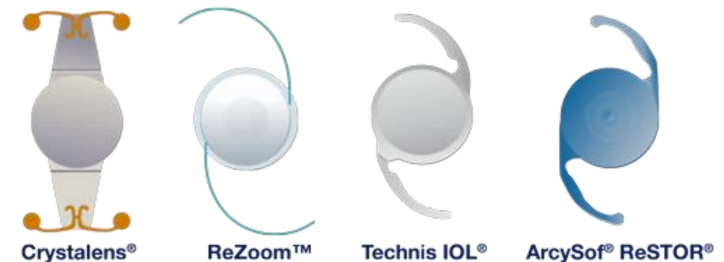
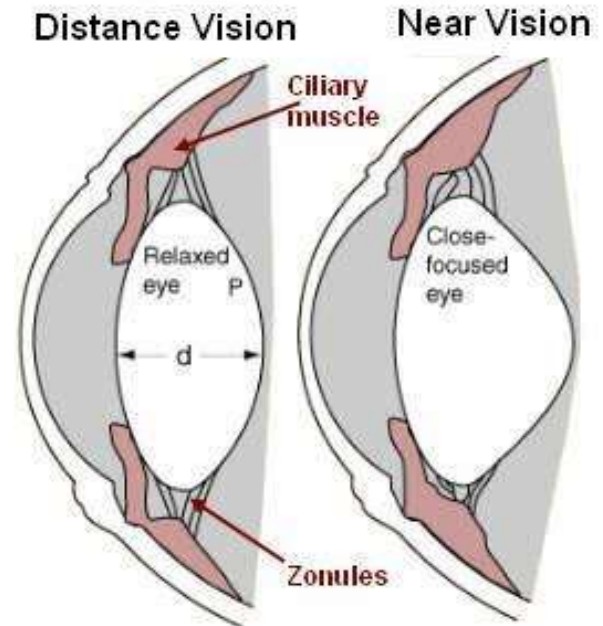
- Redness
- Blurred vision
- Pain
- Photophobia
- Floaters

## ▶ Treatment

- Topical and systemic steroids
  - Non-steroidal anti-inflammatories
  - Cycloplegics
- 

# Crystalline lens

- ▶ The eye's "zoom lens"
  - Accommodation – reflexive change in optical power of lens to adjust focus from distance to near
- ▶ Presbyopia –
  - Loss of elasticity
  - Loss of ability to focus at near
  - Age 40 – 50
    - Symptoms – eyestrain, headache, poor vision in dim lighting
    - Treatment – PAL's, bifocals, reading glasses, multifocal / monovision contacts and IOL's



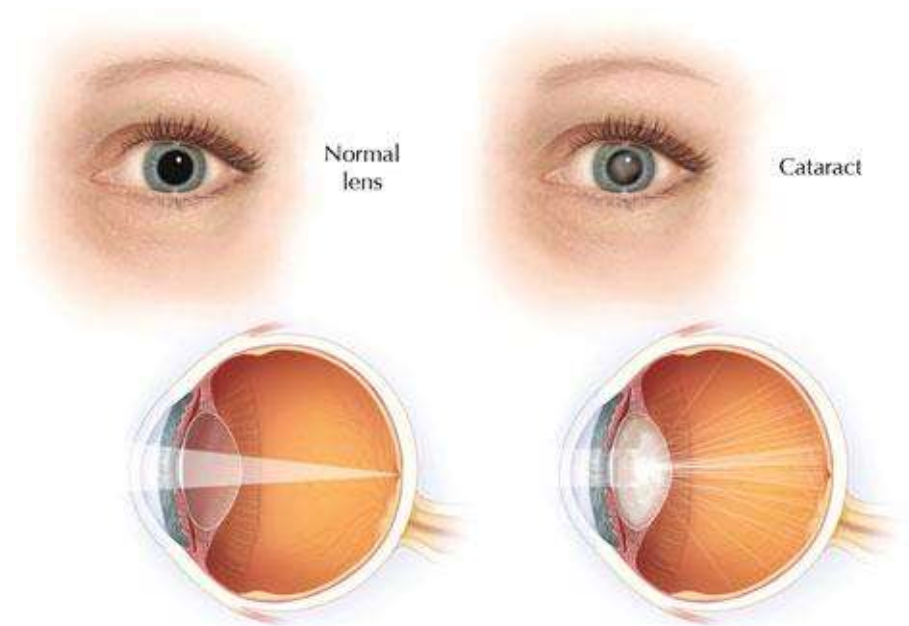
# Cataract – clouding of the lens

## ► Causes

- Age
- Trauma
- Medications
- Diabetes, HTN
- UV exposure

## ► Symptoms

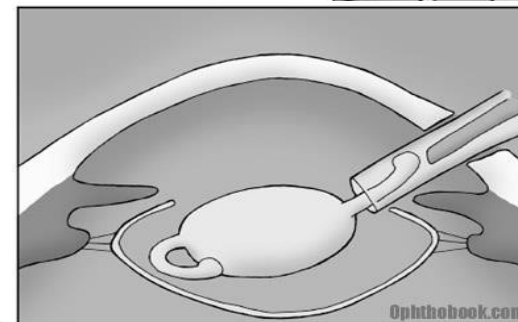
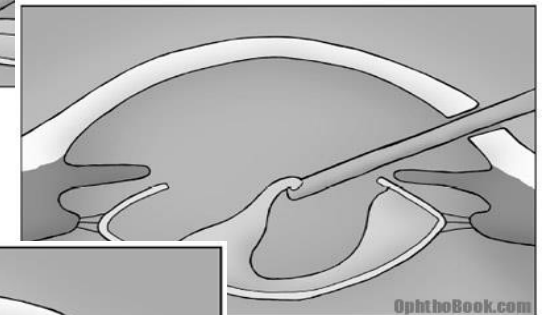
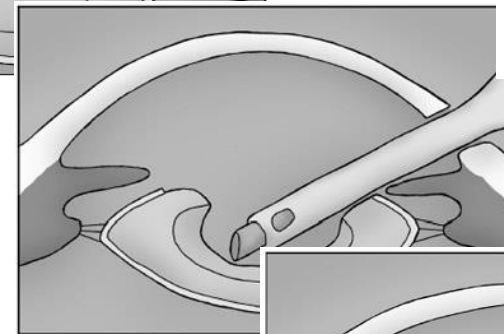
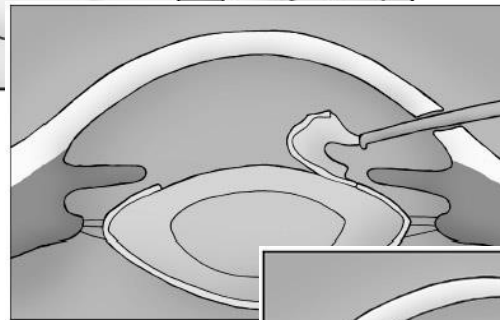
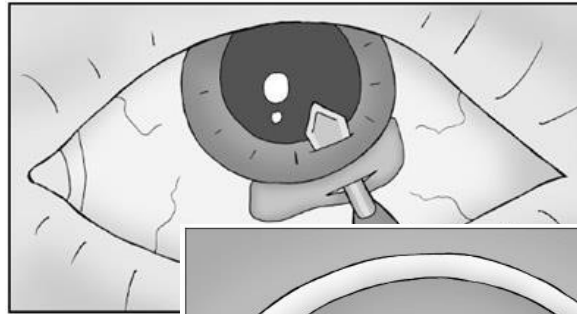
- Painless
- Blurred vision
- Glare
- Decreased night vision
- Frequent Rx change





# Cataract treatment – surgery

- ▶ Most frequent surgery in US
  - 98% success
- ▶ Typically ultrasound, not laser
- ▶ M&M's
- ▶ Laser often used to clean cloudy capsule
  - YAG capsulotomy



# Posterior segment



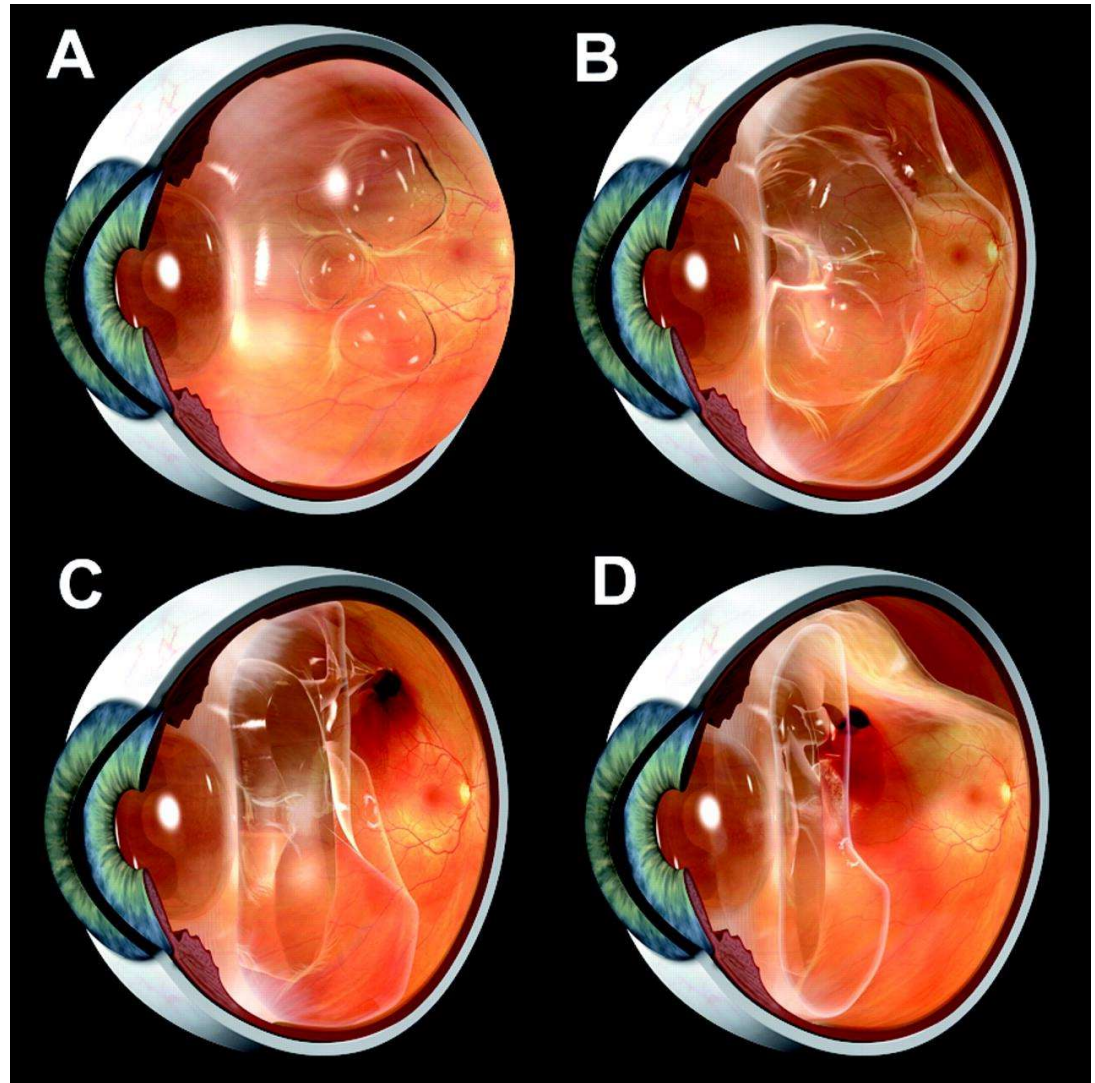
Retina

Vitreous Humor

## Light receptors

# Vitreous Humor

- ▶ Gel composed of water, collagen, hyaluronic acid
- ▶ Fills the hollow cavity of the eye, maintaining shape
- ▶ Liquefies with age
- ▶ Vitreous detachment (PVD)
- ▶ Vitreous floaters
  - Always need to rule out RD

