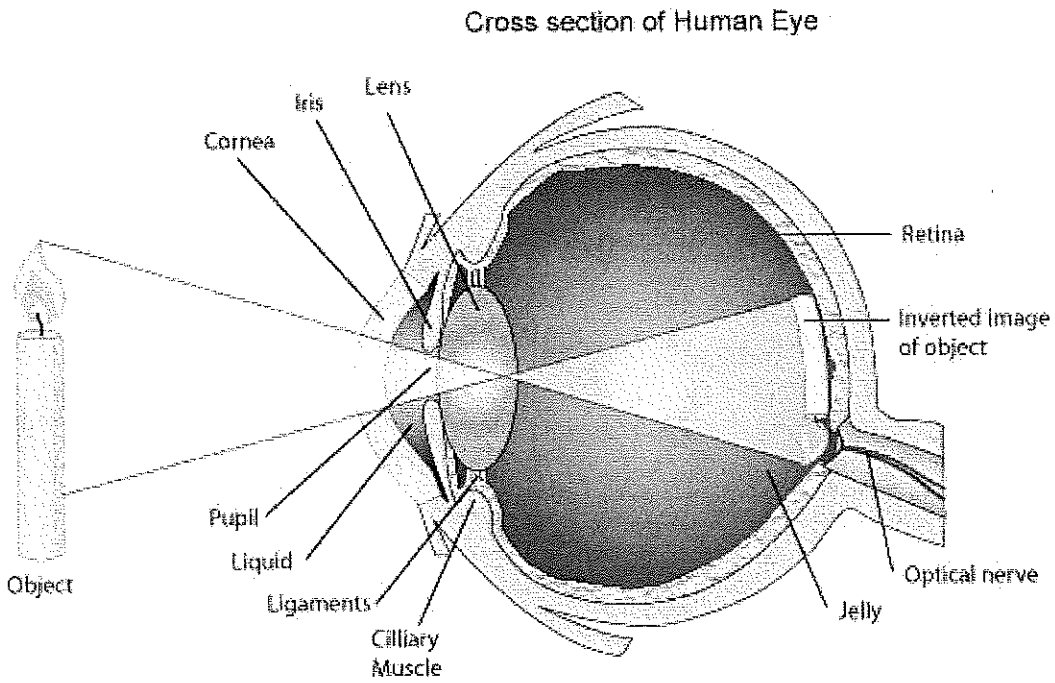
MODULE 18 VISION

THE STIMULUS INPUT: LIGHT ENERGY

- What we see as visible light is but a thin slice of the whole spectrum of electromagnetic energy, ranging from imperceptibly short gamma waves to the long waves of radio transmission.
- Lights **WAVELENGTH** is the distance from one wave peak to the next. This then determines the light's **HUE**, which is the color we experience. **INTENSITY** is the amount of energy in light waves determined by a wave's amplitude, or height, influences brightness.

THE EYE

- Light enters the eye through the **CORNEA**, which protects the eye and bends light to provide focus. The light then passes through the **PUPIL**, a small adjustable opening. The **IRIS** dilates the pupil depending on the light intensity and even to inner emotions. No iris is the same.
- Behind the pupil is a **LENS** that focuses incoming light rays into and image on the **RETINA**, a multilayered tissue on the eyeball's sensitive inner surface. The lens focuses the ray by changing its curvature in a process called **ACCOMMODATION**.



