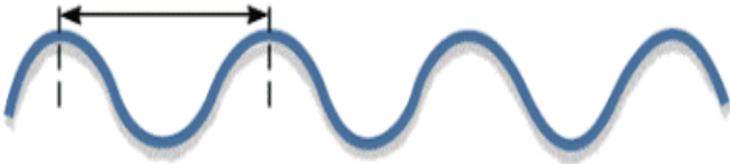


Vision



- Our most dominating sense.
- **Visual Capture**

**Short wavelength=high frequency
(bluish colors, high-pitched sounds)**

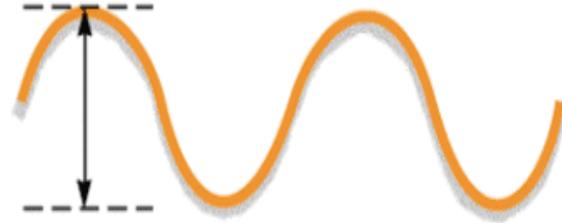


**Long wavelength=low frequency
(reddish colors, low-pitched sounds)**



(a)

**Great amplitude
(bright colors, loud sounds)**



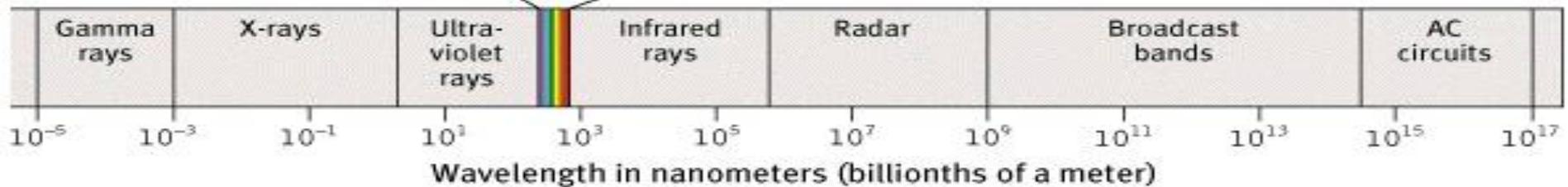
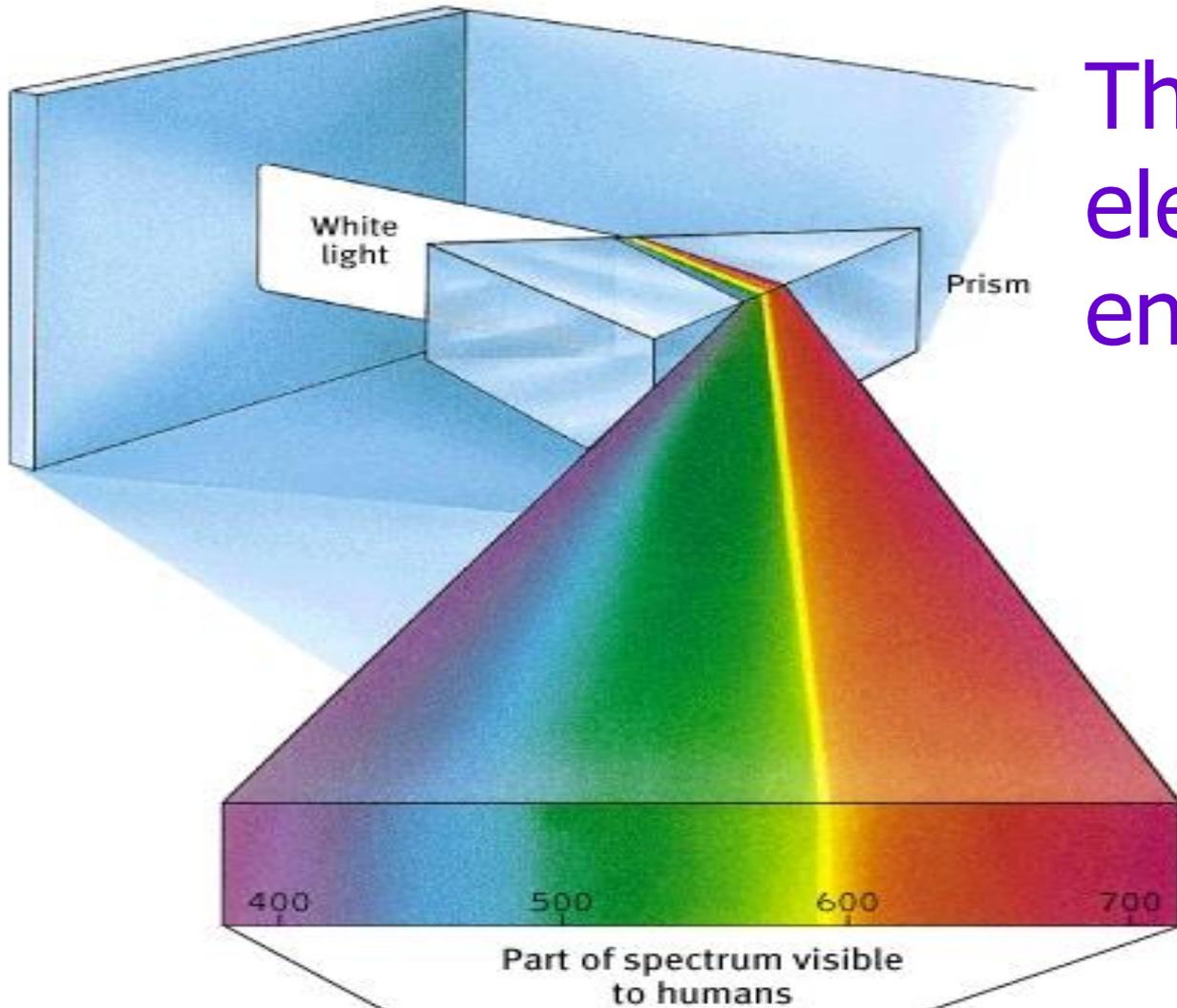
**Small amplitude
(dull colors, soft sounds)**



(b)

- The height of a wave gives us its intensity (brightness).
- The length of the wave gives us its hue (color).
- ROY G BIV
- The longer the wavelength, the more red.
- The shorter the wavelength, the more blue.

