

The Complexity and Origins of the Human Eye: A Brief Study on the Anatomy,
Physiology, and Origin of the Eye

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Abstract

The human eye has been the cause of much controversy in regards to its complexity and how the human eye came to be. Through following and discussing the anatomical and physiological functions of the eye, a better understanding of the argument of origins can be seen. The anatomy of the human eye and its many functions are clearly seen, through its complexity. When observing the intricacy of vision and all of the different aspects and connections, it does seem that the human eye is a miracle, no matter its origins. Major biological functions and processes occurring in the retina show the intensity of the eye's intricacy. After viewing the eye and reviewing its anatomical and physiological domain, arguments regarding its origins are more clearly seen and understood. Evolutionary theory, in terms of Darwin's thoughts, theorized fossilization of animals, computer simulations of eye evolution, and new research on supposed prior genes occurring in lower life forms leading to human life. Creation elements can be clearly understood in the form of the wiring of the eye, answering computer simulated evolution, the lack of biological purpose of emotional crying, and the possible skewed reasoning of evolutionists.

The Complexity and Origins of the Human Eye: A Brief Study on the Anatomy, Physiology, and Origin of the Eye

The human eye is a highly intricate and delicate organ with so many different processes and components, leaving room for much debate on how it came into existence. Creationists use the complexity of the human eye as one of their main arguments for the existence of a Creator and regard the human eye as His handiwork. Evolutionary scientists believe in Darwin's argument that the human eye formed over millions of years through natural selection. In the viewing of the anatomy and physiology of the eye and sight, the nature of the eye's intricacy is clearly seen, leaving room for many questions.

For many years, scientists and researchers have sought specific answers for what specifically may have caused the evolution of the eye. Genetic research has been done in effort to recreate the eye and some of its parts. Research continues to reveal that the eye is more complex than once thought. Questions involving the origin of the human eye, has led to research investigating possible answers to the beginnings of the eye and its supposed place in the evolutionary chain of natural selection. The problem with any theory is solid evidence. The evidence of the exact and minute changes in the development of the eye due to natural selection is difficult to find. Although genes and supposed precursors to the modern human eye may have been found, there is a lack of the small changes leading to the complex and intricate nature of the human eye.

Anatomy and Physiology of the Human Eye

The Anatomy of the Eye

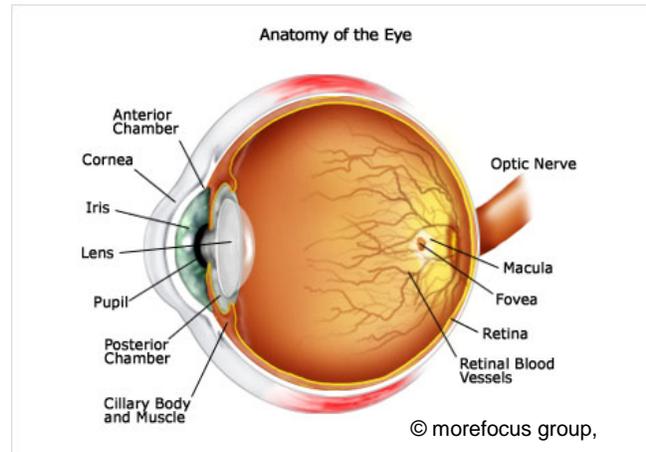
The eyeball itself consists of three main layers; the outer layer, comprised of the cornea and the sclera, the middle layer, responsible for holding the blood supply for the

eye as well as the iris and the pupil, and the inner layer, or the retina. Along with the three layers, there are also three chambers of fluid which are the anterior chamber, between the cornea and iris, the posterior chamber, between the iris and lens, and the vitreous chamber, which is between the lens and the retina. The first two chambers not only provide nourishment to the interior of the eye's structures, but also assist with inflation. The vitreous chamber contains a much thicker fluid called the vitreous humor. The vitreous humor gives the eye its shape and is the way by which light passes through before reaching the optic nerve. The optic nerve is the method of sending information and images to the brain. It runs from the back of the eyeball and through the optic foramen, where it connects with the brain. This nerve transmits the signals for vision to the brain making vision possible. There are also other nerves in the eye, most of which convey pain or control motor actions (Anatomy of the Human Eye, 2009).