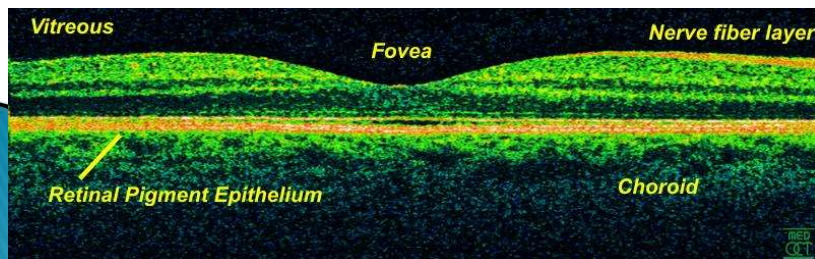




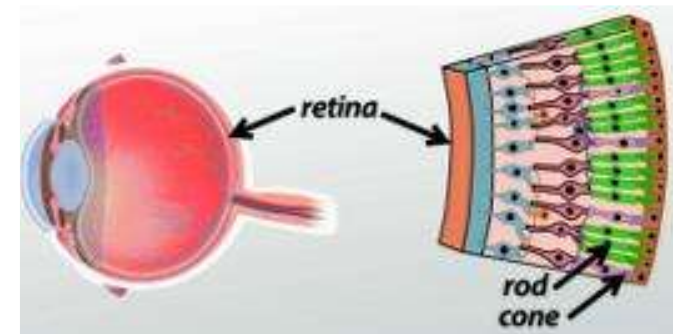
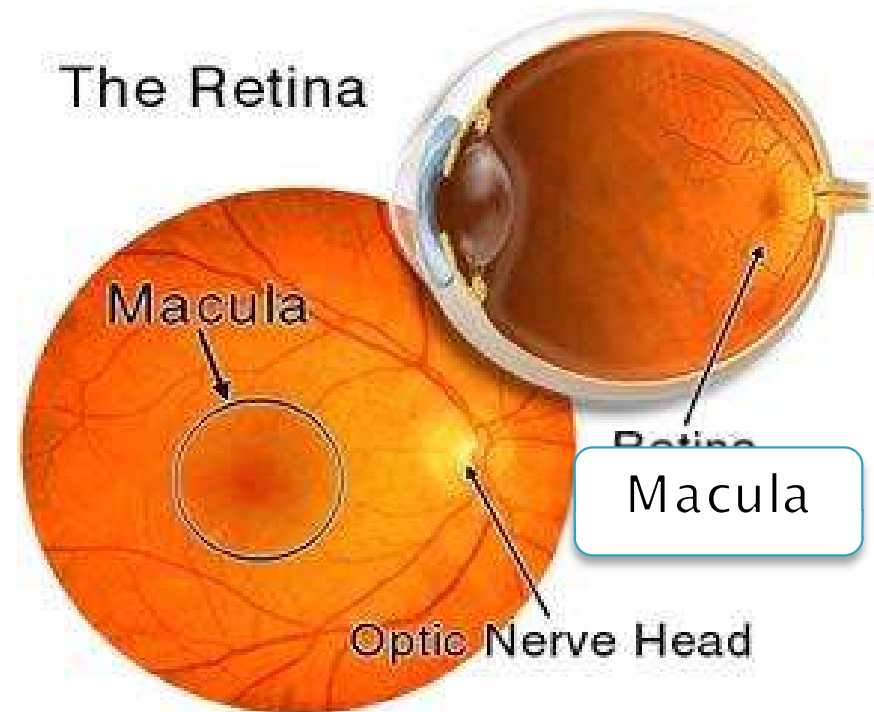
# Retina

- ▶ Inner coat of the eye
- ▶ Composed of photoreceptors (rods and cones)
  - Chemical and electrical events trigger nerve impulses
  - These travel through the optic nerve to the brain

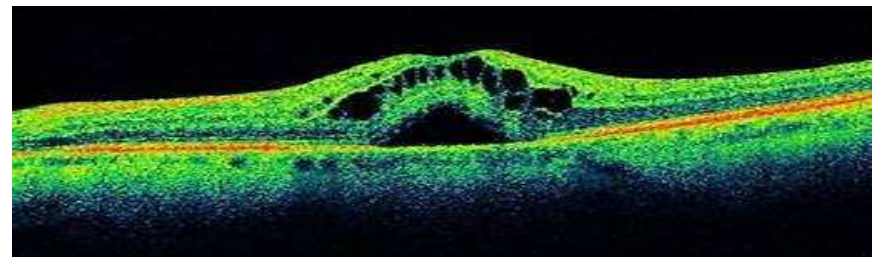
Normal OCT



The Retina

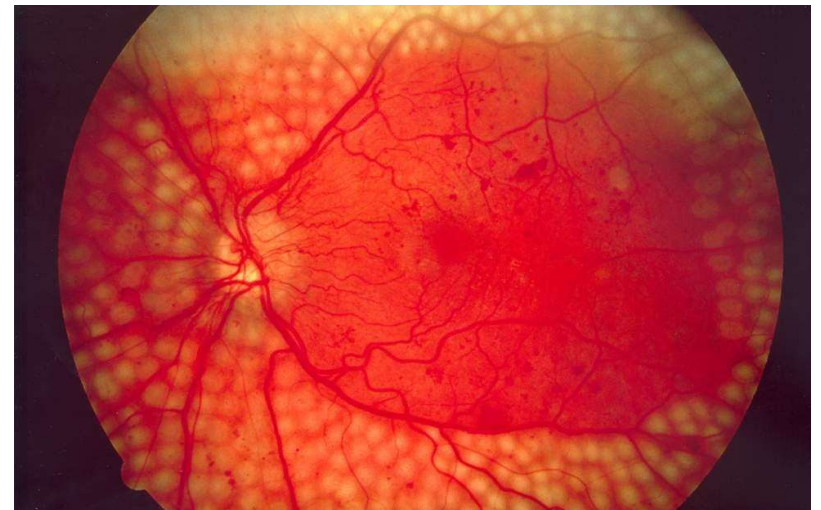
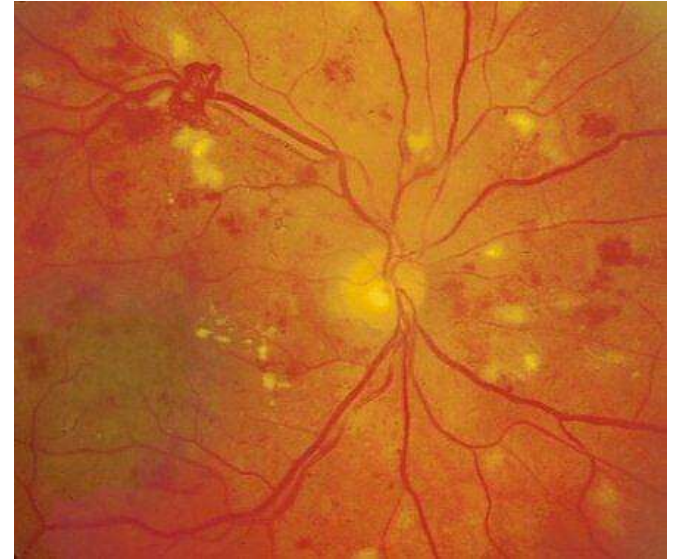


Sub/intraretinal fluid



# Disorders of the retina

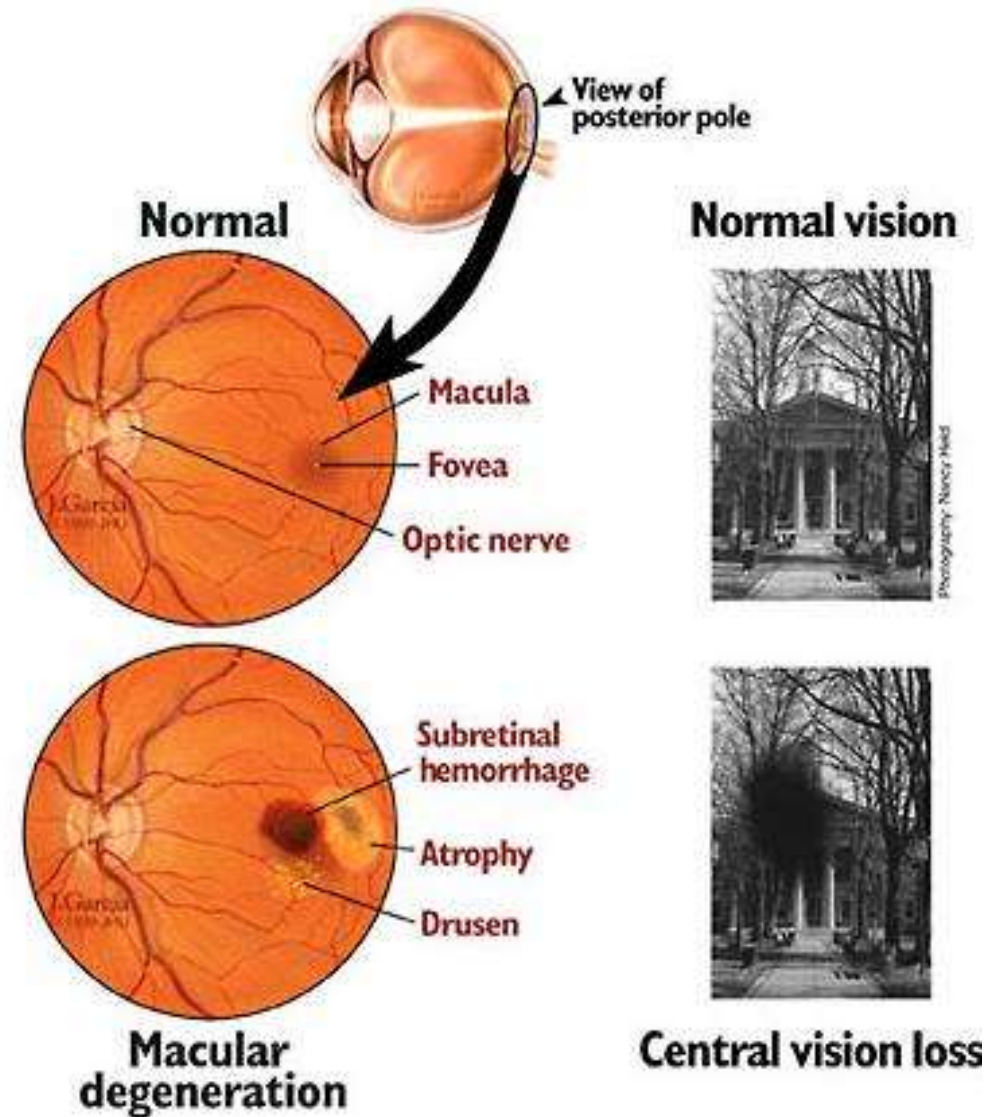
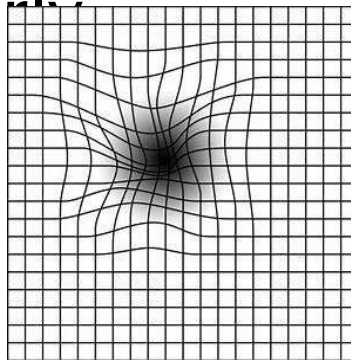
- ▶ Diabetic retinopathy
  - Damage to small blood vessels – leakage, swelling, ischemia, vitreous hemorrhage, retinal detachment
  - Symptoms – blurred vision, floaters, cobwebs
  - Treatment –
    - Blood sugar control
    - Laser
    - Anti-VEGF injections



# Disorders of the retina

## ► Age-related Macular Degeneration

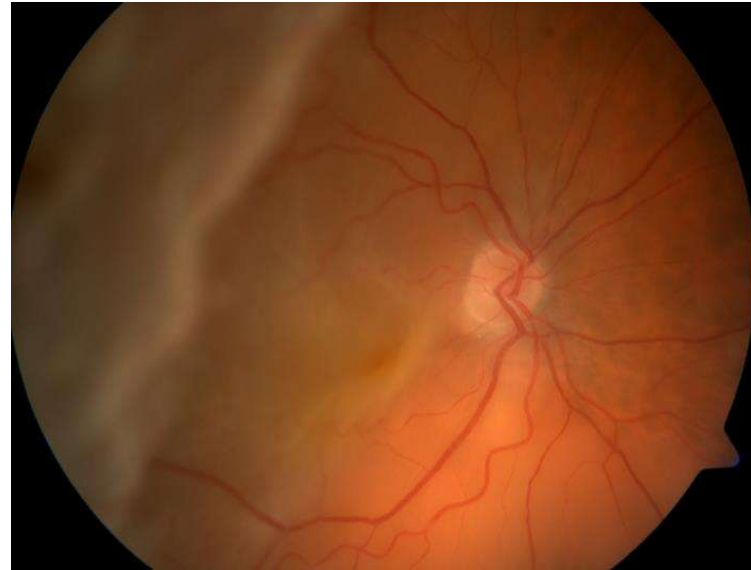
- Major cause of blindness in elderly
- Symptoms
  - Loss of central vision
  - Distortion
- Dry-atrophy
- Wet-bleeding, scarring
- Treatments
  - Laser, Anti-VEGF





# Disorders of the retina

- ▶ Retinal detachment – separation of the inner sensory layer from the outer layers
- ▶ Symptoms
  - Flashes
  - Floaters
  - Visual field cut
- ▶ Treatment
  - Laser
  - Pneumatic retinopexy
  - Scleral buckle



