

5. The function of the ciliary body (muscle) is to:

- a. control the amount of light entering the eye
- b. distinguish among different colours
- c. focus the lens
- d. distinguish dark and light objects

6. List the three layers of the eye and describe the function of each layer. (6 marks)

**Today you will:**

- trace the pathway of light through the eye
- state 4 basic processes of image formation on the retina
- describe the role of cones, rods, bipolar and ganglion cells in vision
- describe accommodation of the eye
- describe common disorders of the eye

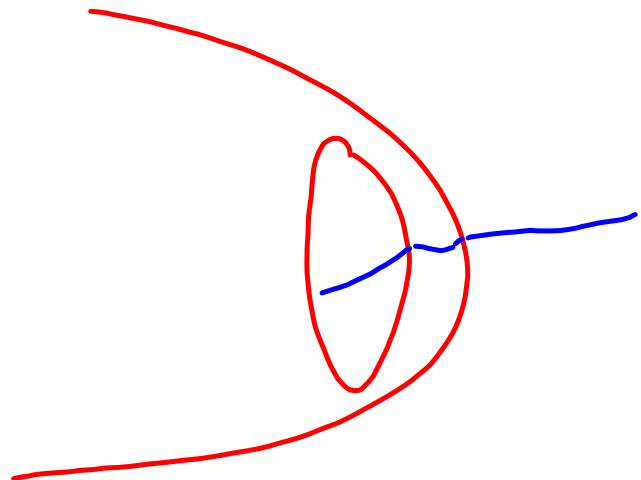
## **Physiology of Vision**

- Light passage
  - a. cornea
  - b. aqueous humor (between the cornea and iris)
  - c. pupil
  - d. lens
  - e. vitreous humor
  - f. retinal (rods and cones) where image is formed

## **Image Formation on the Retinal Requires 4 Basic Processes**

## 1) Refraction of Light Rays

- Refraction - bending of light rays as they pass from one transparent medium (air) to another having a different density (water)
- The eyes mediums of refraction include:
  1. Cornea
  2. Aqueous humor
  3. Lens
  4. Vitreous humor

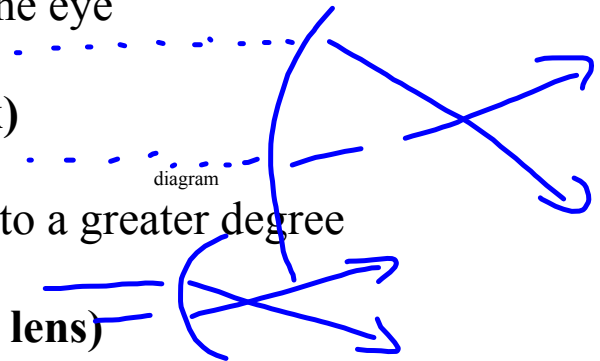


## B) Accommodation of Lens

- ability of lens to increase or decrease curvature of surface of lens
- changes the focusing power of the eye

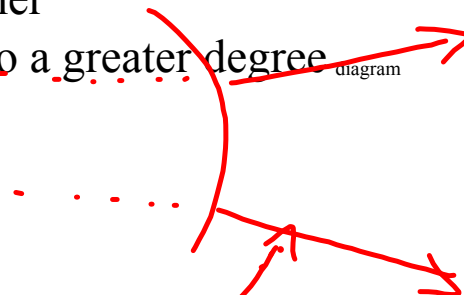
### Surface curves outward (convex)

- refracts rays towards each other
- increasing curvature bends rays to a greater degree



### Surface curves inward (concave lens)

- refracts rays away from each other
- increasing curvature bends rays to a greater degree



### Near vision

- ciliary muscle contracts, ligaments relax
- lens becomes round (thicker)

- pupil constricts in attempt to bring image into sharp focus

### Far vision

- ciliary muscle relaxes, ligaments under tension
- lens is flattened

- pupil dilates in attempt to capture as much light as possible

### C) Constriction of Pupil

- narrowing of diameter of hole
- accomplished by contraction of circular muscles of iris
- prevents light rays from entering eye (protects retina during exposure to bright light)

### D) 3-D Image and Inverted Image

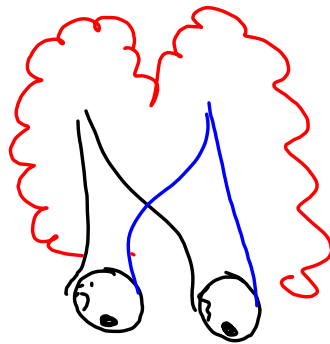
- single binocular vision - both eyes focus on only one set of objects
  - light rays from object directed onto identical spots of two retinas
  - *convergence* - medial movement of two eyeballs toward object being viewed
  - closer objects - convergence and vice versa
  - allows accurate judgment of distance and depth
- 
- images focussed upside down on retina
  - "mirror reversal" - light reflected from right side of an object hits left side of retina and vice versa
  - brain automatically turns *visual image* right side up and right side around