The eyelids are an external portion of the anatomy of the eye, which are mostly for protection and preservation. The eyelid carries lacrimal secretions from the tear glands across the eye as it blinks. This is to ensure moisture and provide minimal protection. The eyelid is attached to the eye by a mucous membrane called the conjunctiva. Tear glands line the upper eyelid, which secrete tears for moisture. There are seven extraocular eye muscles attached to the outside the eyeball. Six are attached to the eyeball itself and the seventh is attached to the upper eyelid and is responsible for blinking. Blinking is a normal reflex involving the movement of the eye muscle attached to upper eyelid. The visual components of the eye are much more complicated in structure and function. The clear part of the eye is composed of the cornea, iris, and pupil. The white opaque part of the eye is the sclera, which surrounds the remaining portion of

the eyeball. The sclera acts as a sheath for the optic nerve. The cornea and the sclera come together at the limbus, which contains many eye blood vessels. The iris and pupil are the most noticeable structures of the eye. The iris is the colored part of the eye composed of tissue lying underneath the cornea. The color of the eye, which is predetermined by genetics, also functions to block out unwanted light.

The pupil is located in the center of the iris. This is the entrance of light into the eye and changes size to control the amount of light let in.



The lens is located directly behind the iris and is used to focus light into the retina. The retina is light sensitive tissue containing photosensitive cells. These cells are known as rods and cones and use the light to convert it into electrical signals that the optic nerve carries to the brain (Anatomy of the Human Eye, 2009). These cells add to the amazing nature of the human eyes. The fact that the eye uses light to form an image that makes sense to humans is miraculous.

The Basic Anatomy of Vision

The human eye develops directly from the brain and possesses two excellent lenses which are the cornea and the lens proper. When humans develop in the womb, the embryonic skin over the eye turns clear, becoming our cornea. In order to have complete clarity, this type of skin does not contain blood vessels, hair, and glands found in most other skin. It contains many nerves, causing it to be highly sensitive to touch.

The cornea is mostly a protective element for the eye, but also functions as a lens. The cornea has about four times the focusing power than the actual lens itself does.

The lens, much like the cornea, is made from embryonic skin and is also transparent; however it is able to change focus, which the cornea is not able to do. This function allows humans to focus on an object at any distance. A camera would focus by moving its hard lenses, but the human eye's lens is rubber like and flexes to focus quickly through changing its shape. As humans age, the lens loses flexibility which affects clarity and the ability to focus as compared to its original capabilities (Menton, 2008).

The anatomy of the retina is very important when investigating the complexity of the human eye. There are several layers in the retina that begin the task of processing light. The inner limiting membrane is the boundary between the vitreous humor, the clear gel that fills the space between the lens and the posterior aspect of the eye, and the retina. The ganglion layer is made of the cell bodies and the axons of the ganglion cells. There is also the inner plexiform layer contains the synapses between bipolar, horizontal, and amacrine cells. Next, the outer plexiform layer contains also bipolar and horizontal cells, and also receptor synapses. The outer nuclear layer comes next and contains the nuclei of the photoreceptor cells. The next layer is the outer limiting membrane, which contains a membrane that meets with the base of inner segments of the photoreceptor cells. Following the outer limiting membrane is the photoreceptor layer, comprised of inner and outer segments of rod and cone photoreceptors. The pigment epithelium layer comes next, which is comprised of dark pigmented cells, and appears dark due to its cells that contain melanin granules. Melanin granules absorb stray photons that can cause image blurs and protect certain cells from overexposure to light. The last layer is the choroid,

which has much vascularization, and supplies the nutrients and oxygen to the retina (McCourt, 2003).

The Basic Physiology of Vision

Basic Physiology.