Indirect  
ophthalmoscopy



# Optic nerve and visual pathway



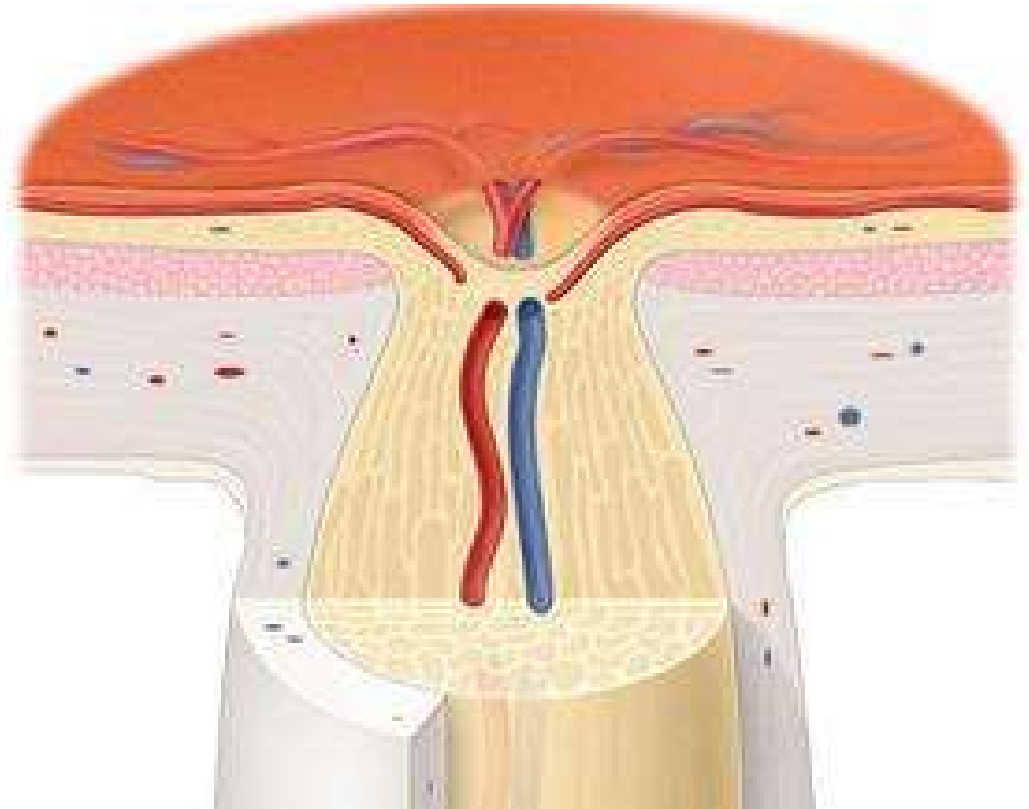
- Optic nerve
- Optic chiasm
- Optic radiations
- Visual cortex
- Visual association cortex

## Eye – brain connection

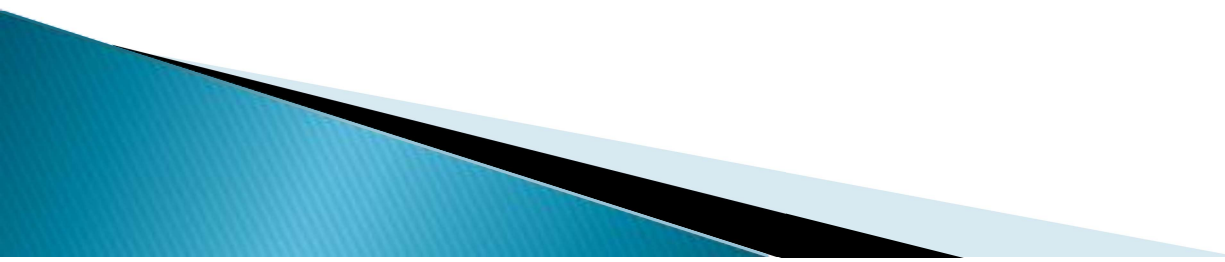
A decorative graphic at the bottom left of the slide, consisting of a blue triangle with a black border, pointing towards the bottom right.

# Optic nerve

- ▶ Transmits visual information from the retina to the brain
  - Like a large fiberoptic cable – carrying 1.2 million fibers from the photoreceptors
  - Color, contrast
  - Light and accommodative reflex

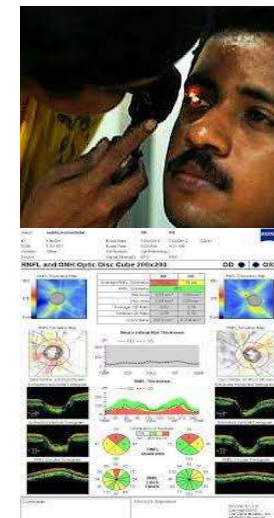
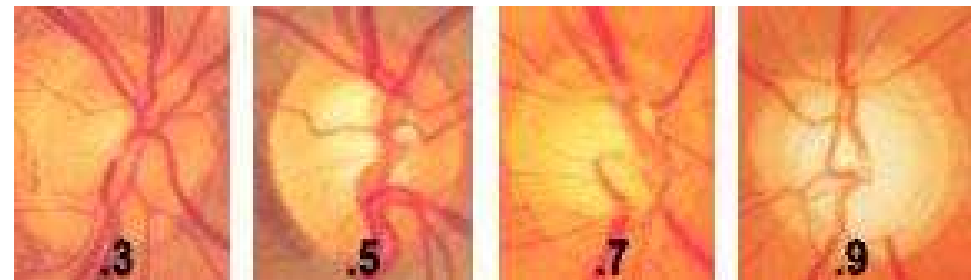
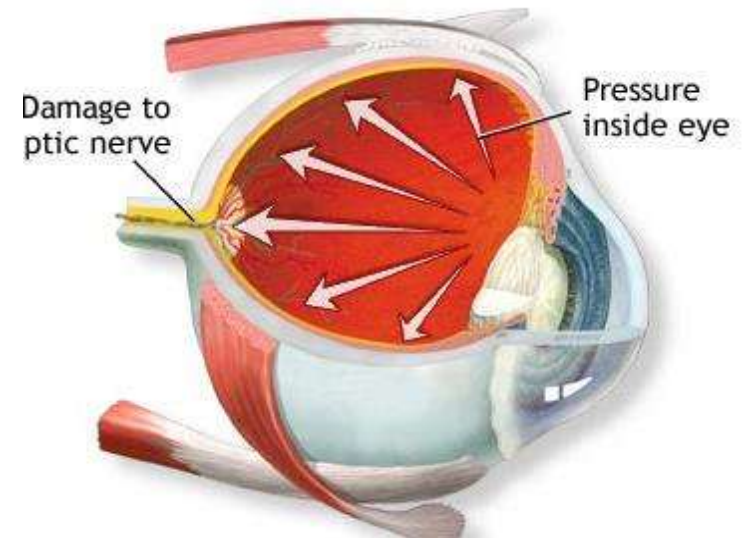


# Disorders of the optic nerve

- ▶ Glaucoma
  - ▶ Trauma
  - ▶ Toxicity
  - ▶ Ischemia
  - ▶ Compression
  - ▶ Inflammation
  - ▶ Infection
  - ▶ Congenital
- 

# Glaucoma

- ▶ Disease of retinal ganglion cells
  - Elevated intraocular pressure (IOP)
  - Peripheral visual field loss
- ▶ Symptoms
  - None until advanced
- ▶ Treatment
  - IOP lowering medicines
  - Laser
  - Trabeculectomy surgery





# Glaucoma vision loss

**NORMAL VISION**



**ADVANCED GLAUCOMA**



**EARLY GLAUCOMA**



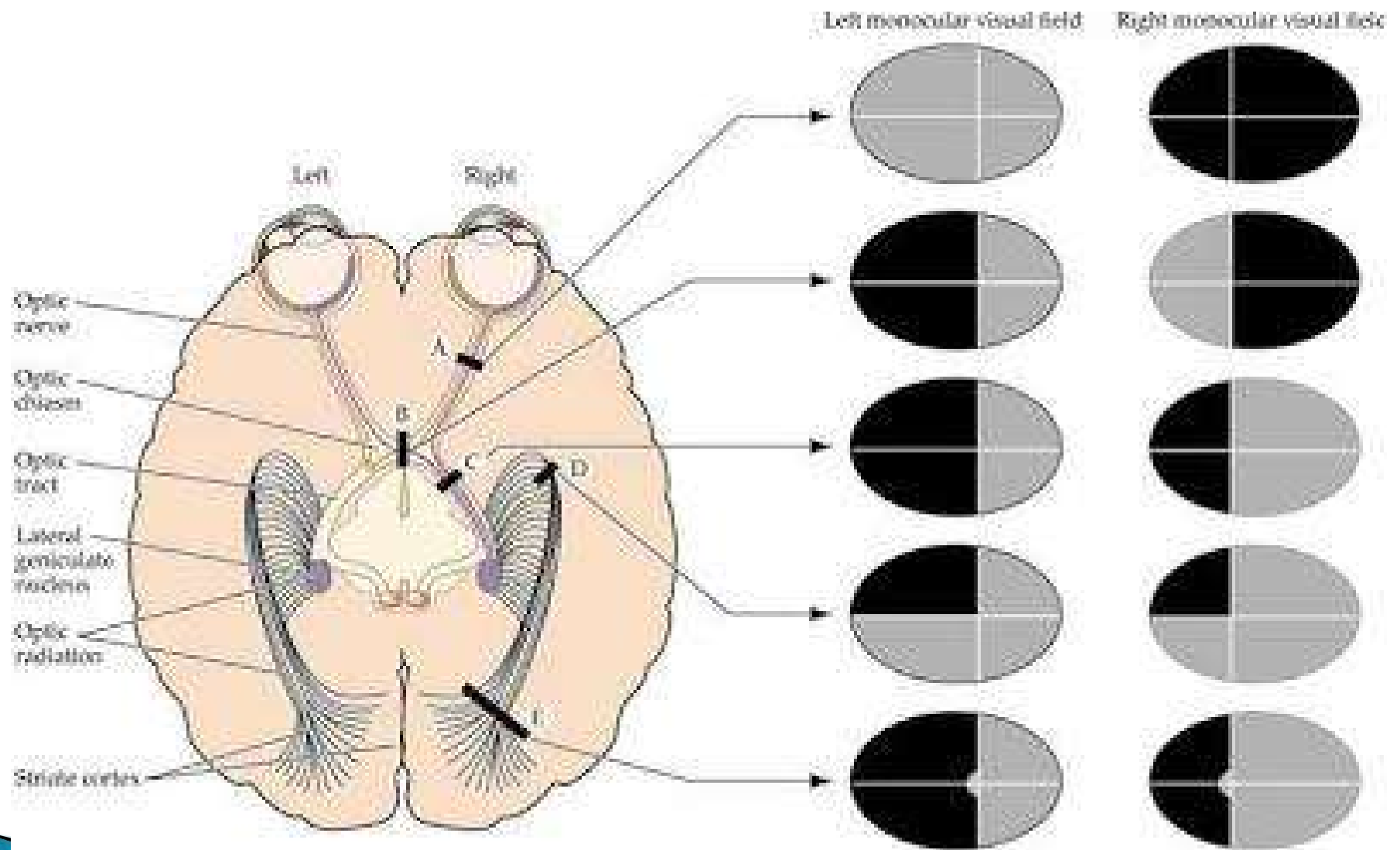
**EXTREME GLAUCOMA**



# Posterior visual pathway

- ▶ Optic chiasm
  - The optic nerves from both eyes meet and cross
- ▶ Optic tract
  - Crossed fibers from one nerve join uncrossed fibers from the other
  - Left visual field processed by right side of the brain
- ▶ Optic radiations
- ▶ Visual cortex
  - Where vision takes place
- ▶ Visual association cortex
- ▶ Diseases affecting posterior pathway
  - Tumors (e.g. pituitary)
  - Inflammation (MS)
  - Stroke
  - Aneurysms
  - Trauma
- ▶ Symptoms
  - Bitemporal hemianopia
  - Homonymous hemianopia
- ▶ Visual field testing can localize the problem

# Posterior visual pathway



# Clinical refraction



Myopia  
Hyperopia  
Astigmatism  
Presbyopia

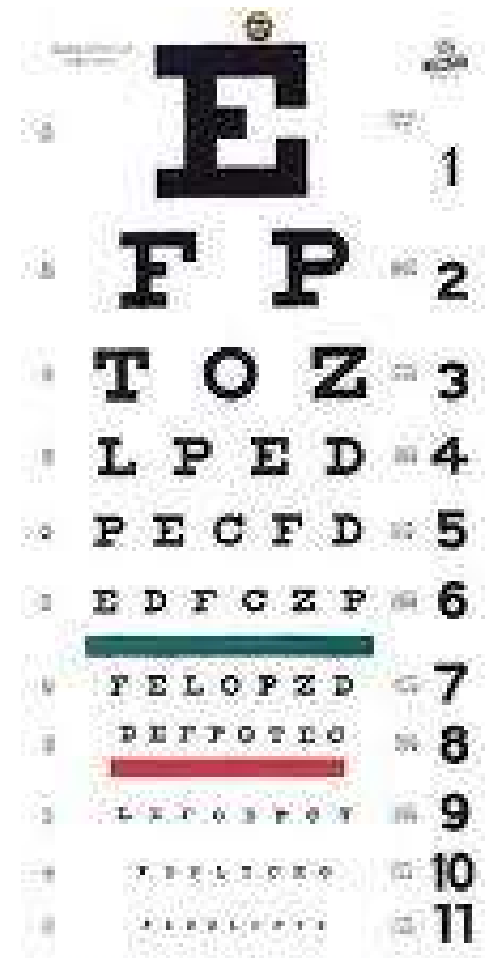
Eye is  
healthy, but  
out of focus



# Visual acuity

## What is 20/20 vision?

To have a visual acuity of 20/20 means that when you stand 20 feet away from a Snellen eye chart you can see letters down to a certain size.