The spectrum of electromagnetic energy



Differing Eyes

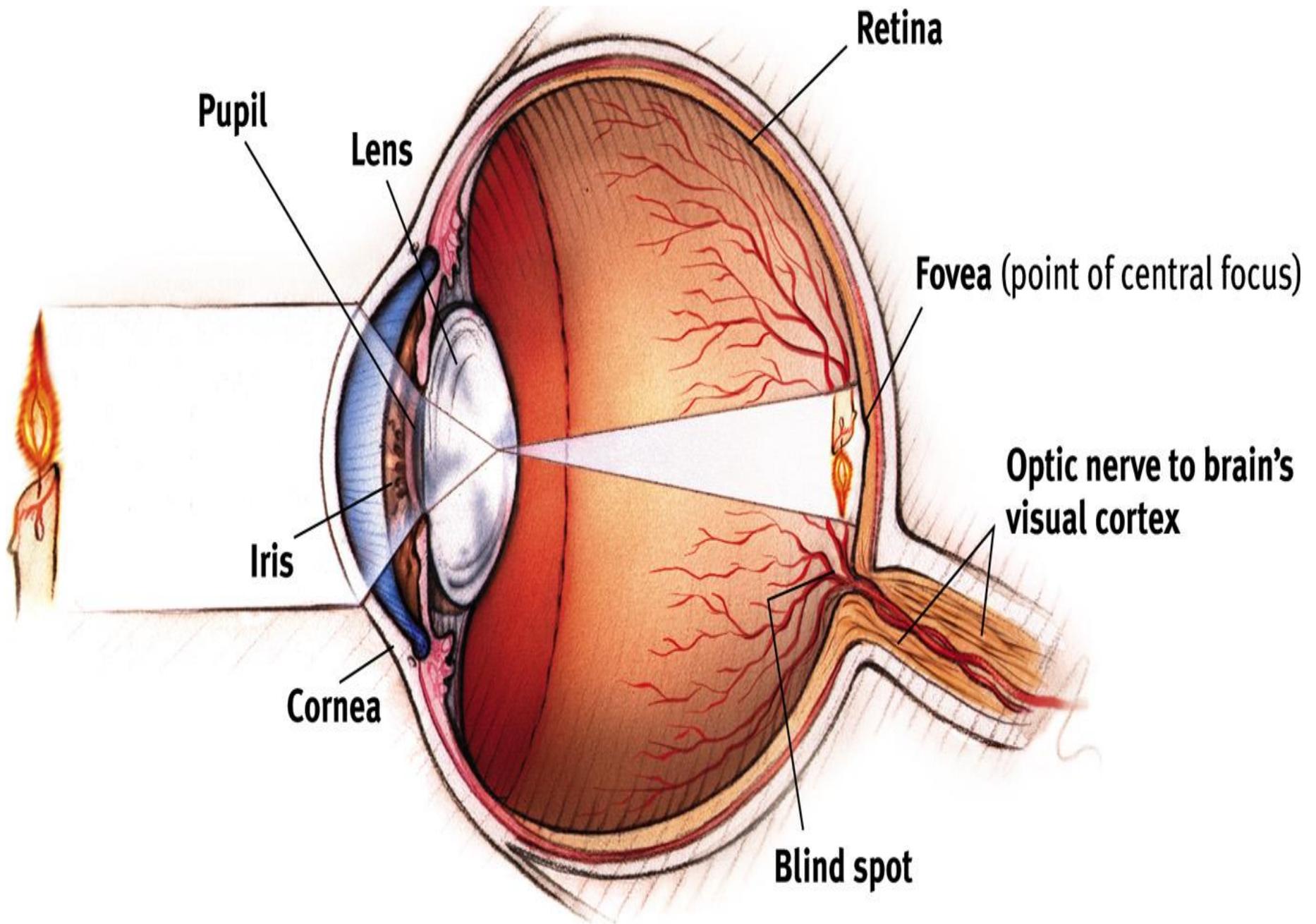


Human eye



Bee's eye

Bee detects reflected ultraviolet wavelengths



Vision

- **Pupil**- adjustable opening in the center of the eye, lets light in
- **Iris**- a ring of muscle that forms the colored portion of the eye around the pupil and controls the size of the pupil opening

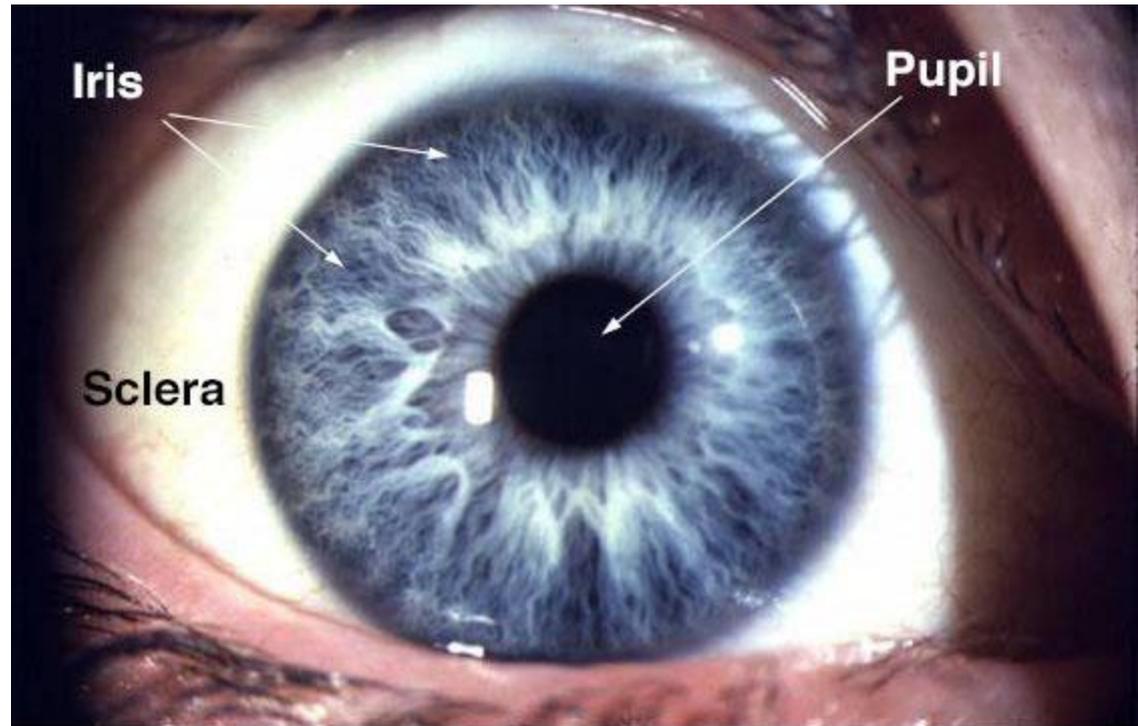


Fig. 1. View of the human eye

Vision

- **Cornea**- protects the eye and bends light to provide focus
- **Lens**- transparent structure behind pupil that changes shape through **accommodation** to focus images on the retina



Vision

- **Retina**- the light-sensitive inner surface of the eye, containing receptor rods and cones plus layers of neurons that begin the processing of visual information
- **Optic nerve**- nerve that carries neural impulses from the eye to the brain



Fig. 14. Ophthalmoscopic appearance of the retina to show the macula lutea (yellow around fovea).