The retina is a piece of tissue that measures close to one half of a millimeter thick. This tissue lines the back of the inside of the eyeball. The tissue itself is developed from the embryonic forebrain, thus considered a part of the brain. The retina is one of the most important parts of the eye because it begins basic visual processing before the brain receives the information. There are three layers in the retina with packets of nerve cells arrayed in three rows and separated by two other layers containing synaptic connections. The retina's two most important functions are detecting and responding to light through sensory neurons and neural circuits. This begins the first stage of visual processing (Kolb, 2003).

Cones and Rods are vital in light processing. In the outer segment layer, photopigment is seen in free floating disks in the rods and folded layers in the cones. Rods have discs, similar to stacked coins, while cones have a continuous outer membrane. The outer segments of the rods and cones are continuously replenished. This causes the pigment epithelium to trim off the excess of the membrane via phagocytic cells, which consume and recycle the material. Cones' disks are trimmed at dusk and rods at dawn, which is amazing considering that cones function best in bright light and rods function best in low light. The inner segment of the rods and cones contains support organelles, the nucleus, and the axon terminal. The axon terminal is the point where the neurotransmitter is released. The photopigment molecules in the disk membranes capture

individual photons, which begins the neural signaling process. These photoreceptor cells are actually specialized hair cells that contain inner and outer segments, which are held together by the cilium.

There is a segment of the retina called the macula, located almost directly in the center of the retina. The macula is specialized for attaining acuity in straight ahead vision. Located in the macula is the fovea. In this area, cone density is the highest within the retina and rods are absent. These foveal cones are spaced tightly, in a honeycomb fashion. Altogether, the retina contains 120 million rods and 1 million cone photoreceptors (McCourt, 2003).

Hyperpolarization in the Retina.

The disk membranes in the photoreceptors contain photopigment in the outer segment that absorbs photons and undergoes the biochemical changes of light. This photopigment is a complex of opsin, which is a protein, and the chromophore, which is the part which is affected by light, also known as retinal. Retinal is a derivative of retinol or Vitamin A. Retinal is bound to opsin to form a bent shape configuration. When the photon is absorbed by the chromophore, it unbends the molecule. This process is known as photoisomerization. This process is what leads to signal transduction cascades, which causes the closure of a cyclic GMP-gated cation channels, and leads to the hyperpolarization of the photoreceptor. In comparison to most neurons, the transduction process is a hyperpolarization rather than a polarization of the photoreceptors. Through a specific chain of events, sodium channels that are open at a resting state, close, thus less neurotransmitters are released. The hyperpolarization of the outer segment is sent to the inner segment via electrical conduction. The receptors are very small at the axon

terminal of the inner segment, thus the potential is still very large when it reaches them. Because they are so small, most retinal neurons only transmit information as graded potential, which is the change in membrane permeability. After this beginning transduction process, the photoreceptor cells make synaptic contact with horizontal cells and bipolar cells, beginning the very complex and intricate retinal neuron response (McCourt 2003).

Physiology of Cones and Rods.

Rods respond to low levels of light at all wavelengths of the visible spectrum by generating an electric signal. They are highly important under conditions in which the lighting is dim and distinguishing colors is not a primary requirement. Cones are wavelength specific to a degree, and are responsible for color vision. Cones are less sensitive than rods, and require higher levels of light to generate adequate signals. They function optimally in daytime. According to Dr. Thomas Caceci,

The rods and cones are the fundamental and indispensable cells, because without their ability to trap photons, no signal would be generated in the first place. The rest of the eye has *support* functions. Focusing and light control are chiefly mechanical matters. Once the signal has been generated, initial integration and processing take place in the neural elements of the retina's middle layers: but signal generation is the crucial step. Rods and cones contain visual pigments, substances capable of absorbing the energy of the visible spectrum. Within the cells a cyclic metabolic pathway regenerates the pigment, produces more or less of it as needed to adapt to light conditions, and permits constant response. The first response to light is, then, a physiochemical phenomenon, which ultimately

leads to an alteration in the surface charge of the light sensitive cell. This in turn is translated into nervous signals and action potentials (Caceci, 2001, para. 1).