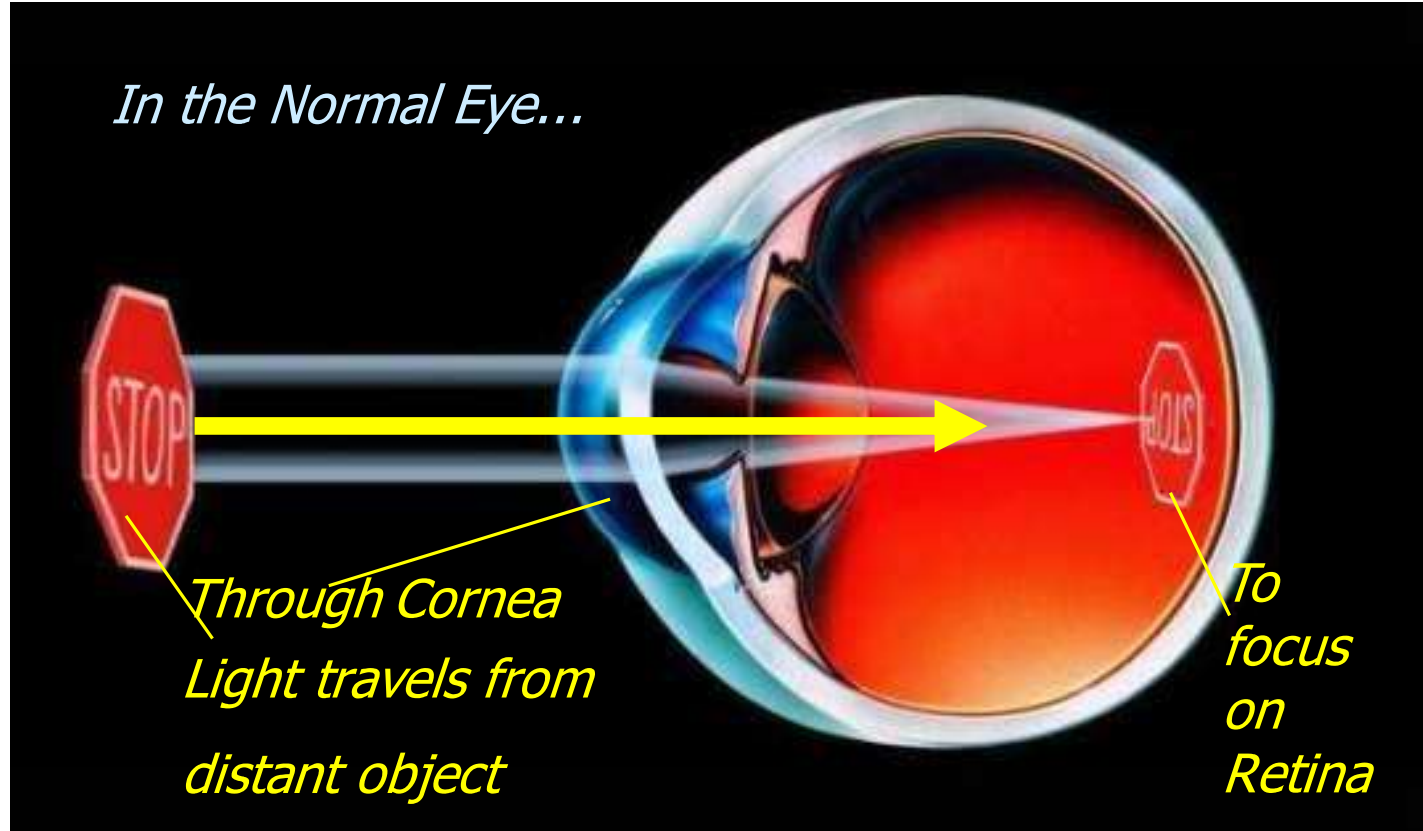


# Visual Acuity

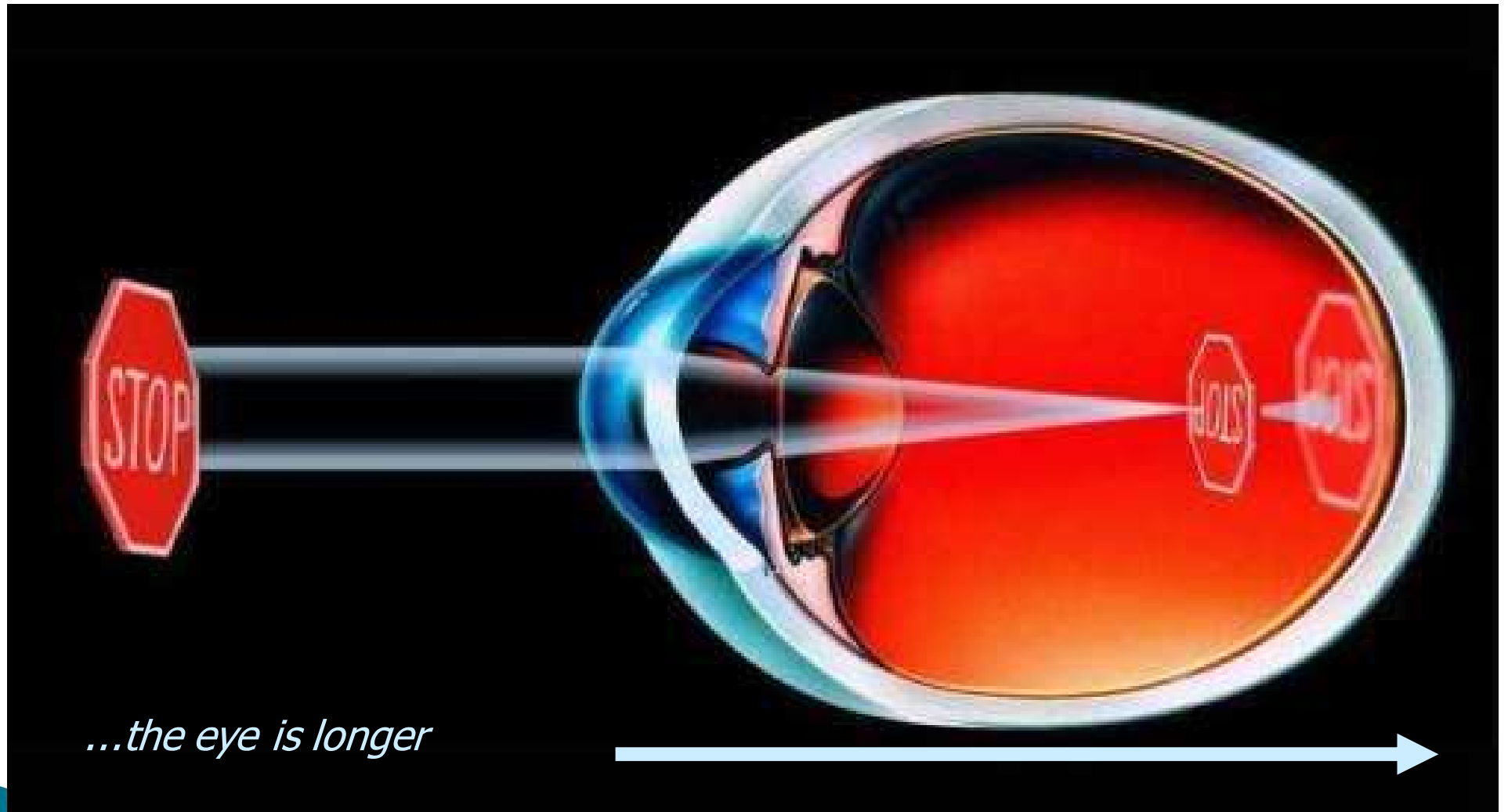
**What if you don't have 20/20 vision (healthy eye)?**

- ✓ You need corrective lenses (glasses or contact lenses) or refractive surgery to improve your vision.
- ✓ This is called having a **refractive error**.