Vision

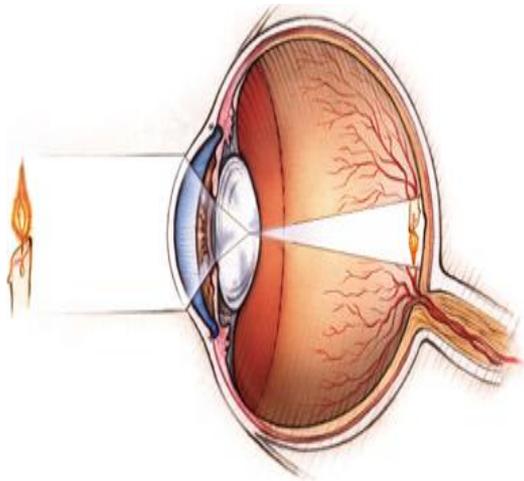
- **Blind Spot**- point at which the optic nerve leaves the eye, creating a “blind spot” because there are no receptor cells located there
- **Fovea**- central point in the retina, around which the eye’s cones cluster



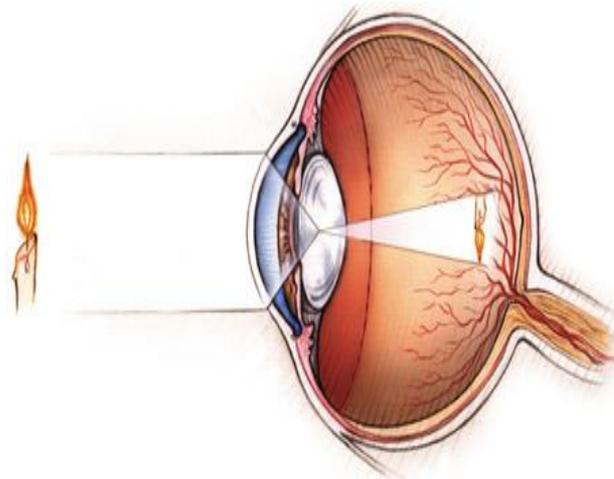
Acuity- the sharpness of vision (can be affected by distortions in the eye's shape)

Nearsightedness- condition in which nearby objects are seen more clearly than distant objects because distant objects in front of retina

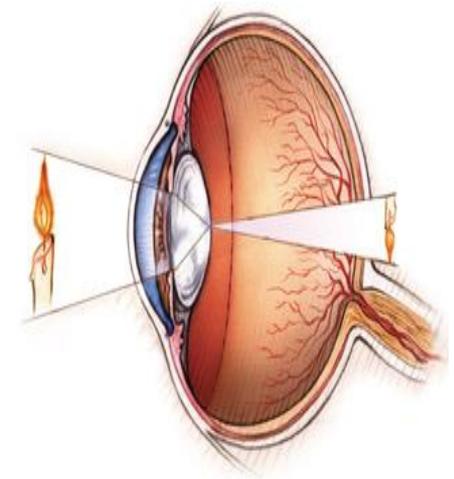
Farsightedness- condition in which faraway objects are seen more clearly than near objects because the image of near objects is focused behind retina



■ Normal Vision



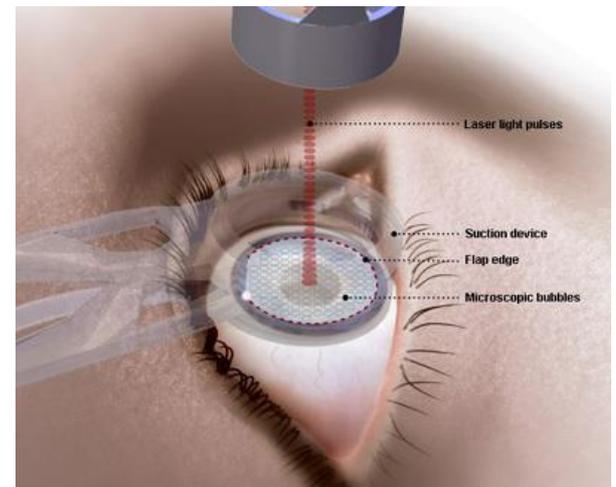
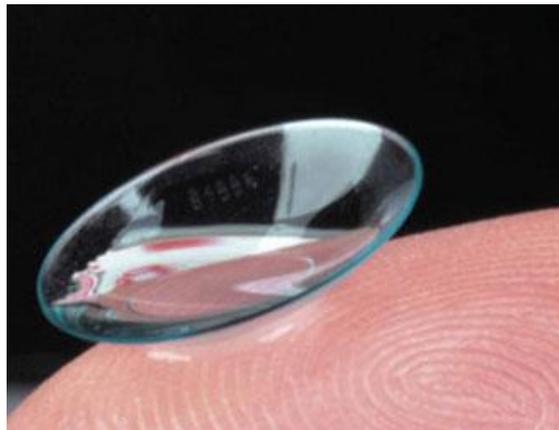
Nearsighted Vision