### Visual Pathway

- visual images pass from the rods and cones (retina) to bipolar neurons, then to ganglion cells.
- nerve impulses travel through axons that lie on the retina and leave the eyeball through the optic nerve
- the **optic chiasma** is the crossing point of optic nerves
  - i) the nerve fibres that cross over are those that are located at the inner or nasal side of the retina
  - ii) fibres from the outer field of each eye are uncrossed

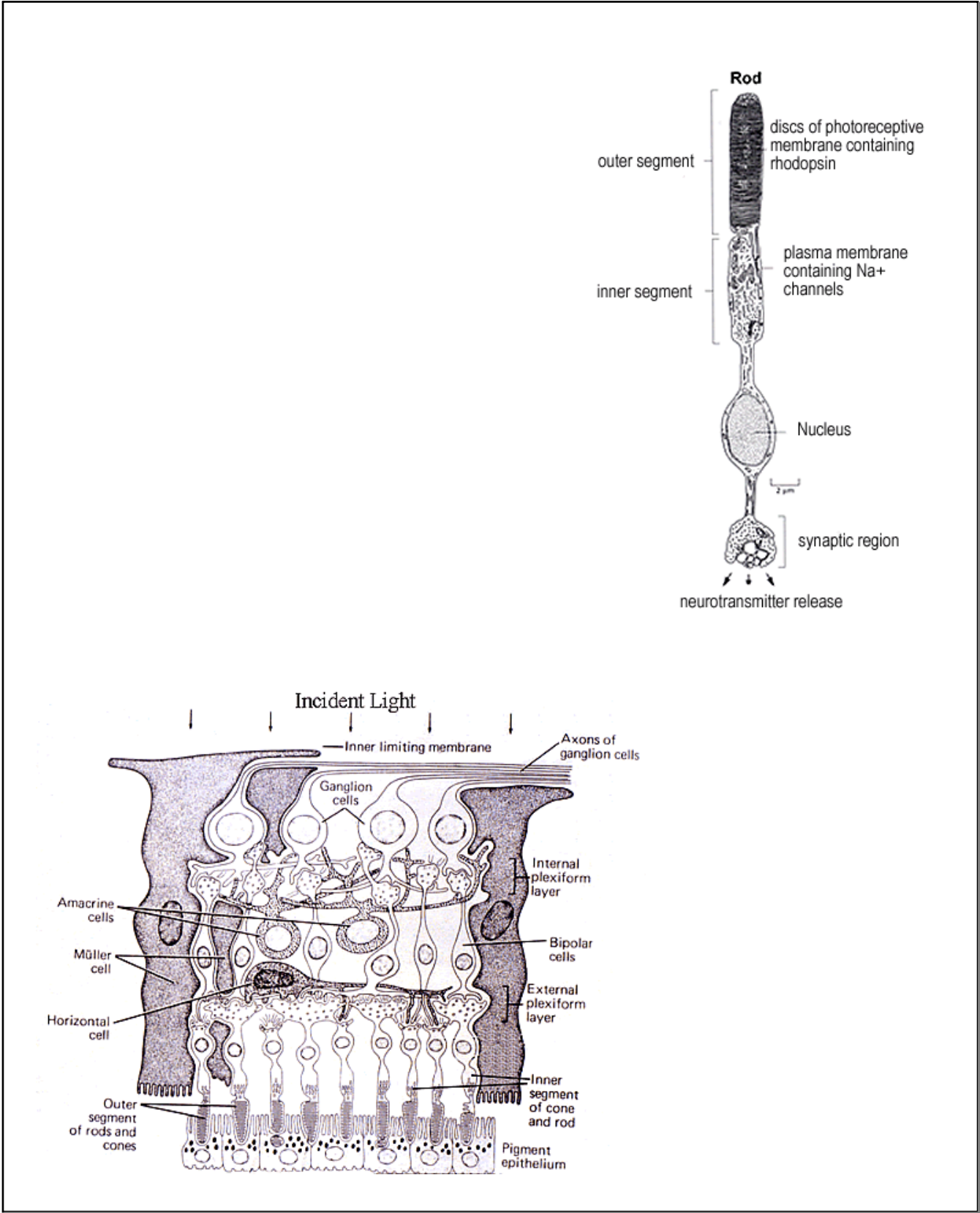
### Visual Cortex

- right, visual cortex receives information from the right side of each eye which is the left side of the visual field
- left, visual cortex receives information from the left side of each eye which is the right side of the visual field.