# Normal Eye and Refraction

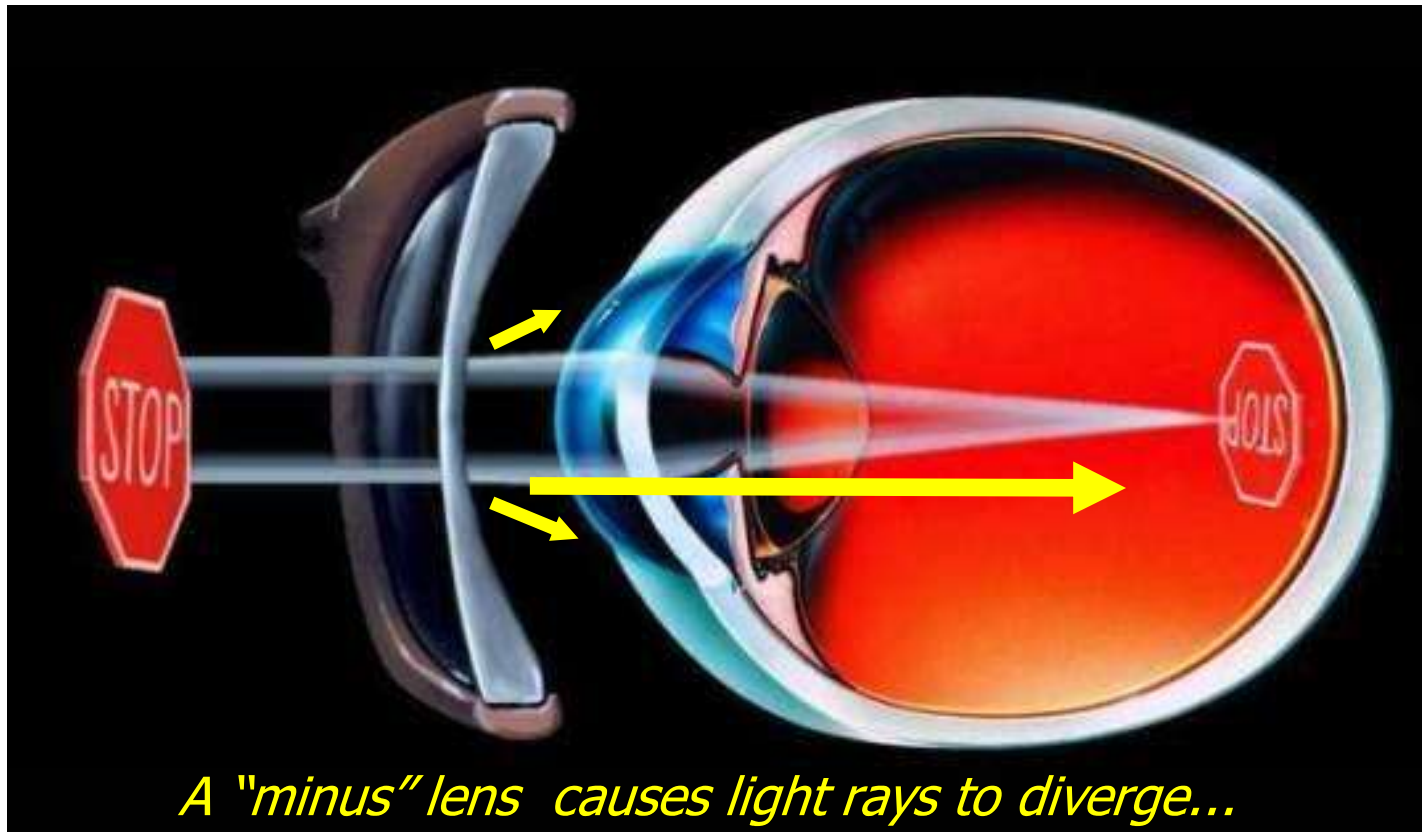


# Myopia- Nearsighted Eye





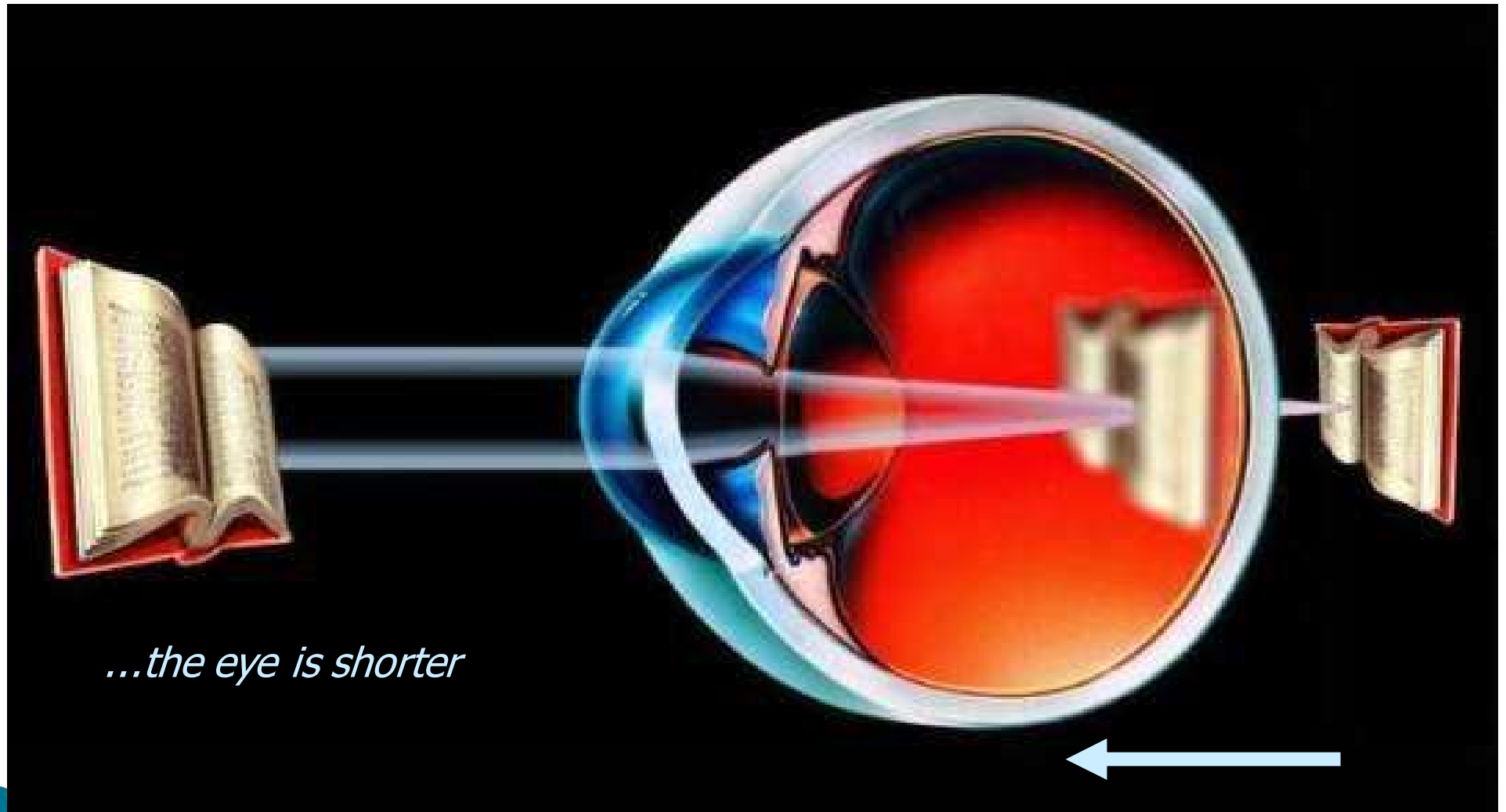
# Spectacle Correction of Myopia



*A "minus" lens causes light rays to diverge...*

*...to focus further back in the eye, on the retina*

# Hyperopic- Farsighted Eye

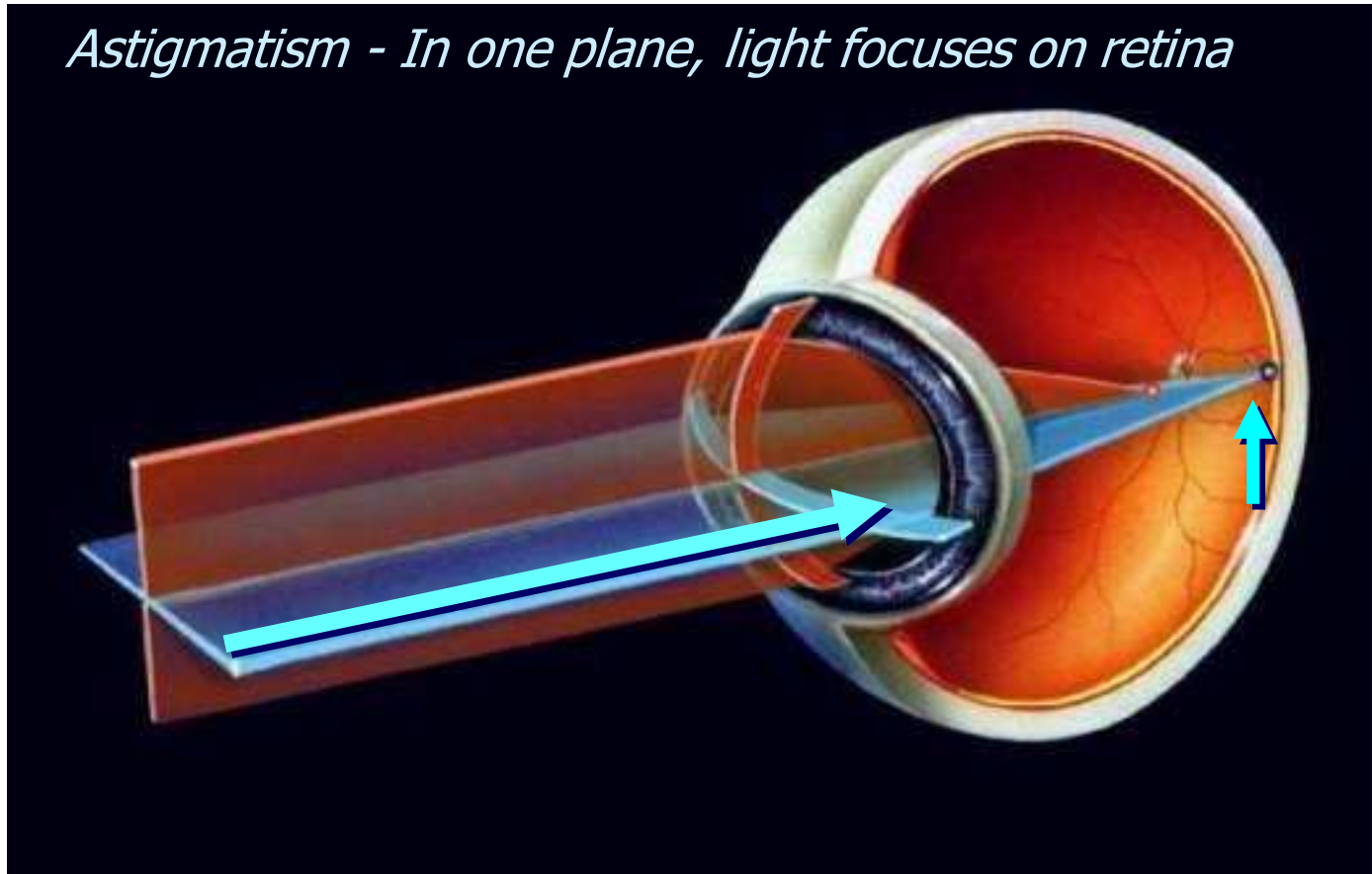