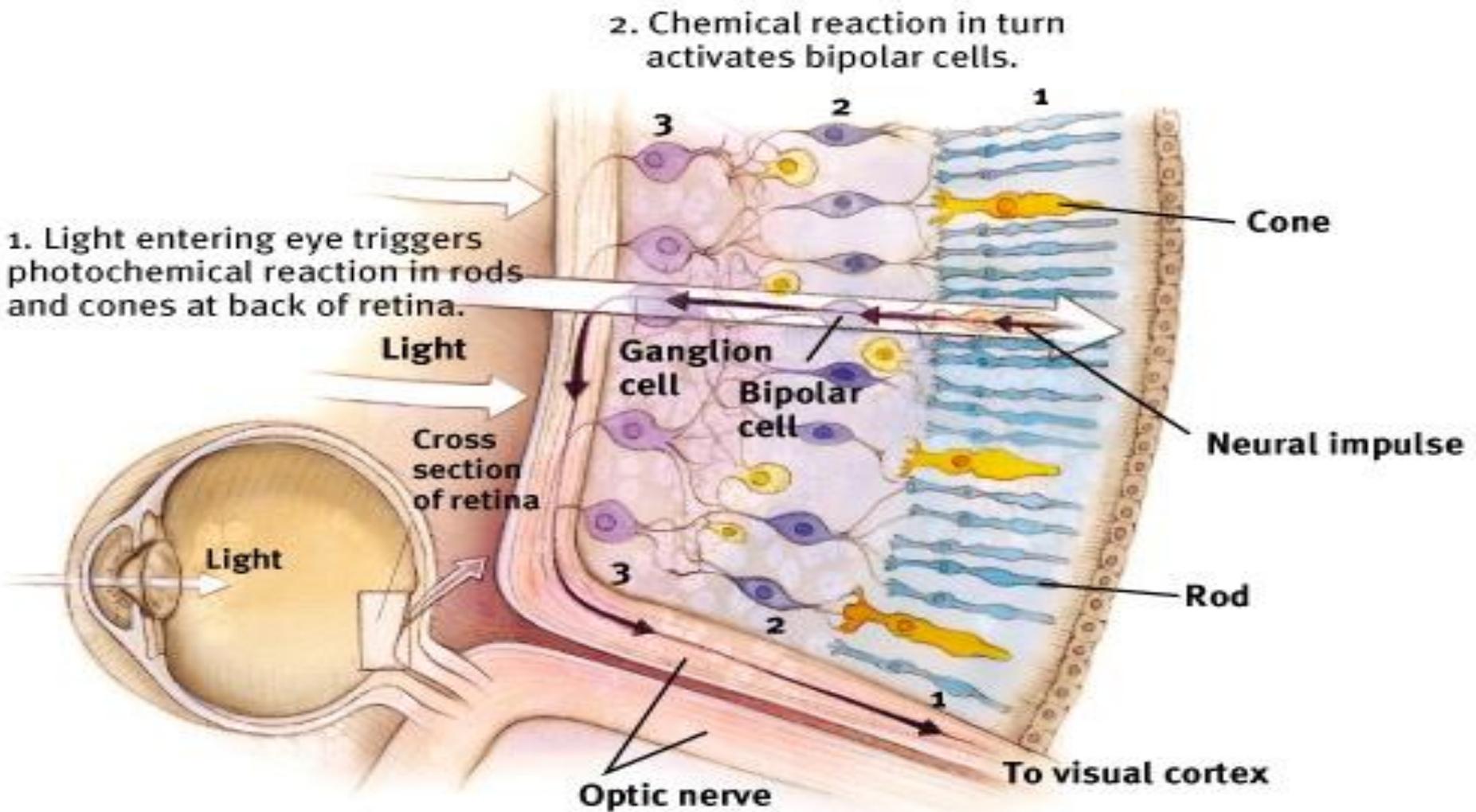


Farsighted Vision

How do we correct vision?

- Glasses, contact lenses, or LASIK surgery reshape the cornea (which is also involved in bending light to provide focus) to correct the problem





**Light energy → Rods and Cones → Bipolar Cells
 → Ganglion Cells (axons form the optic nerve)**

Retina's Reaction to Light-Receptors

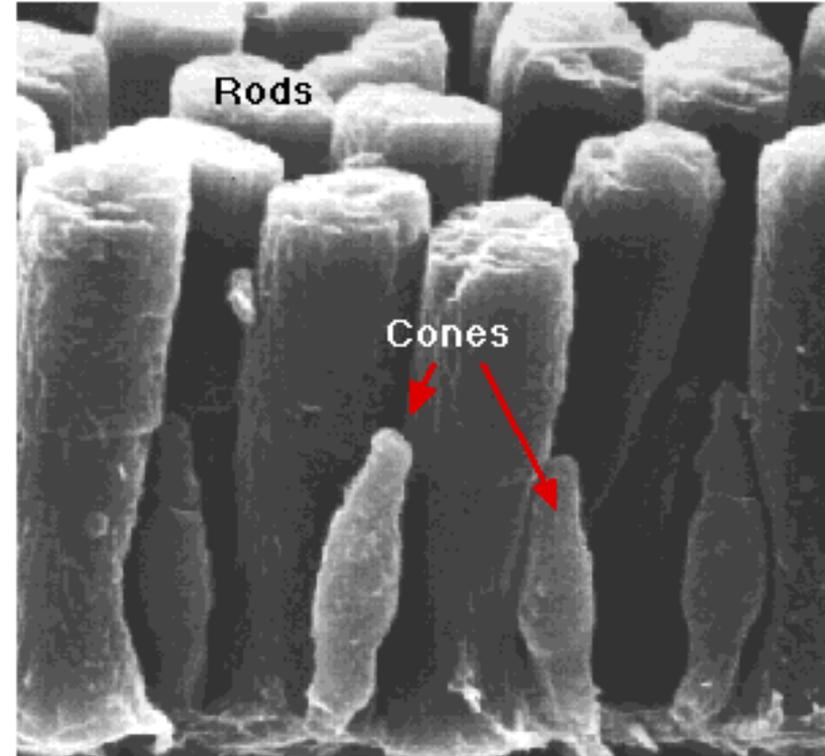
■ Rods

- peripheral retina
- detect black, white and gray
- twilight or low light

■ Cones

- near center of retina
- fine detail and color vision
- daylight or well-lit conditions

- Light energy striking the rods and cones produces chemical changes that generate neural signals