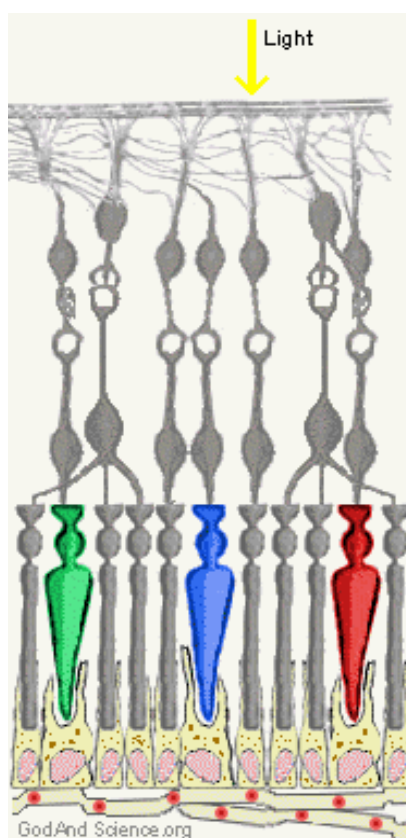


- Both eyes "see" entire object but information of right  $\frac{1}{2}$  of each retina goes to right visual cortex and visual of left half of each retina goes to left visual cortex.

When info. is pooled, brain "sees" entire object and "sees" it in depth.







## Colour Blindness

- view power point

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- colour blindness

- occurs when one or more types of cones are defective

- most common type is

red-green colour blindness

(red sensitive pigment fails to work properly)

→ genetic

Parts of the eye + video on how retina works

**<http://www.macula.org/anatomy/anatomy.html>**



Cool labelling site

**<http://www.bishopstopford.com/faculties/science/arthur/Eye%20Drag%20%26%20Drop.swf>**




How the eye works

**<http://www.1800contacts.com/StaticContent/vision101/frames.html>**



## **Common Disorders of the Eye**

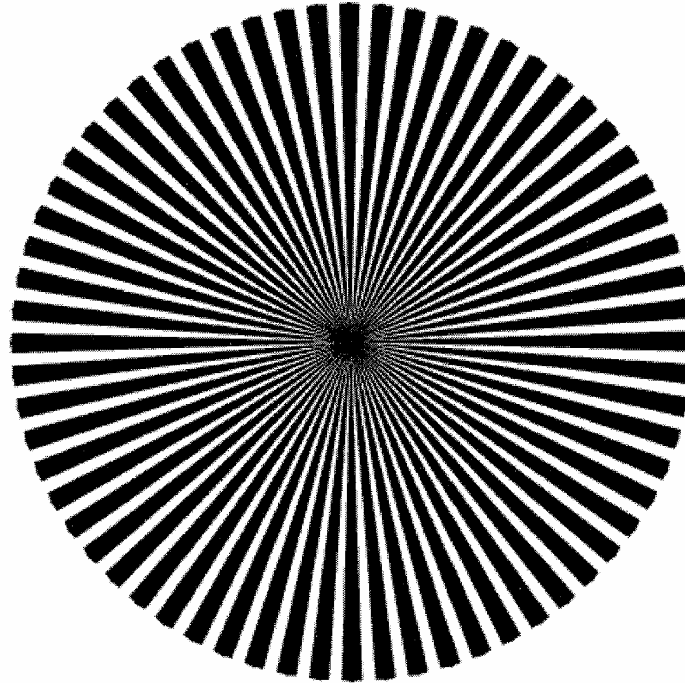
- view hand out with notes

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Shimmer: Exploratorium Exhibits. Your eye movements make this design seem to shimmer. Page 1 of 1

## Shimmer

Your eye movements make  
this design seem to shimmer.



### To Do and Notice

Your eye movements make this design seem to shimmer.

You can get a stronger shimmer effect by moving your head as you stare at the design.

### What's Going On?

The motion you see is not in the design, but in your own eye. Even though you're not aware of it, your eyes are constantly making small, jittering movements, which continually refresh the image cast on the back of your eye. Normally, your brain can ignore this motion, so your picture of the world stays stable.

Each time your eye moves, the old image is briefly superimposed on the new image in your eye. When your eye moves over the repeating, evenly spaced lines of this design, the old and new images are superimposed to create a swirling shimmer.

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online exhibits

<http://www.exploratorium.edu/exhibits/shimmer/>

24/09/2001

## Protection of the Eye

- **bony socket**
- **eyebrow** deflects water + debris
- **eyelashes** have 'blink' reflex that responds to potential danger
- **blinking** keeps eye moist
- **lacrimal gland** (tears): (top/temple side of eye)
  - tears flow from top/temple to bottom/nasal
  - tears contain an antibiotic
  - tears drain into the nose
- **tarsal gland** (oil): (located in the lid)
  - secrete an oil to moisturize the eye
- **lids** sweep the eye
- **sclera** to resist punctures

## **Evaluation**

- 1) finish the questions from the lab.**
- 2) Compare rods and cones in terms of location, structure and function.

## Attachments

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