This statement describes the necessity and complexity of the signals to the brain from the eye, all beginning with photons of light, which are eventually made into distinct and colorful images which can perceive depth as well as movement. Dr. Thomas Caceci also stated, “Vision is a vitally important sense in all vertebrates, but some groups have better vision than others. Color vision is best in birds and primates. Human vision is among the best in the animal kingdom, and the ability of humans to detect subtle variations in colors is well documented” (Caceci, 2001, para. 7). Dr. Caceci also went on to discuss the senses of smell and sight among the bird populations in comparison to humans, to establish order of evolution to the human eye. Even with a highly detailed description of what the eye does and how it functions, its intricacy and complications are far from being explained.

Hyperpolarization is a response that is proportional to the intensity of the light. According to Dr. Caceci, “The net change in overall membrane charge is perceived by the integrating neurons of the retina, specifically the horizontal and bipolar cells. They in turn pass the information (with suitable inhibitory and/or excitatory signals of their own) to the ganglion cells” (Caceci, 2001, Basic Physiology of the Eye; para. 8.). The ganglion cells serve as the last intraocular neuronal element. They send axons out through the optic nerves and to the visual processing centers of the central nervous system.

Basic Neuroscience of Visual Processing.

Sensory information must reach the cerebral cortex via the thalamus in order to be processed for visualization to occur, in the case of somatosensory sections. The primary

place for receiving vision information in the brain is located in the occipital lobe. By way of the optic nerve, information leaves the retina to be processed by the brain. The information, while on its way to the brain, goes through the optic chiasm, which is the partial crossing over of axons. This chiasm is the reason why the eyes in function together give one visual field instead of two separate fields. The nerves coming from the right eye that are associated with the left temporal visual field remain on the right side of the brain, and the same occurs in the left eye and left side of the brain. The information is then transferred to the lateral geniculate nucleus, via the optic tract.

The lateral geniculate nucleus is where most of the processing of visual information is done and the axons must synapse. It is part of the thalamus, thus considered part of the brain. The lateral geniculate nucleus axons go through the white matter of the brain as the optic radiations. This optic radiation is the pathway of the visual information, transcribed by the lateral geniculate nucleus, to the striate cortex along the calcarine fissure, or the visual cortex. The primary visual cortex, also known as Brodmann area 17, is the first of 5 sections of the cortex known as extrastriate visual cortical areas. These five areas are responsible for the processing visual information that makes human vision possible, and each play a specific role. The description given is minute in consideration of the brain's job is processing and interpreting information received from the retina. The eye is only the tool from which the brain gains information in order to produce sight. Even a simplification of the information shows the complexity and intensity of human sight and unmistakably miraculous (Molavi, 1997).

The Brain and the Ethernet Connection.

Researchers at the University of Pennsylvania School of Medicine estimate that the transference of information from the eyes to the brain runs at about the speed of an Ethernet connection (Kreeger, 2006). The ganglion cells transport information from the retina to the higher brain where nerve cells in the retina analyze the first stages of the vision. The axons of the retinal ganglion cells are what form the optic nerve by which signals are carried to the brain along with other supportive cells.

Research shows that there are ten to fifteen different types of ganglion cells in the retina that pick up different movements and work together to create an image for the brain. UPENN researchers estimated the information amount that is carried to the brain through seven cell ganglion types through testing. The researchers from the University of Pennsylvania tested guinea pig retinas and through electrode testing saw that there were specifically two cell types in the eye, brisk and sluggish, depending on their speed. Dr. Vijay Balasubramanian commented in regards to the two different cell types and responded that, "It's the combinations and patterns of spikes that are sending the information. The patterns have various meanings. We quantify the patterns and work out how much information they convey, measured in bits per second" (Kreeger, 2006, para. 7). The sluggish cells, although smaller, are most important when it comes to the amount of information sent (Kreeger, 2006). Considering that the connection of the retinal information to the brain is comparable to the speed of the Ethernet connection of the internet shows just how complex and intelligent human systems can be.