# Hyperopic- Farsighted Eye

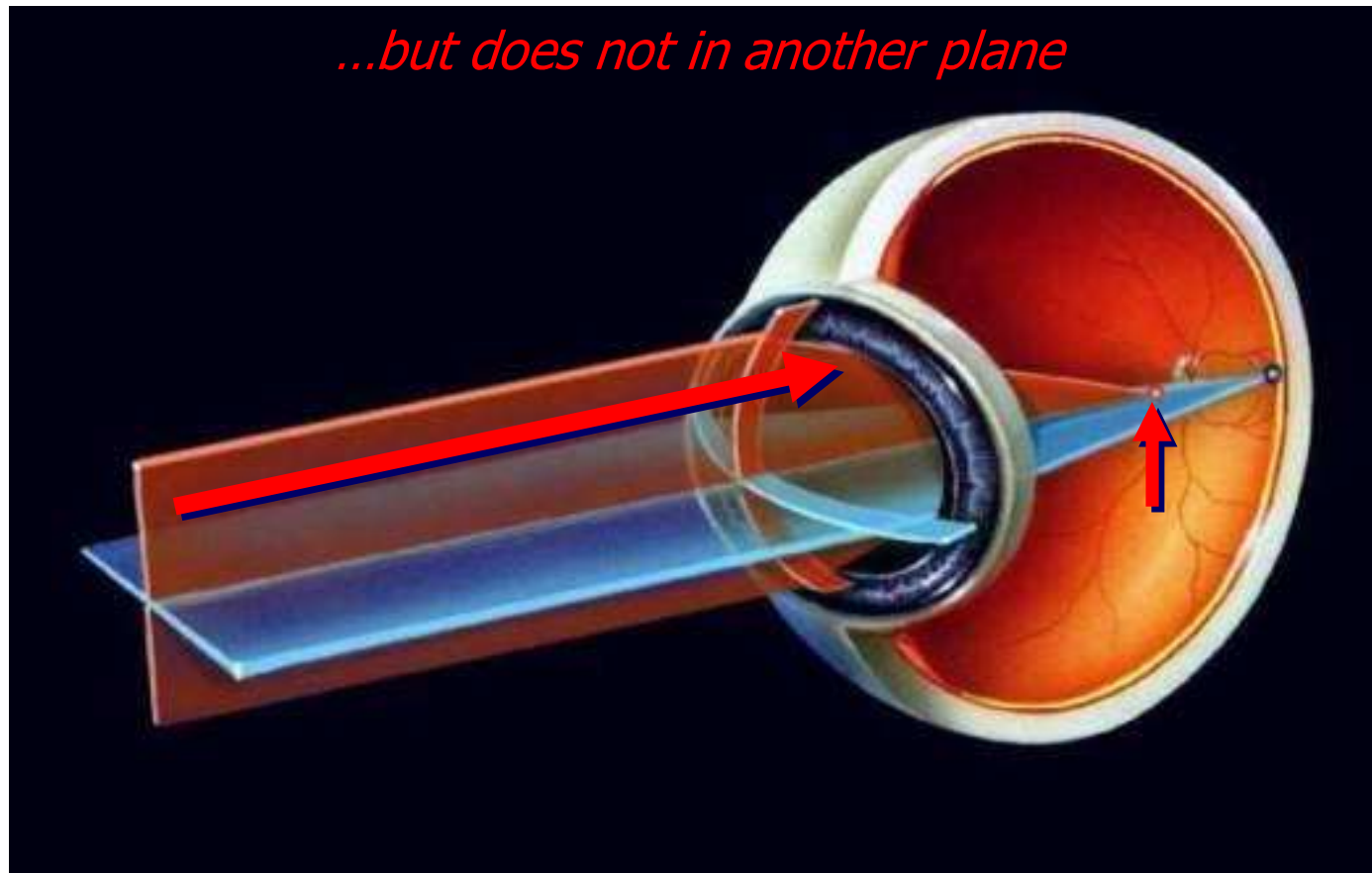


# Astigmatism

*Astigmatism - In one plane, light focuses on retina*



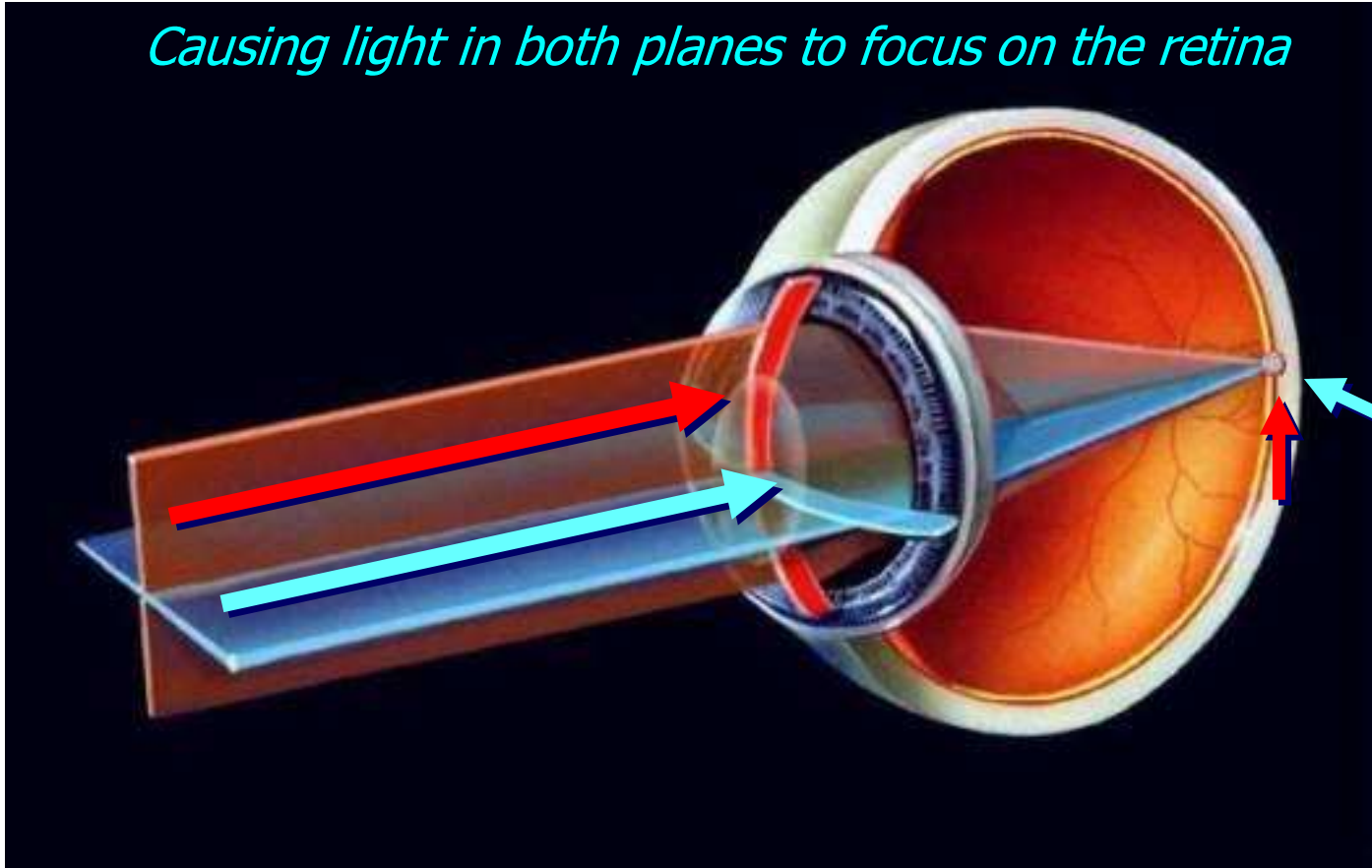
# Astigmatism



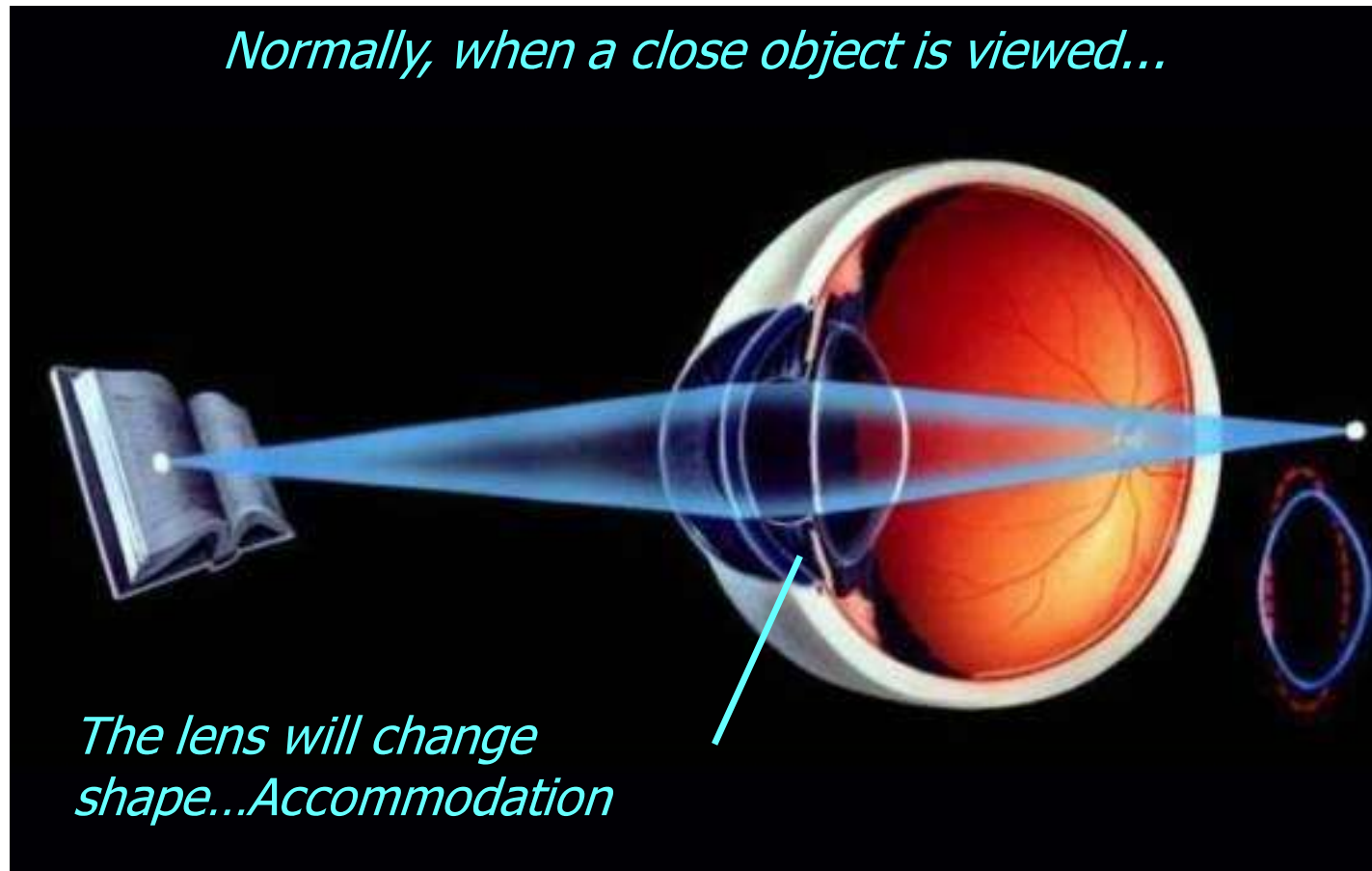


# Astigmatism

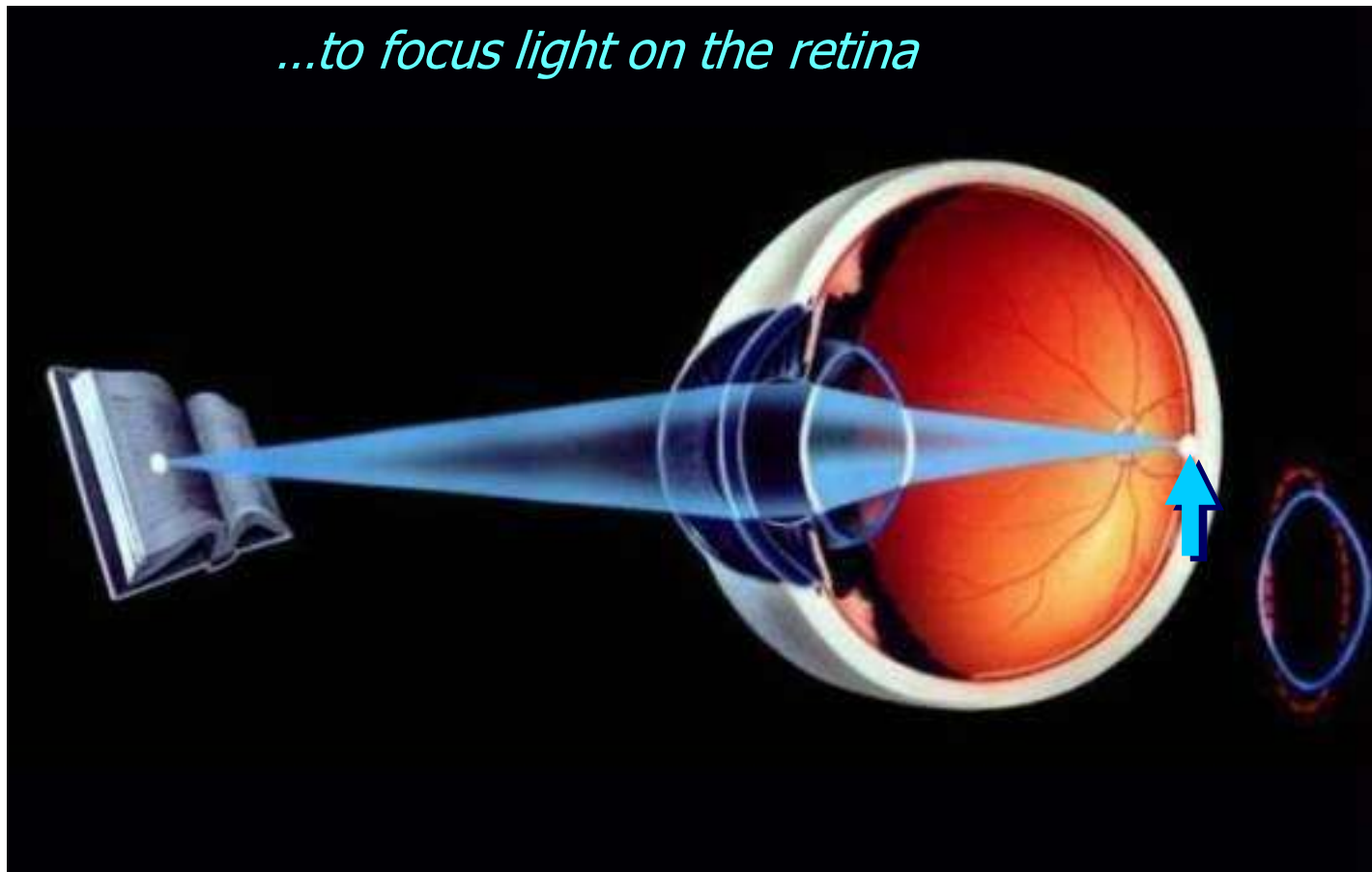
*Causing light in both planes to focus on the retina*