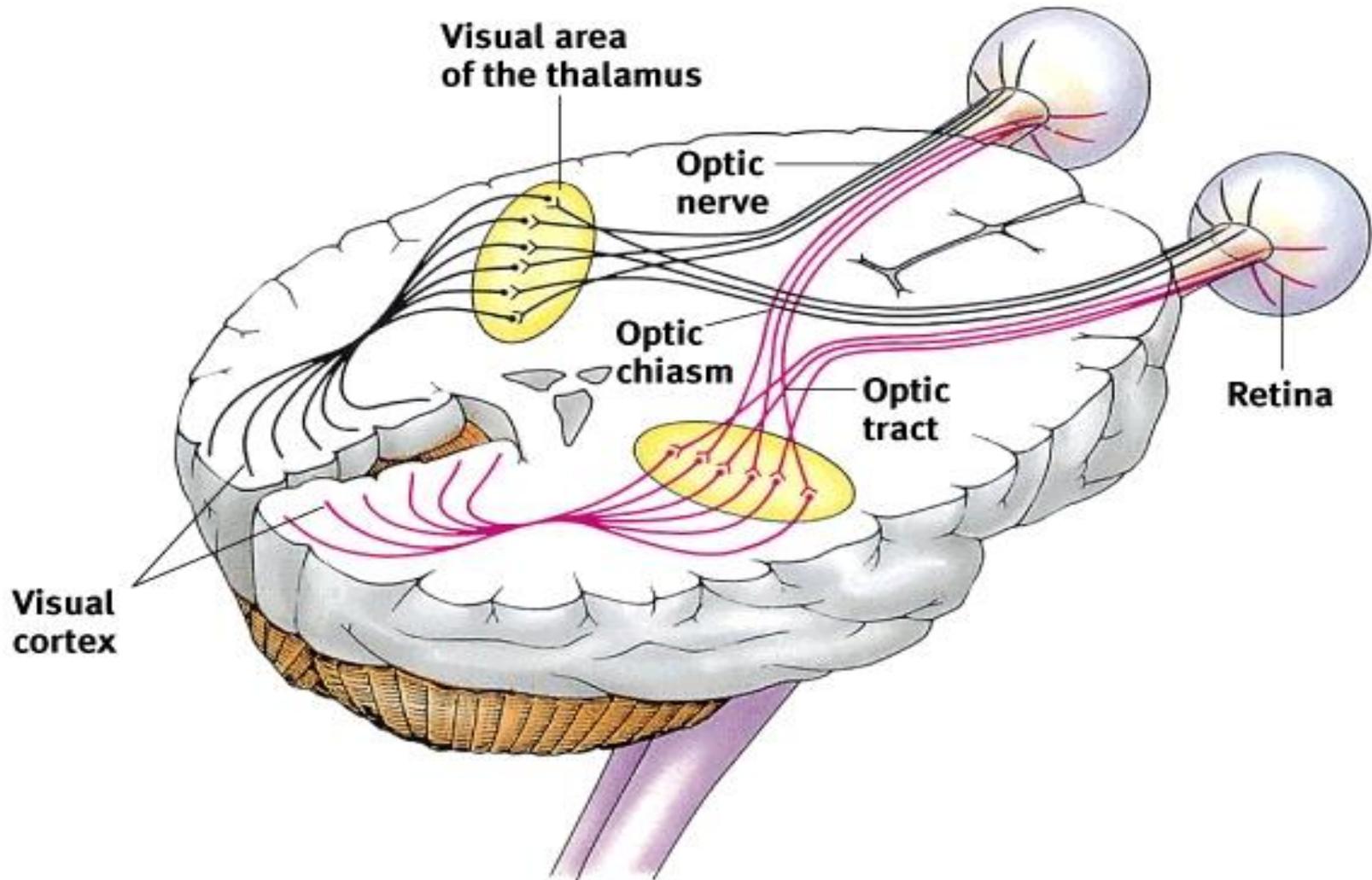


Vision- Receptors

Receptors in the Human Eye

| | Cones | Rods |
|---------------------------------|------------------|--------------------|
| Number | 6 million | 120 million |
| Location in retina | Center | Periphery |
| Sensitivity in dim light | Low | High |
| Color sensitive? | Yes | No |

Pathways from the Eyes to the Visual Cortex



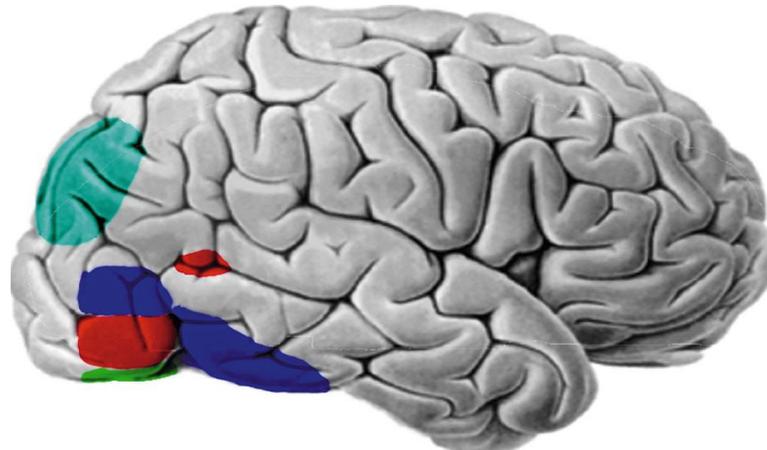
Visual Information Processing



■ Feature Detectors

- Located in the visual cortex
- nerve cells in the brain that respond to specific features
- shape
- angle
- movement

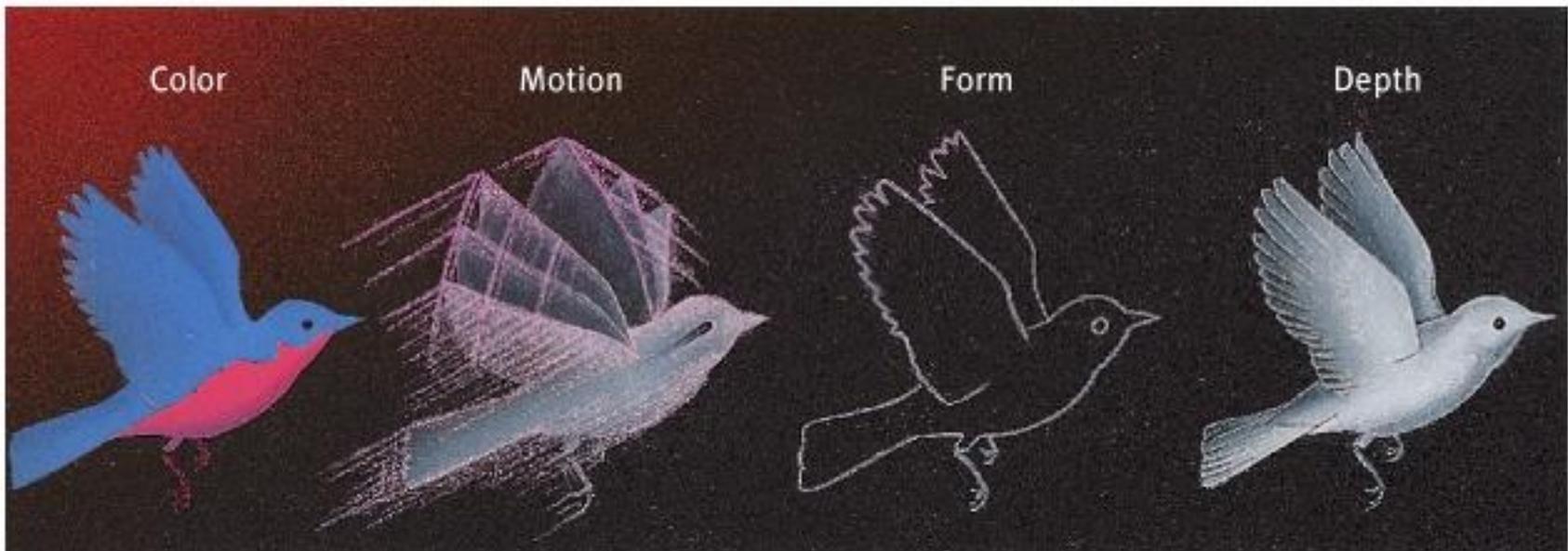
We have specific cells that see the lines, motion, curves and other features of this turkey. These cells are called feature detectors.



- Faces
- Houses
- Chairs
- Houses and Chairs

Visual Information Processing

- Parallel Processing
 - processing of several aspects of a object simultaneously