Muscular Movement Makes Vision Possible

Significant research has been performed regarding the movement of the eye muscles, which play a key role in assisting the process of vision. There are three distinct motions of the eye called tremors, drifts, and saccades. These motions are caused by small contractions in six muscles which are attached to the outside of the eye. These movements occur many times during only one second. Tremors are the smallest of these movements and continuously move the eyeball about its center in a circular fashion. Tremors cause the cornea and retina to move in a small circular motion, so small it is unnoticeable, measuring approximately .00004 inches in diameter. This movement occurs an average of one million times in five and one half hours. Concerning the absence of movement in the human eye, the light sensing cells on the retina would stabilize, causing a cessation of information to the brain, causing the vision to fade to gray if it were not for this motion. The continued change in the light projected on a single retinal cell in the eye is crucial for constant vision. Tremors are one of the most critical muscular movements for vision (Wagner, 1994).

Theoretical Origins of the Human Eye

Evolutionary Origins

Darwin's Ideals.

The claim for evidence in the scientific realm is that the only fact that is known is that which can be tested in nature. The issue of creationism versus evolution is the quest for what supports the best explanation regarding the truth of the human eye. Darwin is often quoted in his book *Origin of Species* from 1859 saying:

To suppose that the eye with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest degree. Yet reason tells me, that if numerous gradations from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, can hardly be considered real (p. 167) .

Darwin knew that the eye was highly complex. He thought that evolution of the human eye was possible by viewing the steps of development in different creatures and to see the usefulness of the different changes in the eye structure that lead to the human eye. The most difficult part of this theory is that it is nearly impossible, even if he was correct, to find every step along the way showing direct change in an eye that are small enough to be considered natural selection. Darwin saw that the thought of evolution to the human eye based on known information in the 1800s was seemingly impossible to show.

Evolutionary Theory on the Human Eye.

Zoologist Dan-Erik Nilsson demonstrated in a PBS article how the human eye could have evolved through the small variations of natural selection. Nilsson defended the evolutionist standpoint through questions made by skeptics such as if evolution occurs through gradual changes, how then could it have created the different parts of the

human eye? The question deals specifically with the fact that none of its parts is able to make vision possible by itself. Scenarios have been thought up by scientists regarding the development of a single light sensitive spot on the skin that could have changed and gone through transformations to form the human eye.

Some scientists believe that the simple light-sensitive spot gave the animal some survival advantage, most likely allowing it to escape a predator. This would give the animal with the simple light-sensitive spot an advantage over other species, thus propelling it in the evolutionary process. Nilsson went on to say that “Random changes then created a depression in the light-sensitive patch, a deepening pit that made *vision* a little sharper. At the same time, the pit's opening gradually narrowed, so light entered through a small aperture, like a pinhole camera” (Nilsson, 2001, para. 6). The basis for the argument was that the layer of cells in the retina changed and developed slightly over a very long period of time. “In fact, eyes corresponding to every stage in this sequence have been found in existing living species. The existence of this range of less complex light-sensitive structures supports scientists' hypotheses on how complex eyes like ours could evolve” (Nilsson, 2001, para. 8).

Fossil Evidence.

Researchers from Australia claim to have found a missing link in the fossil evidence for evolution based on the eye itself. In an article published in 2008, researchers from the Research School of Earth Sciences claim to have found a seemingly missing link in vertebrate in placoderm fish. This claim is that the extinct fish show a “unique type of preservation of the cartilaginous braincase and demonstrate a combination of characters” not seen in other vertebrate species of those either living or extinct (Young,

2008, Abstract, para. 1). It is believed to be the oldest detailed fossil evidence for the vertebrate eye and brain, which could show a “legacy from an ancestral segmented animal, in which the braincase is still partly subdivided, and the arrangement of nerves and muscles controlling eye movement was intermediate between the living jawless and jawed vertebrate groups” (Young, 2008, para. 1).

This is important to researchers because it adds a link between already known species that shows a combination of *characters* that have not been seen before. Not as many transitional forms exist as to what Darwin would have thought based on the advanced types of systems that are alive. Few possible intermediate species seem to have been found compared to the number thought to exist. This is sometimes believed to be because of the invertebrates that would have not been preserved like fossilized vertebrates found in excavations. Genes such as Pax6 are very important to researchers because they seem to support the belief that there is a beginning and intermediate gene leading to the more complex human eye. The gene is discussed in further detail later to better explain what the Pax6 gene is.