# Presbyopia

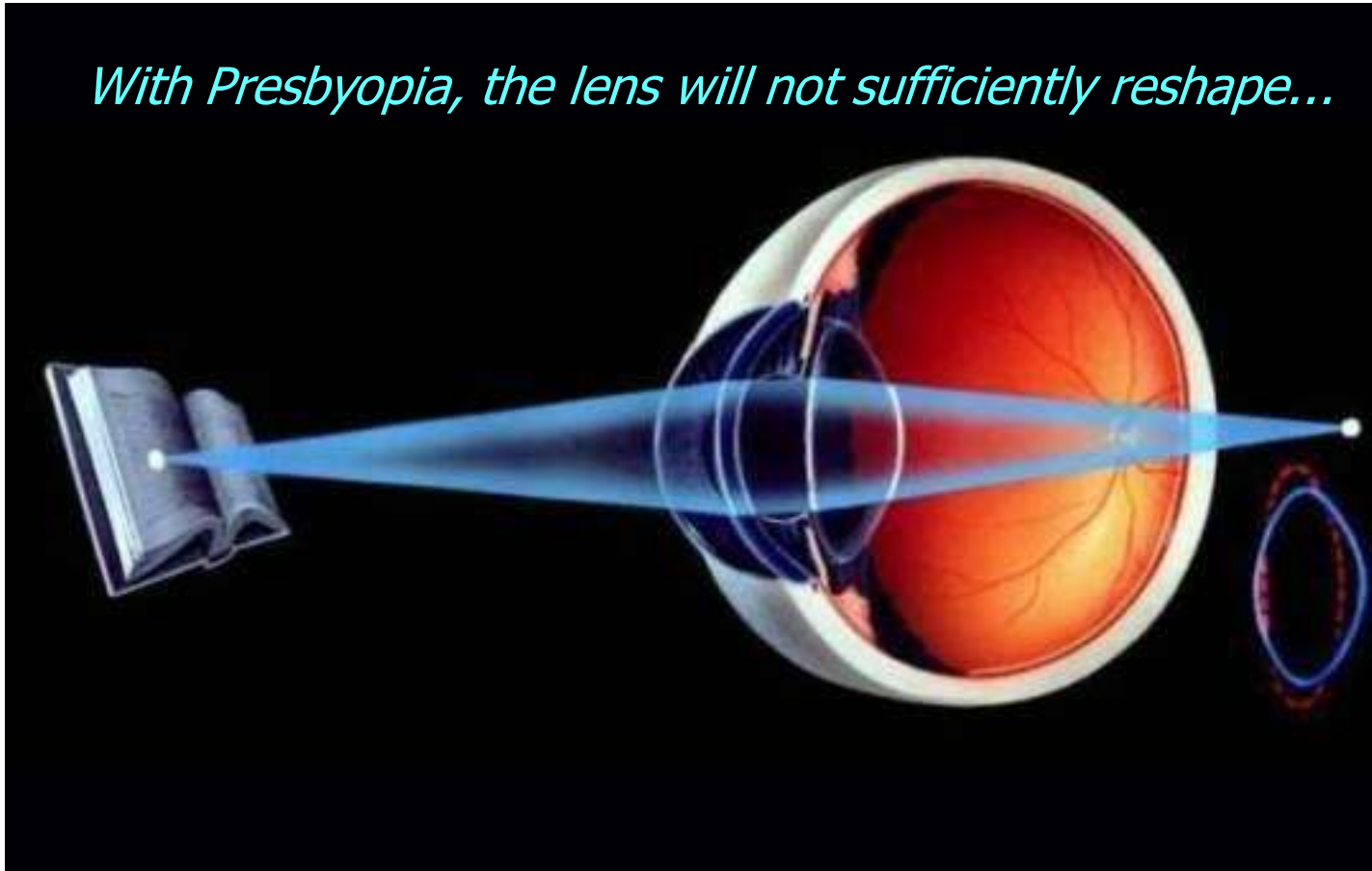


# Presbyopia



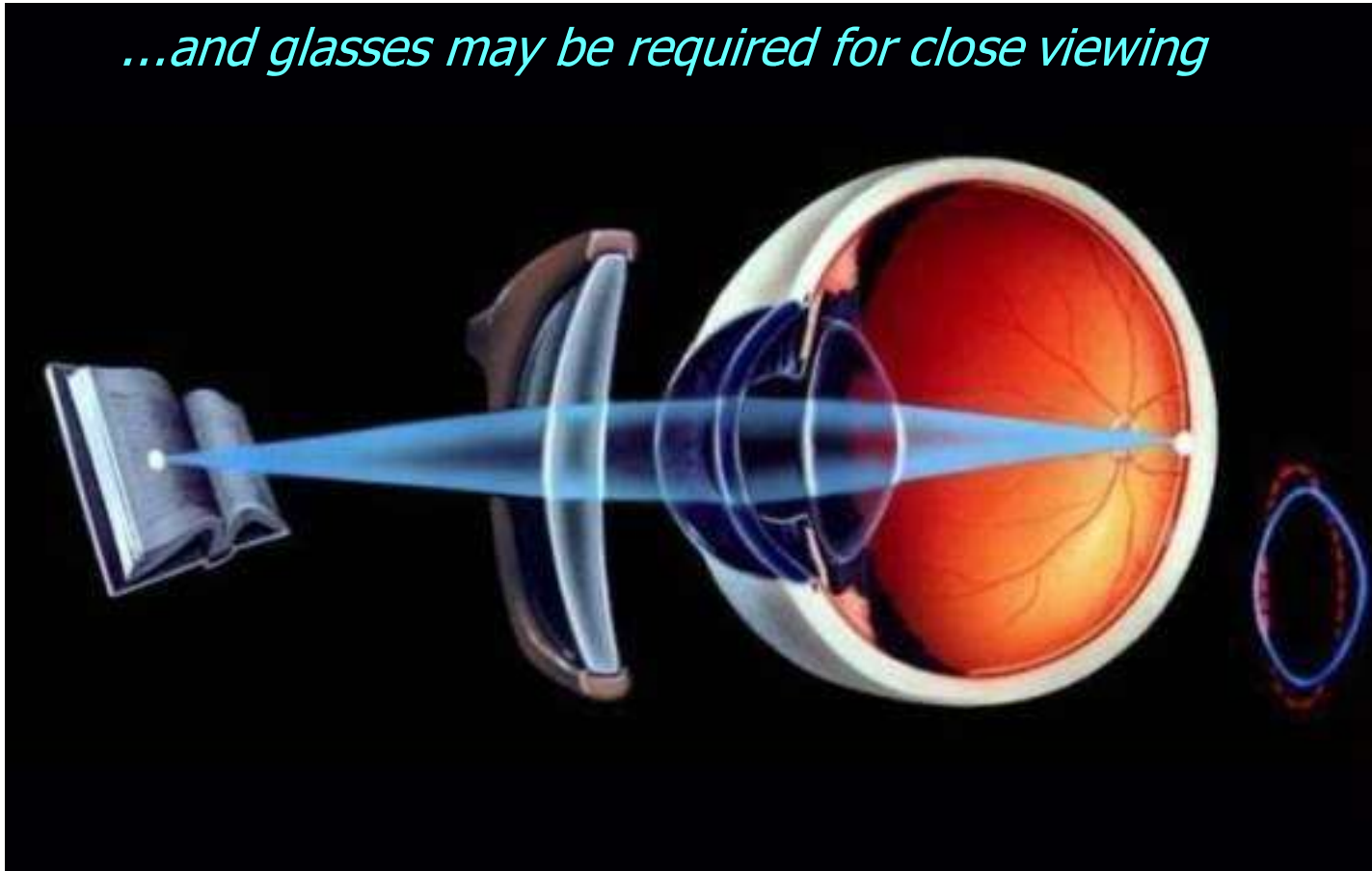
# Presbyopia

*With Presbyopia, the lens will not sufficiently reshape...*



# Presbyopia

*...and glasses may be required for close viewing*





# Lens technology

## ► PAL

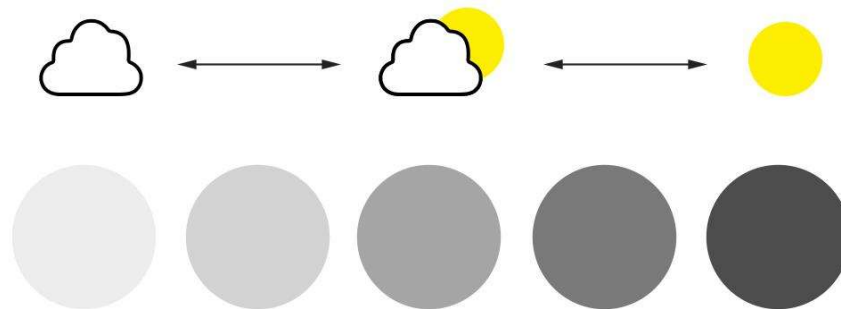


## Anti Reflective



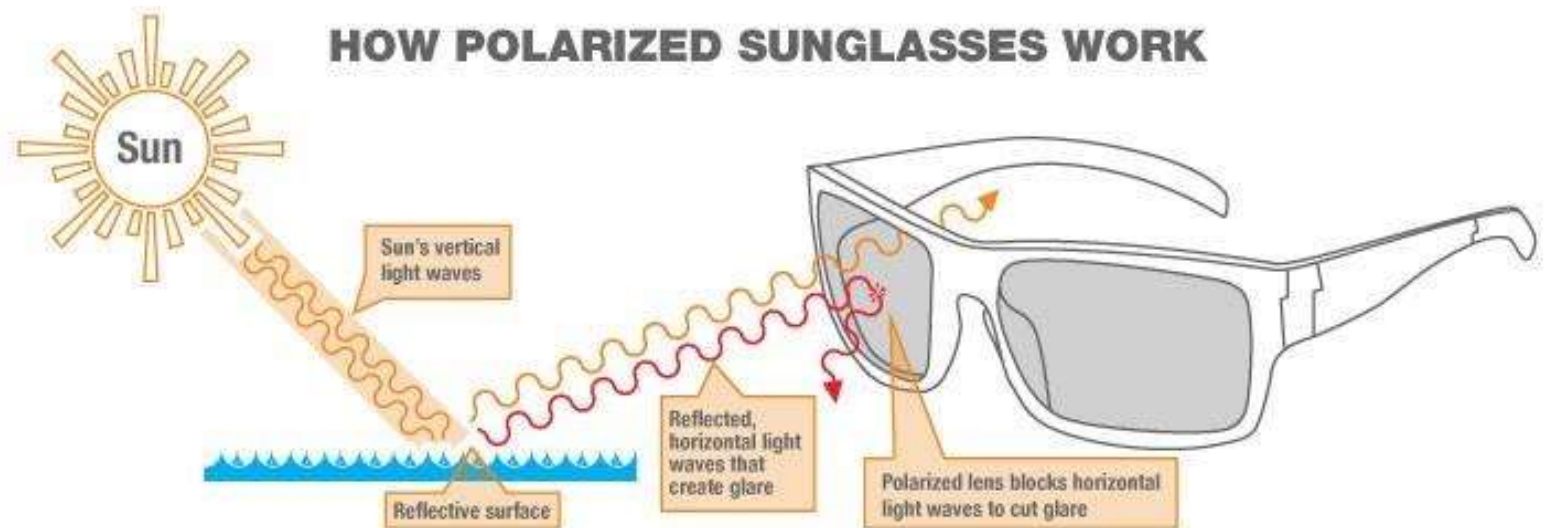
# Lens technology

## ► Photochromic



photochromic.

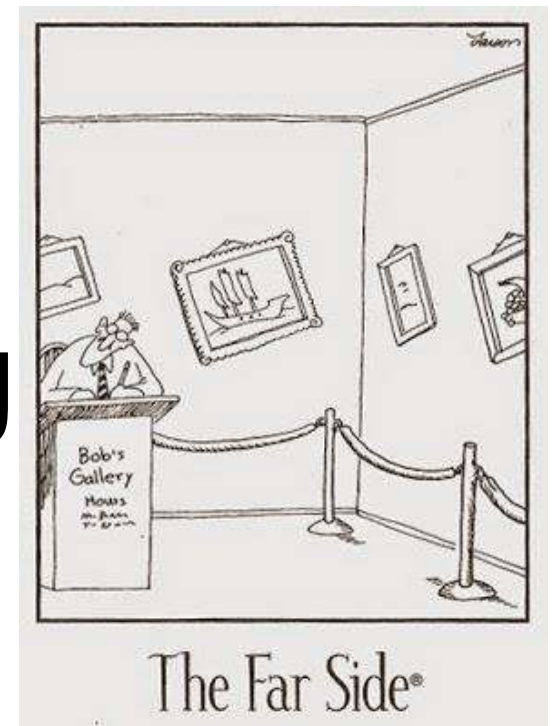
## ► Polarized



# Binocular vision

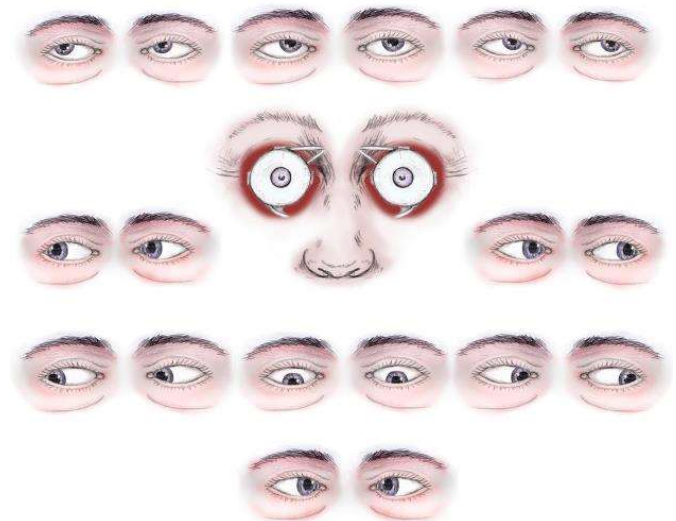
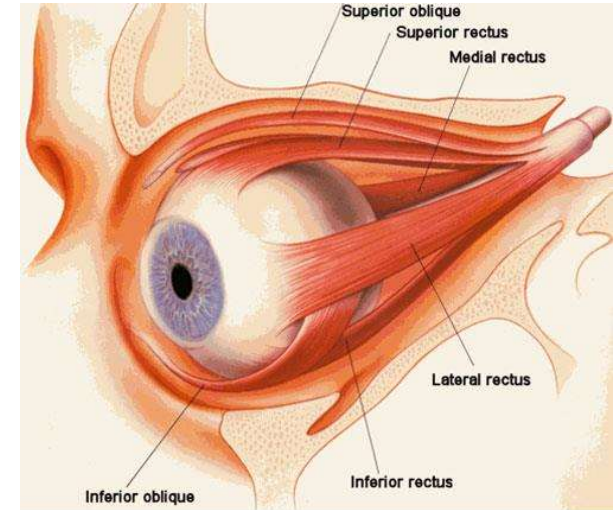
- » Ocular motility
- Strabismus
- Amblyopia

Eyes working  
together



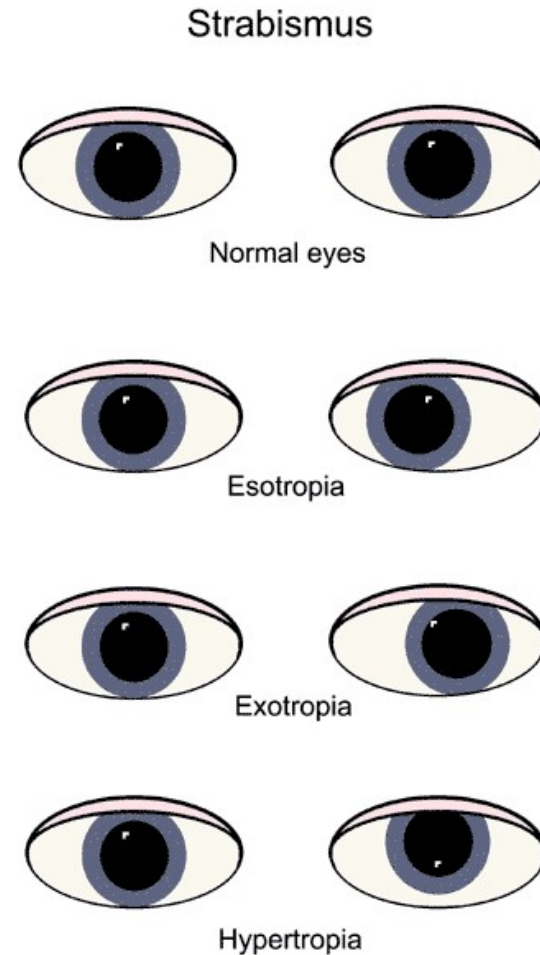
# Ocular motility

- ▶ Eye movements – controlled by 6 extraocular muscles (EOM)
  - Places desired image onto fovea of both eyes
  - Necessary for
    - binocular vision (single fused image)
    - depth perception
    - broad peripheral field
  - Each muscle is yoked to a muscle in the other eye



# Strabismus

Failure of the two eyes to simultaneously direct their gaze at the same object due to an imbalance in the activity of the EOM's.