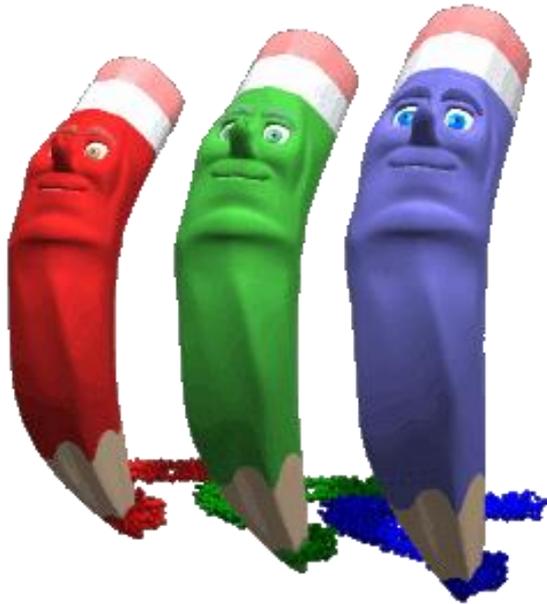


Color Vision



TWO MAJOR THEORIES

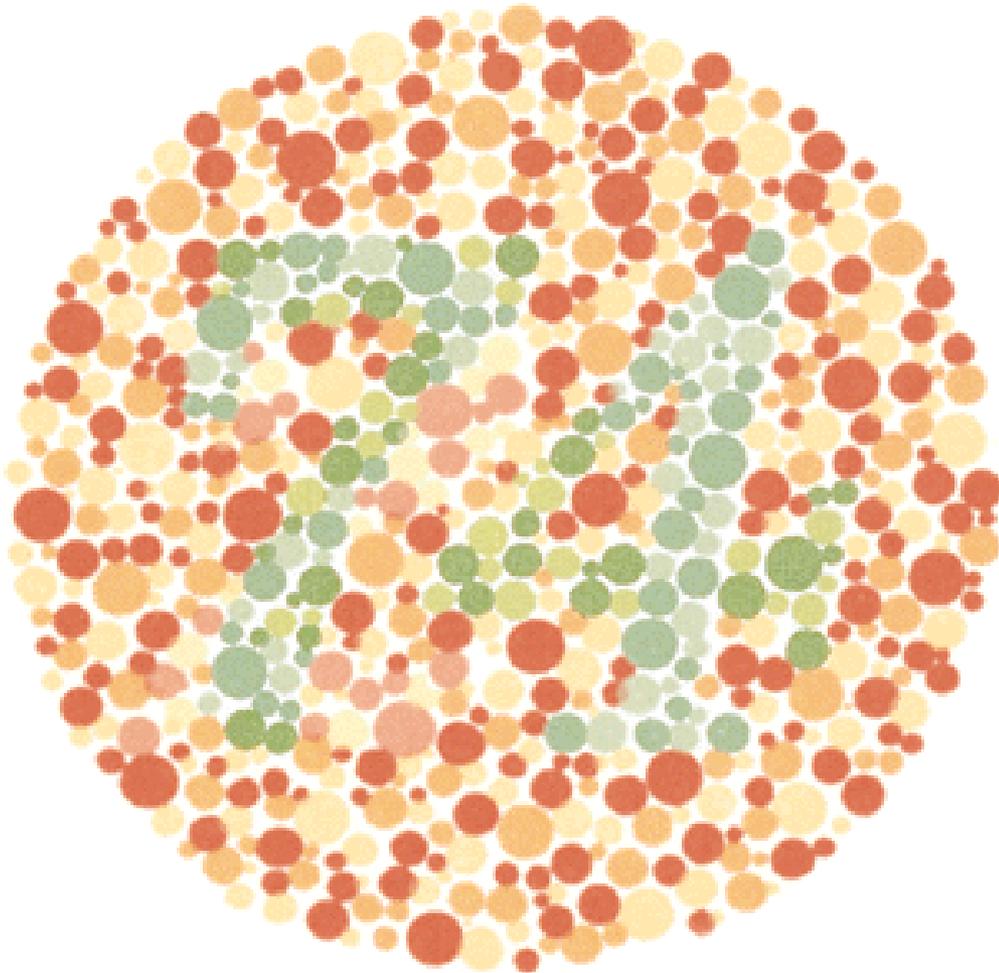
Trichromatic Theory



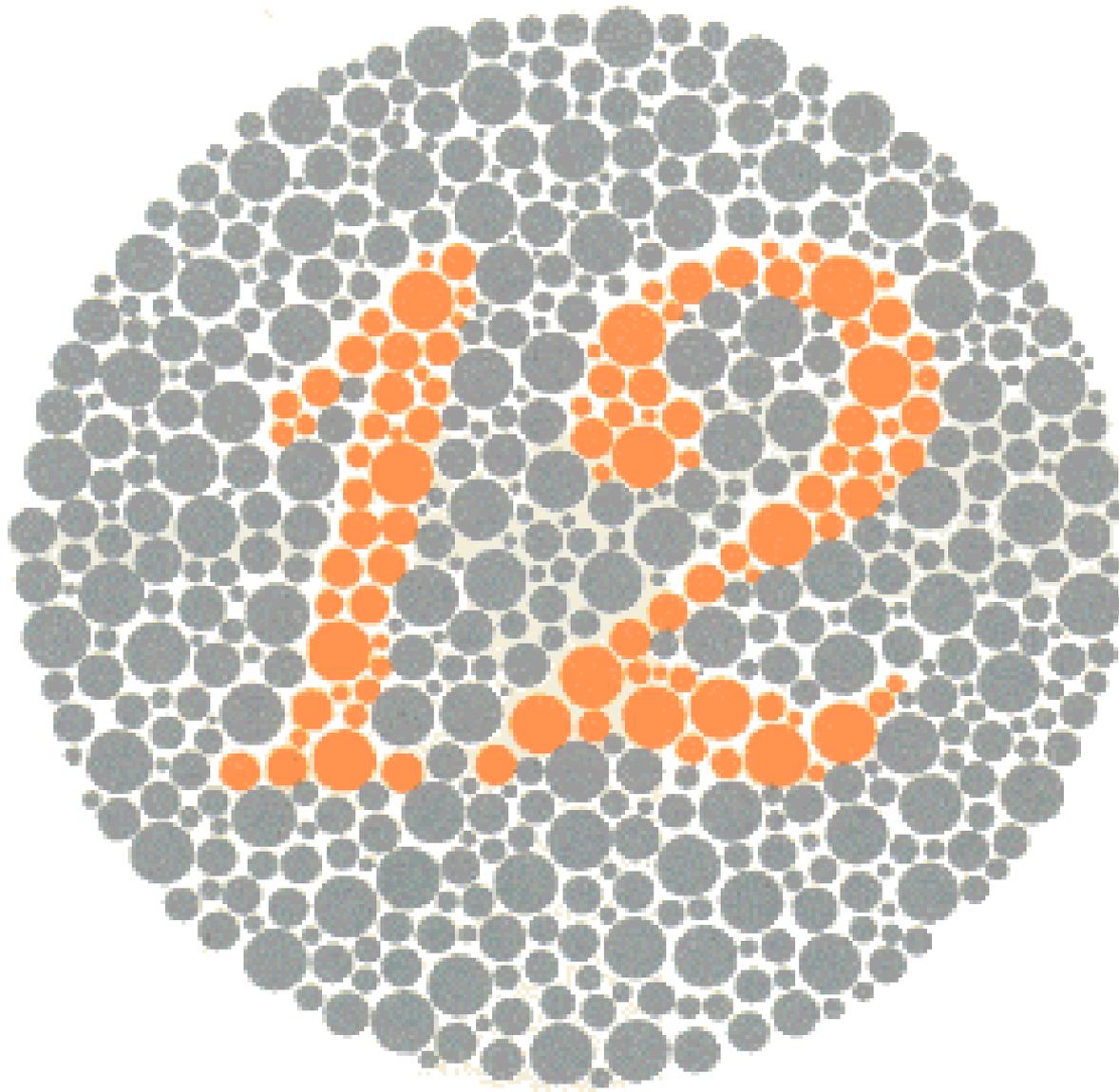
Three types of cones:

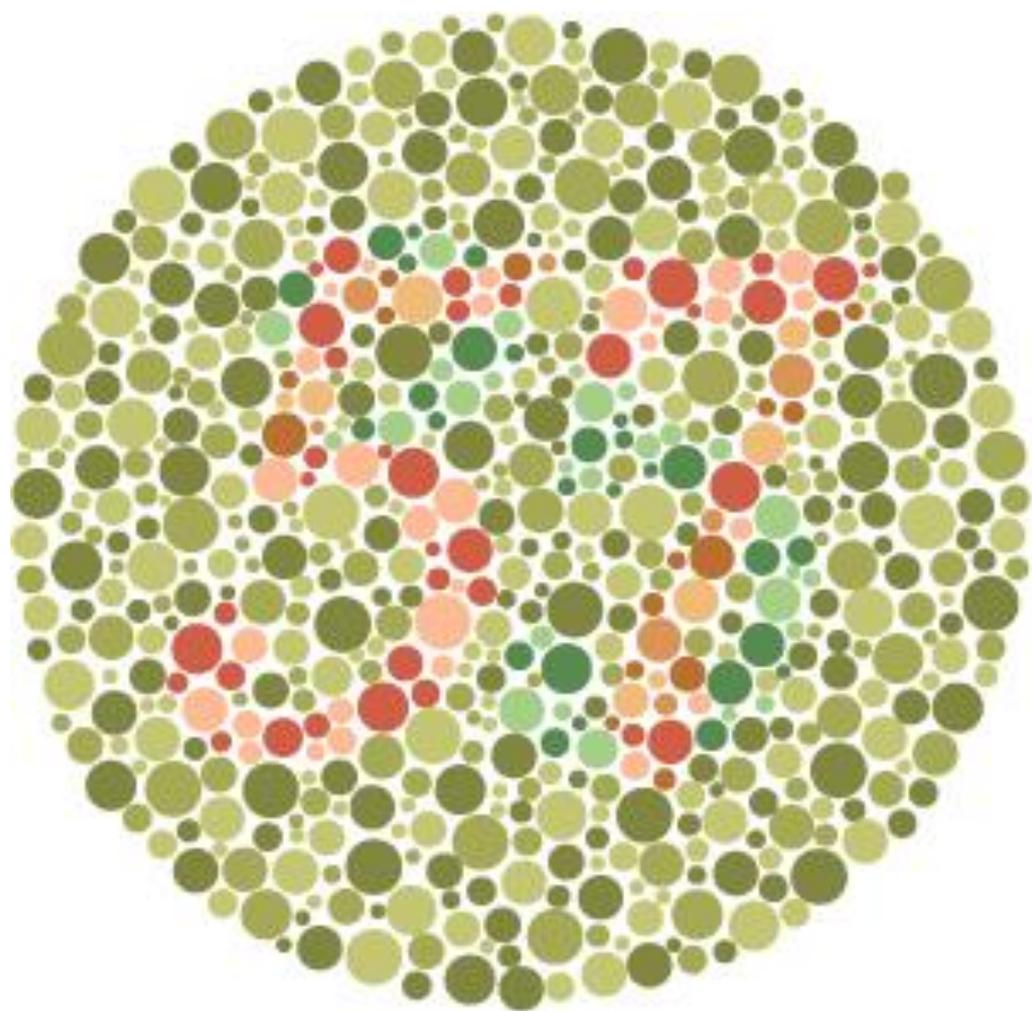
- Red
- Blue
- Green
- These three types of cones can make millions of combinations of colors.
- Does not explain afterimages