Evolution by Computer Simulation.

The human eye is complex enough to have scientists scrambling for explanations and evidence of its development. Mathematicians and scientists are now trying to build simulators that will predict evolutionary movements. Biophysicists from Rockefeller University, have predicting evolutionary movement through a simulator. “When you look at systems like the eye or structures like the human spinal cord, you think how could these have evolved from a simple network,” said Francois in a case study of evolutionary computation of biochemical adaptation (As cited in Rockefeller, 2008, para. 5).

In May of 2003, *Nature* magazine published an article describing the results of the Avida researchers who claimed that complex functions can originate by random mutation and natural selection as demonstrated through computation (Lenski, 2003). Avida is an artificial life software platform to study the evolutionary biology of self-replicating and evolving computer programs or digital organisms. The difficulty with the computations and algorithms is its actual biological significance and degradation of complexity in the biological realm, argued by Dembski. In a recent article refuting the Avida's efficiency, researchers stated that, "According to conservation of information theorems, performance of an arbitrarily chosen search, on average, does no better than blind search. Domain expertise and prior knowledge about search space structure or target location is therefore essential in crafting the search algorithm" (Dembski, Ewert, & Marks, 2009, para. 1). This theorem states that complexity in a closed system remains the same or decreases, there is no spontaneity, and it may at one point have been open but no longer is. The Avida project was allegedly directed at Michael Behe's Irreducible Complexity argument, in hopes of creating odds that could defy his reasoning.

Pax6 and the Human Eye.

Researchers from the University of Basel in Switzerland have been investigating the Pax6 gene in order to reproduce the eye and structures from it. They have been successful in producing eye-like structures. The result of this research is evidence enough for some evolutionary scientists. Evidence of this gene is also located in animal phyla, which leads scientists to believe that it moved through lower classes of life to humans (Gehring, 2005, para. 1). Duplication could possibly lead to transplants and other forms of medical operations that could save people's sight.

New research is also being done on the sea squirt, which is believed to obtain the most primitive version of sight. A single crystallin gene, which is expressed in its primitive light sensing form, is believed to be held in the sea squirt (Melville 2007). This gene is thought of as the precursor to more developed versions of sight, which include image creating sight, color detecting sight, and lens focusing sight. Although there is no proof that this is the first form of primitive sight, researchers seek to find an answer. Although much has been done to find the beginnings of the human eye, an important component in the evolutionary argument, would be the minute changes seen in other various forms. Having evidence of the beginning and end products still does not solve the problem of how either developed.

The *Earliest* Form of Sight.

Evolutionary scientists assume there is a logical order of evolution from the earliest forms of light sensation to the human eye. The beginnings of photosensitive cells are thought to have possibly come from the marine zooplankton consisting of two cells only: a photoreceptor and a shading pigment cell. Phototaxis of marine zooplankton is poorly understood. It involves zooplankton vertical migration towards light. The research is believed by some scientists to be a landmark achievement in sufficiently explaining the mass migration of zooplankton as well as the earliest known light receptive cells in an organism (Jekely & Colombelli, 2008). This new research is thought to be a plausible explanation of the evolutionary argument of evolution of the eye.

According to researchers, the first animals with something similar to an eye lived close to 550 million years ago. The researchers stated that it would only take 364,000 years for the eye to fully develop into a more sophisticated eye that has camera like

qualities. Genetic material was never mentioned but is an essential argument in the development of new parts in a system (Nilsson, 2001). Natural selection of the human eye would require much time and random chance and is the basis for evolutionary thought of how the human eye developed.