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Image source:  
[http://www.fairview.org/healthlibrary/content/ea\\_strabism\\_art.htm](http://www.fairview.org/healthlibrary/content/ea_strabism_art.htm)



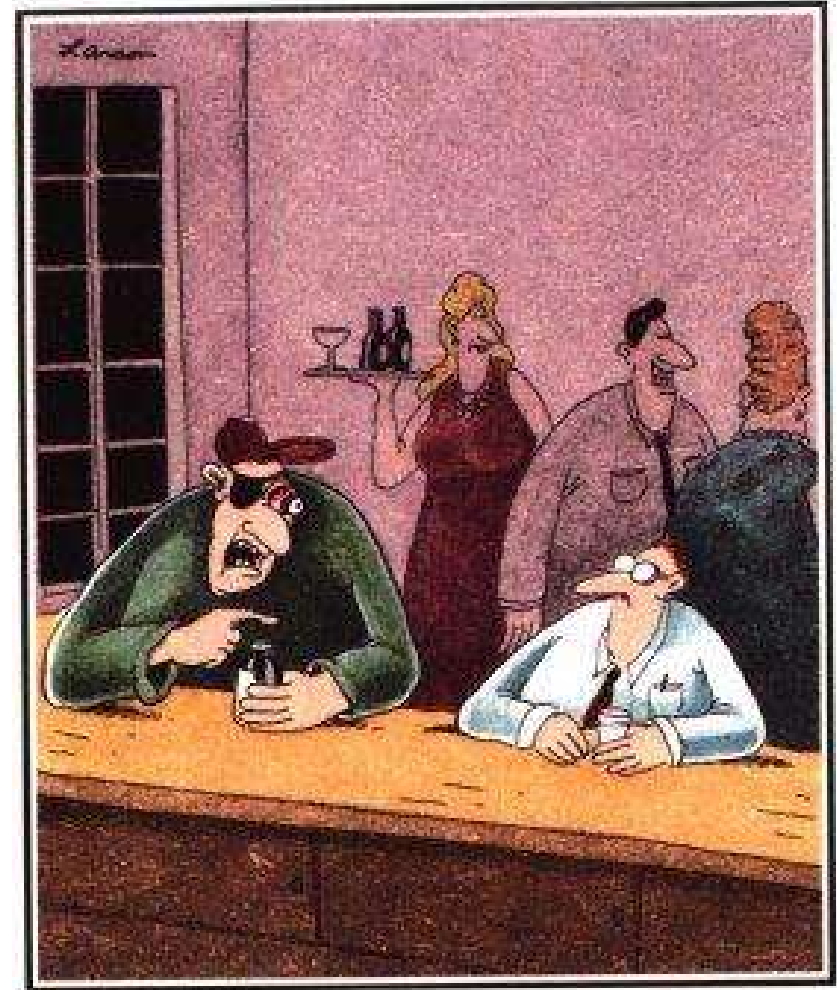
# Strabismus – 3 categories, different treatments

- ▶ Restrictive
- ▶ Paretic
- ▶ Sensory



# Amblyopia

- ▶ Loss of vision due to unequal visual input between the two eyes
  - The brain ignores the lesser of the two inputs
    - Strabismus
    - Anisometropia
    - Opacities – cataract, corneal scars
    - Ptosis
  - Sometimes referred to as “lazy eye”
  - Can occur in children up to teenage years
  - Treated with patching, dilating drops



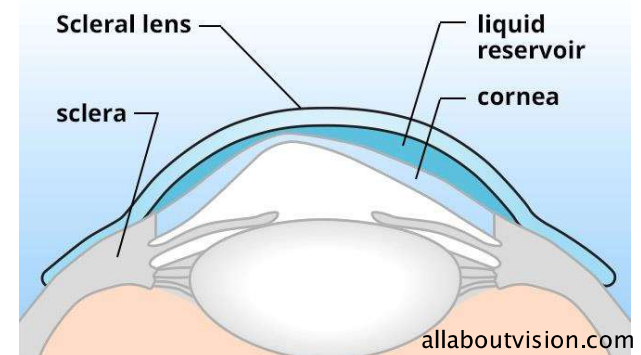
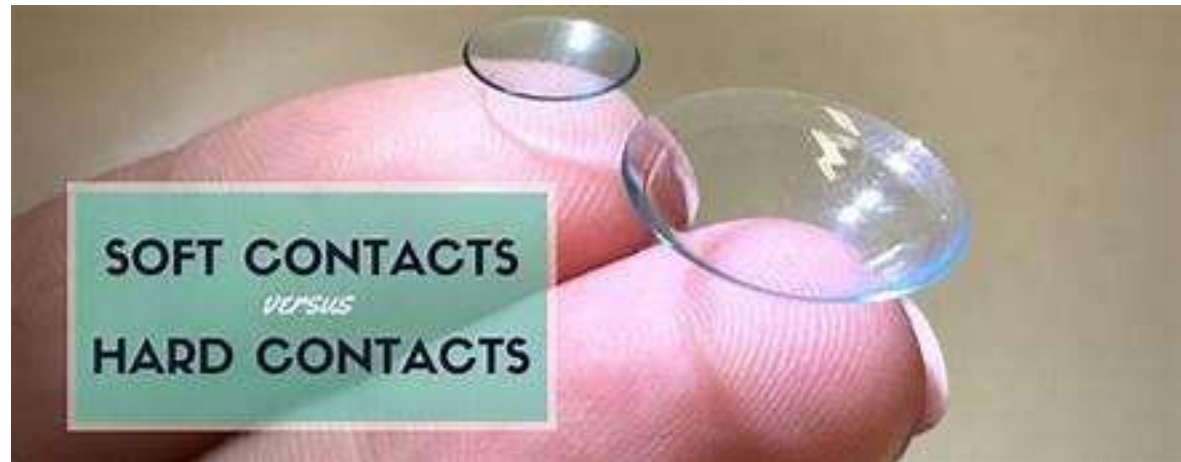
“Just keep starin’, buddy, and I’ll show ya my bad eye!”

# Contact Lenses

- » Types/Usage
- Insertion and removal
- Care

# Materials

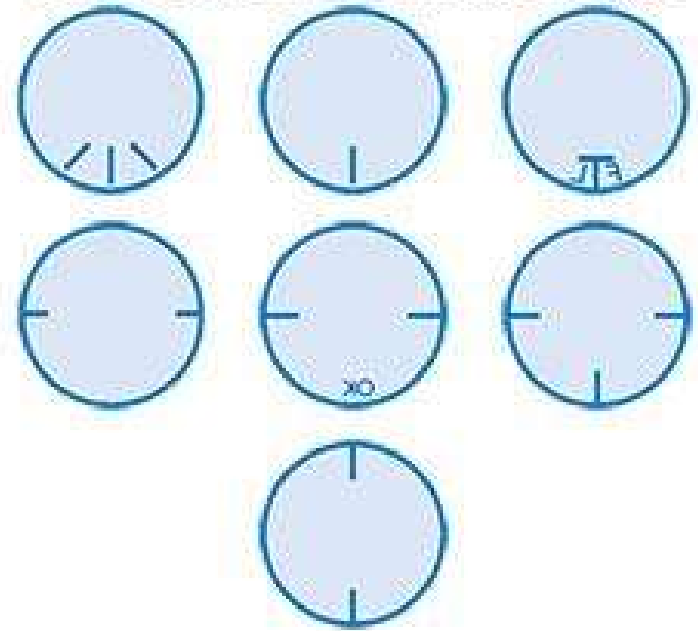
- ▶ Soft – most common, ~90% of wearers
  - Multiple polymers, proprietary materials
  - Oxygen: dK/t
- ▶ RGP – “hard”
- ▶ Scleral
- ▶ Hybrid



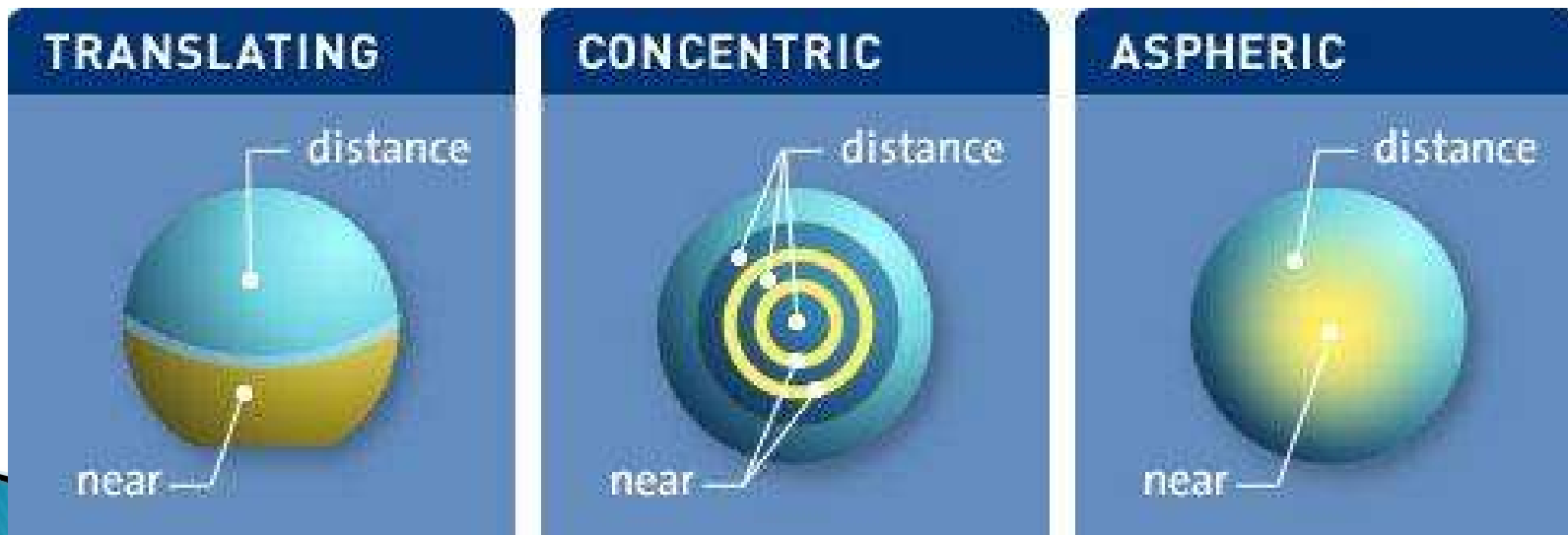
# Refractive power

- ▶ Sphere
- ▶ Toric – for astigmatism
- ▶ Multifocal

Various Toric Lens Markings



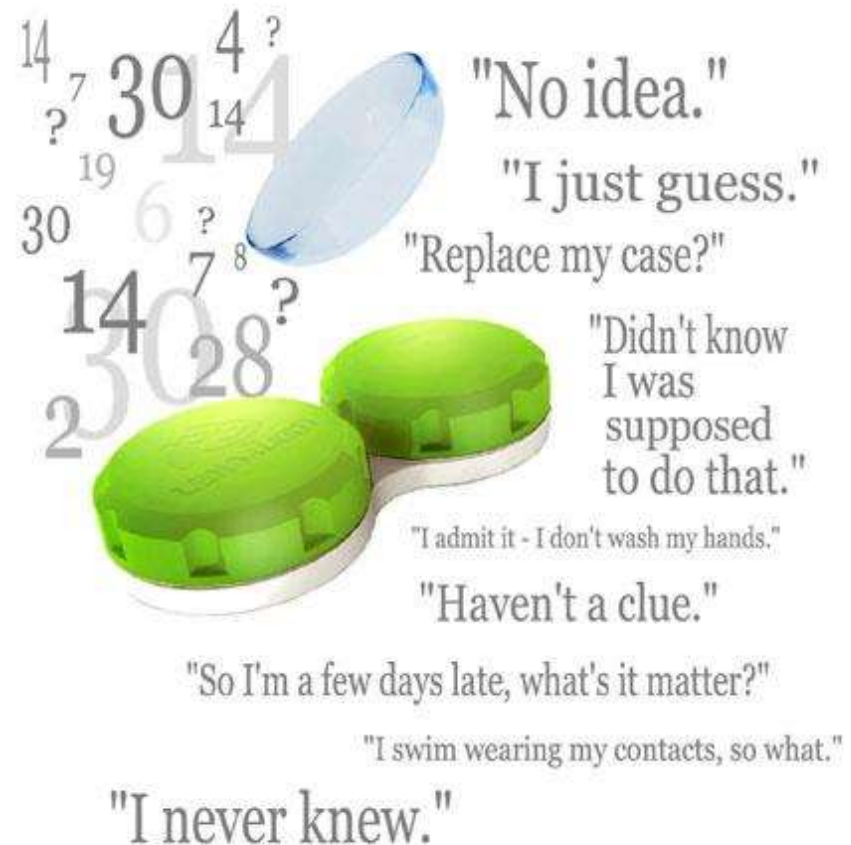
## Multifocal designs





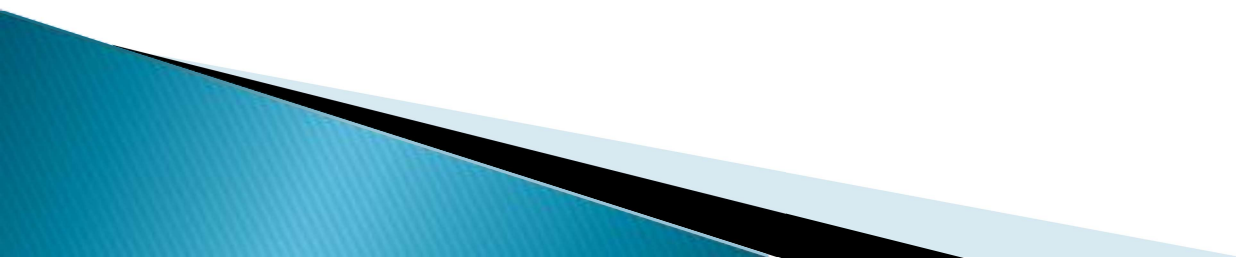
# Care

- ▶ Daily disposable CL
- ▶ Planned replacement CL
- ▶ Always use fresh solution (don't top off)
- ▶ Rub and rinse
- ▶ Never sleep in CL
- ▶ Never swim in CL
- ▶ Change CL cases



# Questions or comments?

»» Thank you.



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