The function of the human eye essay sample

Inarguably, the human eye is one of the most complex human organs in the body. The eye aids in almost every activity that people participate in (excluding pin the tail on the donkey). Scientists can only guess at the probability in evolution of the eye being formed; there are so many variables that a close number would be incalculable. The eye is an extraordinary part of the human body; most people agree that is the most important sensory organ. The eye sends messages to the brain via optic verves, not unlike information through a computer. To understand how the eye works we must first see what the eye is made up of. The eye has various parts with various functions.

The human eye is capable of forming images of objects miles away, detecting a countless variety of colors and responding to small amounts of light. The globe of the human eye consists of a tough, white outer layer of connective tissue called the sclera and a thin, inner layer called the choroid. A layer of epithelial cells forms a mucous membrane called the conjunctiva that covers the outer surface of the sclera and helps keep the eye moist. At the front of the eye, the sclera is then called the cornea, which lets light into the eye and acts as a fixed lens. The anterior choroid makes up the iris (the colored part of the eye. The iris regulates the amount of light entering the pupil by changing the size of the hole in the middle. Within the choroid, the retina forms the innermost layer of the eyeball and contains the photoreceptor cells. Information from the photoreceptors leaves the eye at the optic disc, where the optic nerve attaches to the eye.

The lens and ciliary body make two cavities in the frontal region. The ciliary body produces a watery discharge. The other cavity covers most of the internal eye. These discharges help to bring pictures into focus. The lens is a transparent protein disc that focuses an image onto the retina. Humans focus by changing the shape of the lens. When viewing a distant object, the lens is flat. When focusing on a close object, the lens becomes almost perfectly round.

The human retina contains about 125 million rod cells and 6 million cone cells, two types of photoreceptors named for their shapes. They account for 70% of all sensory receptors in the body, a fact that underscores the importance of the eyes and visual information in how humans perceive their environment.

Rods and cones have different functions in vision. Rods are more sensitive to light but do not distinguish colors; they enable us to see at night, but only in black and white. Because it takes more light to stimulate cones, cones do not function in night vision. Cones can distinguish colors in daylight. In the human eye, rods are found in greatest density at the peripheral regions of the retina and are conversely absent from the center of the visual field.

When the lens focuses a light image onto the retina, each rod cell or cone cell has an outer segment with membranes where visual pigments are embedded. The visual pigments consist of a pigment molecule called retinal bonded to a membrane protein called an Opsin. Opsins vary in structure from one type of photoreceptor to another, and the light-absorbing ability of retinal is affected by the specific identity of its opsin partner. When rhodopsin absorbs light, its initial component changes shape, triggering a signal that results in a receptor in the rod cell membrane. The altered opsin molecule then activates relay molecule in the second pathway.

The light-induced change in retinal, which begins the light-transducing signal pathway in rod cells. In the dark, enzymes convert the retinal back to its original form, and it recombines with opsin to form rhodopsin. Bright light keeps the rhodopsin activated and rods become unuable; cones take over. If there is not enough light to stimulate the cones it takes at least a few minutes for the rods to become functional again. These photoreceptors are known as red cones, green cones, and blue cones, referring to the colors that they absorb best.

Processing of visual information begins in the retina. The axons of rods and cones synapse with neurons called bipolar cells, which in turn synapse with ganglion cells. Other types of neurons in the retinasuch as the horizontal cells and amacrine cells, help integrate the information before it is sent to the brain. The axons of ganglion cells then convey the resulting stimuli to the brain as information along the optic nerve.

Rods and cones function in different ways. Signals from the rods and cones may follow either vertical or lateral pathways. In the vertical pathway, information passes directly from the receptor cells to the bipolar cells to the ganglion cells. The horizontal cells provide lateral integration of visual signals. Horizontal cells carry signals from one rod or cone to other receptor cells and to several bipolar cells; amacrine cells spread the information from one bipolar cell to several ganglion cells. When a rod or cone stimulates a horizontal cell, the horizontal cell stimulates nearby receptors but inhibits more distant receptors and bipolar cells that are not illuminated, making the light spot appear lighter and the dark surroundings even darker. This integration, called lateral inhibition, sharpens edges and enhances contrast in the image. Lateral inhibition is repeated by the interactions of the amacrine cells with the ganglion cells and occurs at all levels of visual processing.

Axons of ganglion cells form the optic nerves that transmit sensations from the eyes to the brain. The optic nerves from the two eyes meet at the optic chiasm near the center of the base of the cerebral cortex. The nerve paths of the optic chiasm are arranged so that visual sensations from both eyes in the left visual field are transmitted to the right side of the brain, and visual sensations in the right visual field are transmitted to the left side of the brain. Most of the ganglion cell axons lead to the lateral nuclei of the thalamus. Neurons of the lateral nuclei continue back to the primary visual cortex in the occipital lobe of the cerebrum.

As we can see the eye is a highly specialized organ in the human body. Information has to be processed and reprocessed until it reaches the final destination: the brain. On its way optical information is bounced from one type of cell to another in unbelievable precision. It is hard to imagine how the eye came about in the way of evolution, but any way you describe it, it is a natural wonder of the world.

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