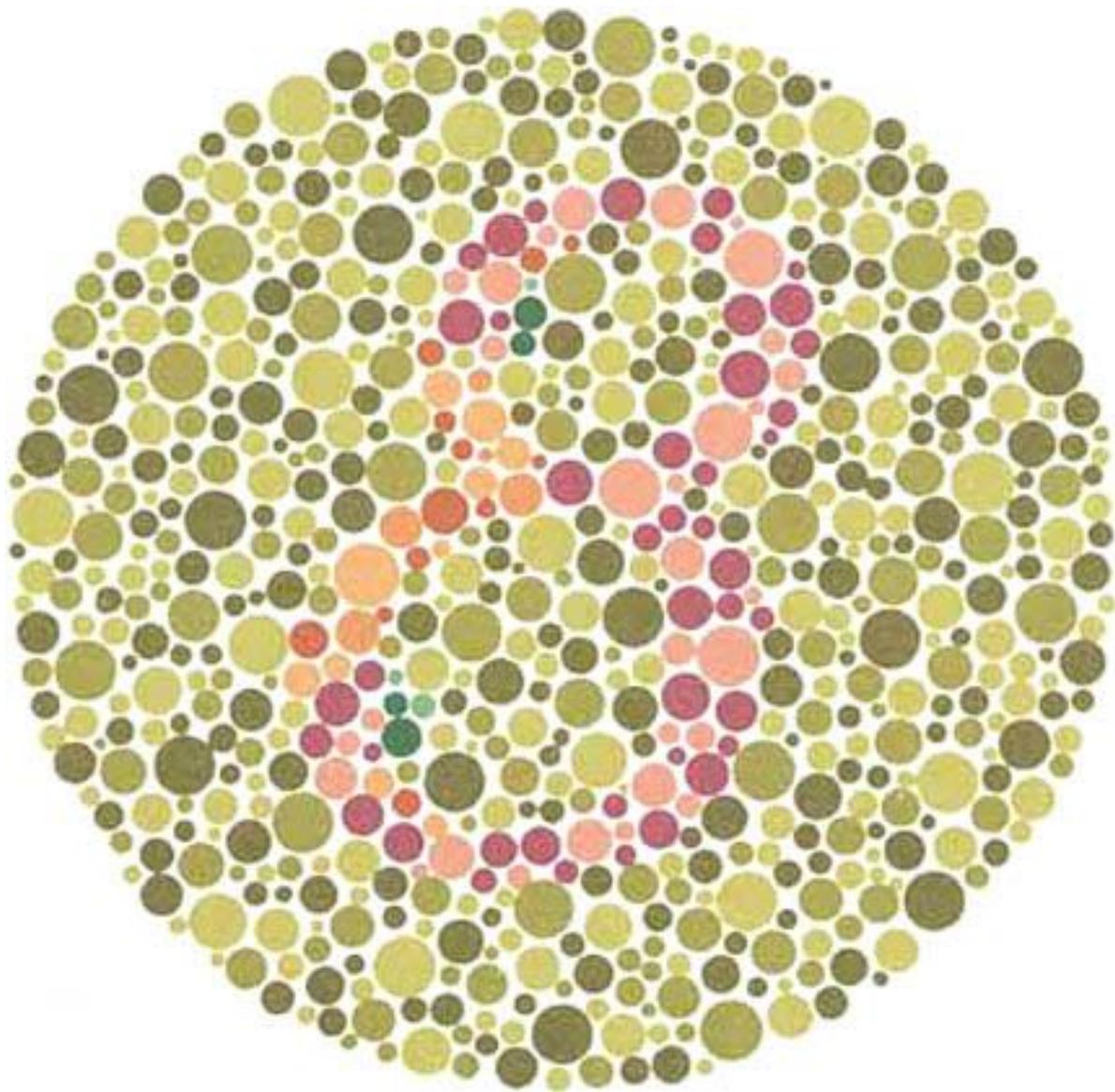
Color-Deficient Vision

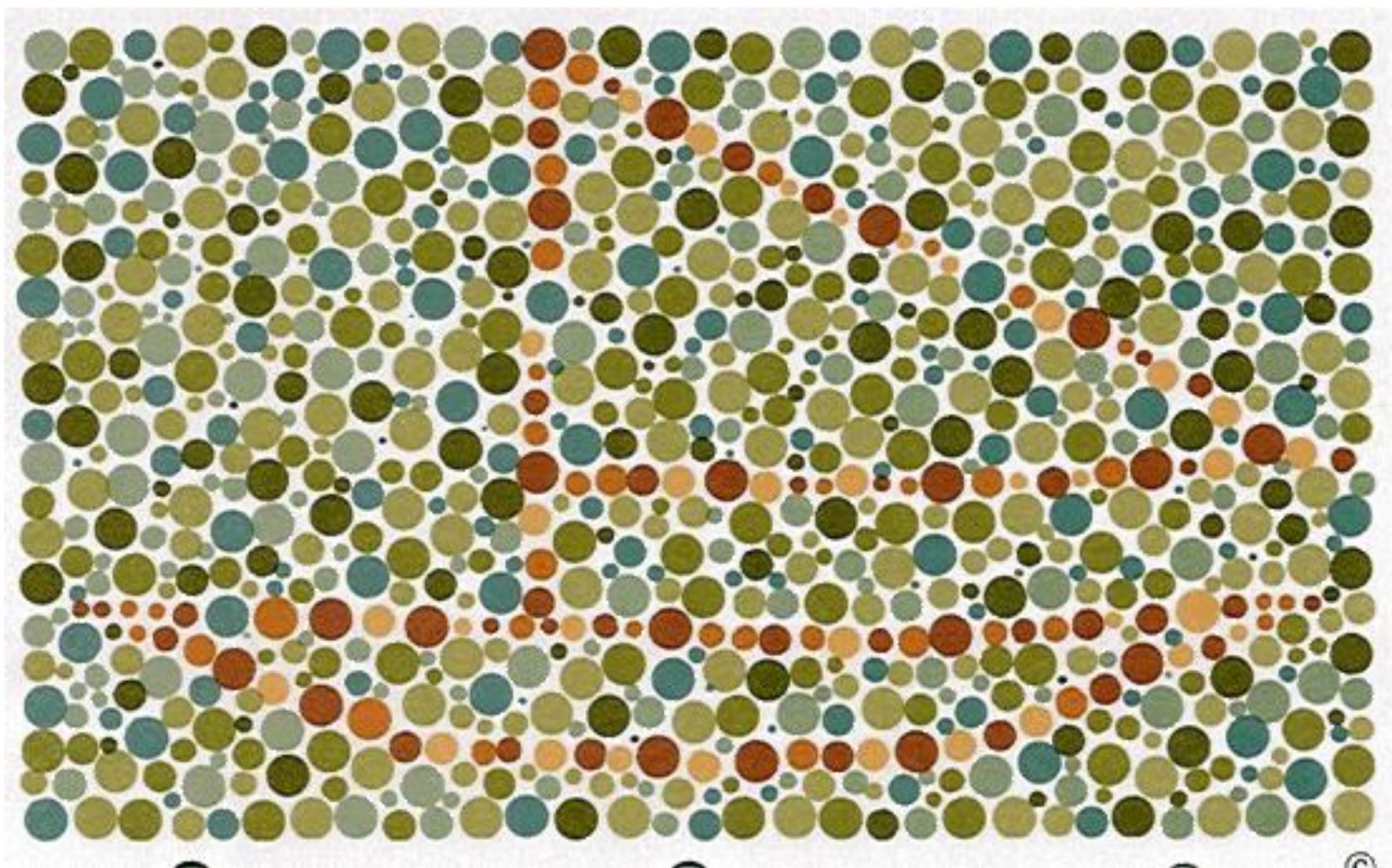


- People who suffer red-green blindness have trouble perceiving the number within the design
- They lack functioning red- or green- sensitive cones, or sometimes both









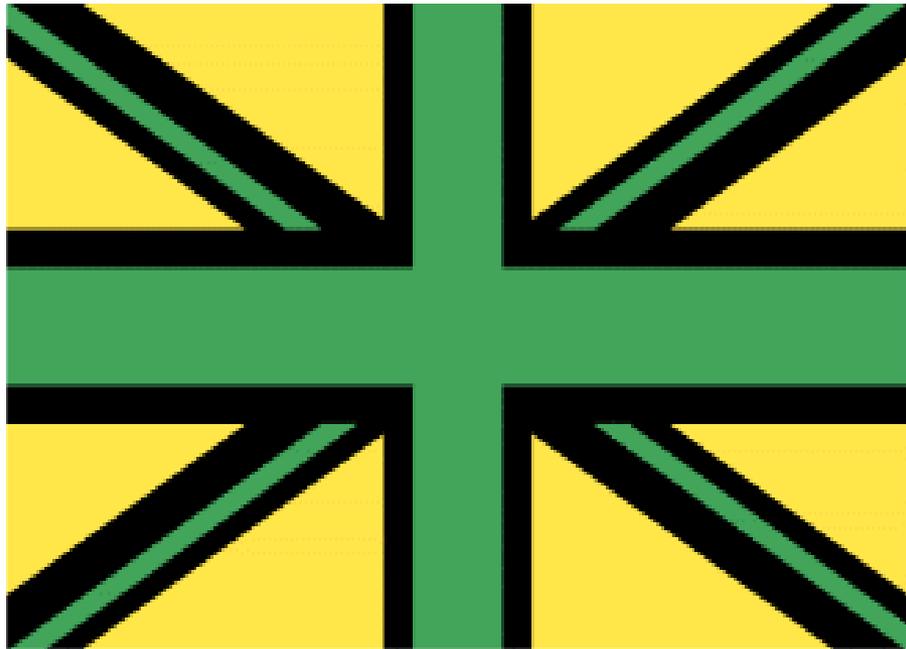
Opponent-Process theory

The sensory receptors come in pairs.

- Red/Green
- Yellow/Blue
- Black/White
- If one color is stimulated, the other is inhibited.



Opponent Process- Afterimage Effect



Stare at the red dot for 10 seconds.