Scientists have found preliminary genes which could be the forerunners to the human eye genome. Even if it is discovered that there is a gene precursor to the human eye, there is no solid evidence on where this gene originated or any concrete evidence to show that it is the precursor. In much of the research being done in the area of human vision, evidence for evolution is the primary focus as most scientists believe that creation is not an acceptable alternative. Evolutionary processes are applied in daily scientific research to forward evolutionary research and ideals. Just as evolution is a theory that was created by Charles Darwin, scientifically, creation is also a theory, both of which lack physical evidence enough to be considered truth, according to scientific standards

The Argument for Creation

Imperfect Wiring of the Human Eye.

The intricacy of the human eye was at one point questioned by scientists because of its seemingly backwards installation, compared to what would seem logical and more efficient to the vision of humans. Its design requires that light travel through the nerves and blood vessels to reach the photoreceptor cells located behind the eye's wiring. This had been cause for scientists to refute creationism claiming that no logical being would create anything that would not be perfectly beneficial and efficient in the eye, and is an example of inefficiency. Because light must travel through the nerves and blood vessels, human vision is not as good as it possibly could have been (Miller, 1999).

Additional research in this area shows that there is a reason for the design of human eyes. A major reason for the retina reversal is that it allows the rods and cones to interact with the retinal pigment cells that provide nutrients to the retina, recycle photopigments, provide a layer to absorb some excessive light, and perform other vital functions. “This design is superior to other systems, because it allows close association with the pigmented epithelium required to maintain the photoreceptors. It is also critical in both the development and normal function of the retina” (Bergman, 2000, para. 1). Although vision is not perfect and humans have a blindspot, where the nerve has to travel over the surface of the retina, there seems to be specific evidence that there is a reason for this wiring.

Evolution and Reason.

In regards to the origins of the human eye, Dr. DeWitt of Liberty University explained how reasoning may be faulty from those who trust the evolutionary viewpoint in his book *Unraveling the Origins Controversy*. “One can only conclude that the eye was produced by natural selection if you start by assuming that all of the organisms share common ancestors. In other words, you must assume that evolution is true” (DeWitt, 2007, p. 198). Dr. DeWitt went on to write that just because there is a sequence of increasing complexity among species does not prove that there is a common ancestor. “This turns out to be a very good trick. The reason that Darwin’s argument is a trick is because it really uses circular reasoning” (DeWitt, 198). In addition, Dr. DeWitt stated that this shows that there are many different types of eyes and that assuming at the start that there is a common ancestor creates the circular reasoning.

A key argument Dr. DeWitt brought to light is that although genetic mutations may occur, there can be no increase in information or genetic material other than what is already in a system. This would mean that the youngest life form in the evolutionary chain contained the genetic disposition and information for the human eye, thus the genes for the human eye must have been in the genome of the first creature that would eventually evolve.

Computer Simulations Marked Too Simple.

In the past, there have been computers created for the purpose of imitating the evolution of the eyes. The Avida was a more recent version of these computers with the same purpose. This conversion of biological instances transferred into mathematical equations and variables stirred many creationists. In a response to a recent article in the *Answers in Genesis* magazine Dr. George Marshall, of Glasgow University in Scotland, answered regarding these computers assuming the role of evolutionary processes that “Those who produced this model would acknowledge that the model is such a gross oversimplification that it cannot be cited as a proof” (An eye for creation, 1996, para. 7). He also commented on the question of the eye’s anatomical design and blames the belief that the eye is wired backwards on a lack of knowledge of eye function and anatomy.

Dr. Marshall also commented on the complexity of the eye regarding the retina as one of the most complicated tissues in the human body. “Millions of nerve cells interconnect in a fantastic number of ways to form a miniature *brain*. Much of what the photoreceptors *see* is interpreted and processed by the retina long before it enters the brain” (An eye for creation, 1996, para. 5). Dr. Marshall said that it is the “perfection of

this complexity that causes me to balk at evolutionary theory” (An eye for creation, 1996, para. 4).

The Biological Purpose of Crying.

There are two processes of tear secretion in humans. The first is tearing, which is caused by irritants, and helps to lubricate and clean the eye. The second process serves a completely different purpose. Tears cried out of emotion is a phenomenon only occurring in humans, making this trait uniquely distinct. If evolution follows, then where did emotional crying originate?

