

# Anatomy of an eye essay sample

[Science](#), [Anatomy](#)



## Abstract

The true mystery of the eye is not just found in the anatomy of the physical eye itself, but, rather in how this anatomy works in conjunction with brain function. The anatomy of the eye is examined in such a context as how the sensory perception of the eye works in tandem with brain function in the optical nerve of sensorimotor functions of visual modality. This paper will examine the visual pathways of the eye and its impact on the visual acuity functionality.

## Human Vision

There are many aspects of human vision that we are not entirely aware of that happens behind the scenes. We certainly understand that we need our eyes to see the many colors and structures that encompass our visual acuities; but, there are many aspects that work in conjunction with the visual dexterity that forms the entire component of the eye and brain functionality.

This paper will focus on not just eye anatomy itself but the functionality of the eye with respect to each faction of what vision means. Any person can describe the basic functionality of the components of the human eye and what their processes are in the participation of vision. For instance, we know that when light hits the human eye through the refractory process, the light is then imaged onto the retina by the lens. The retina consists of three individual layers of “ neurons (photoreceptor, bipolar and ganglion) which are responsible for detecting the light from these images and then causes impulses to be sent to the brain along the optic nerve. The brain then

decodes these images into information that is processed into what we know as vision" (Szaflarski).

### *Rod Cells and Cone Cells of the Retina*

A rod and cone cell is found within the retina of the eye and are basically responsible for, as Max Schultze discovered in around 1874, their responsiveness to light. Schultze discovered that "the retinal cones are the color receptors of the eye and the retinal rod cells while not sensitive to color, are very sensitive to light at low levels" (Szaflarski) and Selig Hecht showed "in 1938, the exquisite sensitivity of rod cells when he showed that a single photon can initiate a response in a rod cell" (Szaflarski). Cone cells, although they are less sensitive to light are in fact a great responder to how we see color.

As shown in Figure 2, described in Dr. Szaflarski's paper *How We See: The First Steps of Human Vision*, basically "the cells are divided into two sections, the bottom portion is called the inner segment and contains the nucleus and synaptic endings. The synaptic ending attaches to the neurons which produce signals that go to the brain. The top portion is called the outer segment which is comprised of a membrane that is folded into several layers of disks which are then comprised of cells that contain the molecules that absorb the light" (Szaflarski).

The rods and cones contain the photoreceptors that are responsible for the transference of light and color to the brain. The first step in the process is to

convert light into chemical energy, then into electrical energy which then sends these energy modules through the optic nerve right to the brain.

The rods are responsible for the perception of light levels and are the first receptors in the analysis of movement and shape recognition, while the cones, which function the best in bright daylight, allow the distinction between colors and fine details. The “cones are divided into three different light wavelengths, which in turn are transferred into color modules: short is responsible for blue colors, middle is responsible for green colors and long ranges are responsible for red colors”(E-notes).

The response function, marked by “s”, which responds most strongly to the shortest wavelengths are those in the blue and violet spectrum; the response function marked I responds most strongly to yellow and green, while the response function marked L responds to the longer wavelengths, primarily yellow, orange and red.

These response curves show how the blue and green primary colors were chosen, since they are close to the peaks in the response functions of two of the 3 types of cones. (Also note why some definitions use a primary blue at 425 nm - it is closer to the peak response of one of the types of cones than 460 nm is.) The 3<sup>rd</sup> primary has a longer wavelength than the peak in the response of the third cone, which is why monochromatic red colors tend to look less bright than the same amount of energy at shorter-wavelength parts of the spectrum. In addition, the response of the “red cone” to red light is only somewhat greater than the response of the “green cone” to the same

wavelength, so that red light often has a hint of yellow in it even when it is really a completely saturated red. (Physics Department)

### *Visual Pigment*

Visual pigmentation comes from within the cone cells and each of the cone cells contain a visual pigment and are classified as red, blue or green. The cone cells primarily detect these primary colors and then the brain mixes these colors in many different proportions in order to perceive a much wider range of color variation. This theory is certainly not new as Thomas Young sought in 1790 to propose that the human eye sees in three primary colors: red, blue and yellow and then other visible combinations are made from those.

### *How Does the Eye Work?*

The interior of the entire eye is lined with a layer of photosensitive cells which is commonly referred to as the retina, which is the structure that forms the organ to sense vision. The eyeball is simply a structure that holds the retina and supplies it with the images of the outside world. Light will then enter through the cornea, into the iris and then passes through the lens before striking the retina. The retina will then receive tiny inverted images of the outside world which is jointly focused by the cornea and the lens. The lens will then change its shape to achieve what is needed to focus the object into a crisp image that the brain then reads.

The retina will then translate light into the nerve signals, consisting of three layers of nerve-cell bodies, and these light signals will make their way

through two more layers of cells in order to stimulate the rods and cones which then provides the light and color imagery. The middle layer of the retina contains three different types of nerve cells: bipolar, horizontal and amacrine.

“ The connectivity of the rods and cones to these three sets of cells is complex but signals eventually pass to the front of the retina and to the third layer of cells known as retinal ganglion cells. The axons from the retinal ganglion cells collect in a bundle and leave the eye to form the optic nerve. The backward-design of the retina means that the optic nerve must pass through the retina in order to leave the eye and this results in the so-called blind spot” (Thinkquest).

## Conclusion

The continuing analysis of how the eye works is far from being over as scientists continue to understand many aspects of how the eye works in conjunction with sensory perceptions of the signals the brain receives in response to different stimuli.

There is the causation to our vision cognition system, for instance, that when we see a red object first in our central vision and then in our peripheral vision the information our brain perceives for the colour is different in each of the same instances; yet, the perception of redness still exists.

## References

<https://assignbuster.com/anatomy-of-an-eye-essay-sample/>

Department, Physics. Topic 50: The Response of the Eye to Color. Colorado: 30 September 2006.

E-notes, Science. What is the difference in the functions of the rods and cones found in the eyes? n. d. 30 September 2006 .

National Health Museum. Anatomy of an Eye. n. d. 30 September 2006 .

O'Regan, J. K. and Noe, A. " What it is like to see: A sensorimotor theory of perceptual experience". University of Paris and University of California. 2004 February. 30 September 2006

Szaflarski, Diane M. " How We See: The First Steps of Human Vision." n. d. n. d. n. d. Access Excellence @ the national health museum: Activities Exchange. 30 September 2006 .

Thinkquest. " How does the eye work?" n. d. October 2004. Kids Page. 30 September 2006 .