THE RETINA

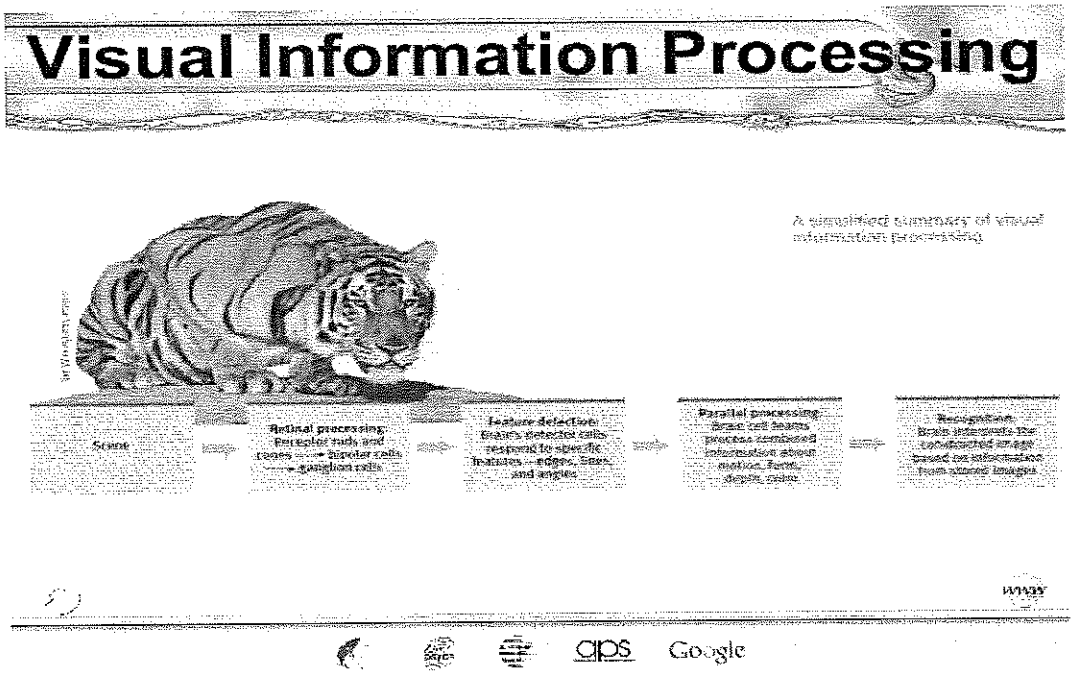
- Light energy triggers chemical changes that would spark neural signals, activating nearby bipolar cells. The bipolar cells in turn would activate the neighboring ganglion cells, whose axons twine together like the strands of a rope to form the **OPTIC NERVE**.
- The optic nerve will carry the information to your brain, where your thalamus stands ready to distribute the information.
- Where the optic nerve leaves the eye, there are no receptor cells and this is known as the **BLIND SPOT**.
- The **FOVEA** is the retina's area of central focus. **RODS** are retinal receptors that detect black, white, and gray. **CONES** are retinal receptors cells that are concentrated near the center of the retina and that function for colors in daylight or in well-lit conditions.

VISUAL INFORMATION PROCESSING

- Any given retinal relays its information to a corresponding location in the visual cortex, in the occipital lobe at the back of your brain.
- **FEATURE DETECTORS** are nerve cells in the brain that respond to specific features of the stimulus, such as shape, angle, or movement.

PARALLEL PROCESSING

- **PARALLEL PROCESSING** is the processing of many aspects of a problem simultaneously; the brain's natural mode of information processing for many functions, including vision. Motion, form, depth, and color.



COLOR TENSION

- If no one sees the tomato, is it red? No. The tomato is everything but red, because it rejects (reflects) the long wavelengths of red. Second, the tomato's color is our mental construction. According to Isaac Newton, color, like all aspects of vision, resides not in the object but in the theater of our brain, as evidenced by our dreaming in color.
- Our difference threshold for colors is so low that we can discriminate more than 1 million different color variations. Color deficient is higher in male because the defect is genetically sex-linked.
- **YOUNG-HELMHOLTZ TRICHROMATIC (THREE COLOR) THEORY** is the theory that the retina contains three different color receptors – one most sensitive to red, one to green, one to blue – which when stimulated in combination, can produce the perception of any color. Color blindness is due to missing a red cone or green cone or blue cone.
- Problems with the trichromatic theory is that it does not depict why one that suffers from color blindness can still see yellow when lacking green or red cones.
- **OPPONENT-PROCESS THEORY** is the theory that opposing retinal processes (red-green, yellow-blue, white-black) enable color vision. For example, some cells are stimulated by green and inhibited by red; others are stimulated by red and inhibited by green.

BE ABLE TO ANSWER: What is the rapid sequence of events that occurs when you see and recognize a friend?

PRACTICE FRQ: As light reflected off an object reaches your eye, it passes through several structures before it reaches the retina. Describe three of these structure, including the function of each.