Tears serve several different purposes in consideration of different aspects of the eye. Tears are secreted by the lacrimals, which are glands that rest above the eye.

Lubricating the eye is the most obvious function for tears. Without lubrication, the eye can become dry and cause many complications, such as abrasions of the cornea, which are severely painful. The second natural reason, and not so obvious purpose of tears, is to bathe the eye in lysozyme which is an affective antibacterial and antiviral agent.

Lysozyme inactivates 90 to 95 percent of all bacteria in 5 to 10 minutes (Montagu, 1981). The presence of lysozyme in tears is more than efficient in terms of fighting infections.

Humans have unique differences from the *lower life* forms. One of these great differences, in reference to the eye, is the tears shed from emotional stress. There are very few explanations of why humans cry when dealing with a range of emotional stresses. “Crying has no direct biological function in the protection of the eye and may serve no physiological purpose whatsoever” (Vingerhoets, & Cornelius, 2001, p. 28). While the definite purpose of the human emotional tears is unclear, there may be positive interpersonal effects of crying. The Department of Clinical Health Psychology infers that

crying may not lead to tension or emotional relief, but depending on the social context in which one does cry, it could create positive interpersonal effects. No proof exists in regards to the biological necessity of crying (Hendricks & Vingerhoets, 2002).

Studies show that when a person, it can relieve them physically and physiologically, while not crying can make someone not feel well. Emotional tears contain much more toxic biological byproducts that can build up during emotional stress. Manganese, which affects moods, can be found up to 30 times more in emotional tears compared to blood serum. Emotional tears had 24 percent more albumin protein than tears caused by eye irritants. Chemicals are also released from emotional crying that are directly related to stress. The endorphin leucine-enkephalin, a pain controlling endorphin, was released along with the tears. The researchers believed that one of the most important compounds found was adrenocorticotrophic hormone (ACTH), which is a good indicator of stress. According to these results suppressing tears would increase stress levels, and be a contributing factor to diseases, such as heart problems, high blood pressure, and ulcers. Emotional tears can lower stress levels by crying, but the body does not have to cry emotional tears to survive (Bergman 1991).

If emotional crying has no direct biological purpose, the question of why crying has embedded itself in the highest form of evolved creatures must be asked. Also the idea that humans are the only animal that weeps makes little sense in terms of evolutionary processes. If “all animal species can survive in their natural environment without the capacity of crying,” then what biological function would the act of weeping serve to humans? (Vingerhoets & Cornelius, 2001, p.28). Tears of emotion, and emotion itself, was an idea that Darwin gave much thought to and even published works regarding the

issue. Emotions only create more questions in reference to the sophistication and wonder in the human eye. It is not only a source for sight, but also a window to emotion and communication through body language, making the human eye even more complex.

The Problem with Creation.

When creation has been brought up in today's scientific world, it has been ignored due to the religious and moral implications. The creationist standpoint has been viewed as just religious or emotional facade used to confront the issue, and lacks scientific evidence (Miller, 2008). Scientists refuse to accept creation as a valid theory specifically because of claimed lack of evidence. Looking to science for and against the evolution of the eye seems to be a trial of deciding whether one idea seems more valid. It seems that mixing science with religion and philosophy and morality repulses most scientists because of the possible implications that it may have, in comparison to the data and research of hard evidence. In the argument of creation against evolution, it seems to become less about the evidence and more about the arguer's beliefs. The answer to the origins of the eye has become a quest for the truth through research and logic, increasing knowledge of the eye and its intense intricacy.

Developing and prior research regarding the human eye has been more sophisticated than could ever have been imagined. The human eye has more parts that are unseen and have vital functions for one of the most profitable senses in humans. Its elaborate design and functions are clearly seen as research develops and methods of eye treatment are engaged. The complexity of this organ has been and will continue to be one of the most debatable standpoints regarding the argument of origins. It is remarkable how the human eye could hold so much value, wonder, and question. Is evolution the

explanation for such a convoluted, yet small organ? Was this a design from a greater being than man? Hard evidence will probably never completely secure answers to many of the questions that the human eye holds, but its complexity will continually confound those who study it.

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