



Too Complicated?



- a brief look at the evolution of the human eye

It is often claimed that the eye is such a wonderfully purposeful organ that evolution (i.e. random chance) can not possibly explain it; it must have been designed. In support of this position, Charles Darwin himself often gets half-quoted.

Darwin confessed that it was “absurd” to propose that the human eye, an “organ of extreme perfection and complication” evolved through spontaneous mutation and natural selection: however, he continued “if numerous gradations from a simple and imperfect eye to one complex and perfect can be shown to exist” this difficulty should be overcome.

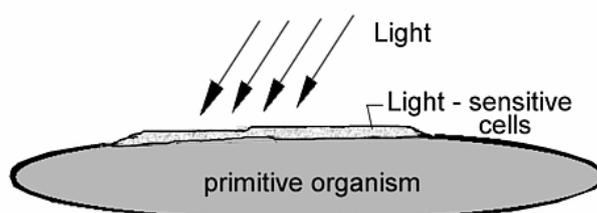
To answer the charge that the human eye is beyond the power of Darwinian evolution, we must show that Natural Selection can provide a plausible mechanism for its development. We should also attempt to demonstrate that evolution of the modern eye from simpler forms not only can happen, but has happened.

Before proceeding, let's go over a few of the “rules” governing natural selection.

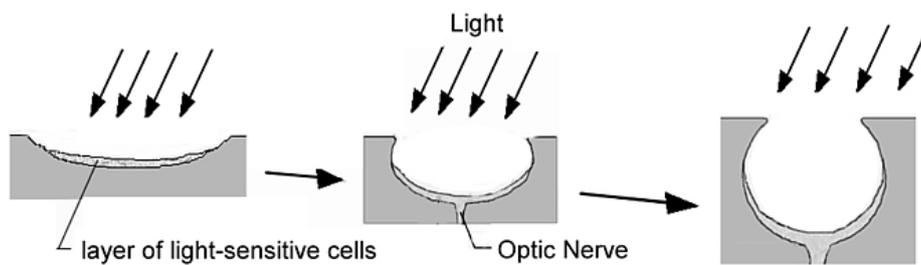
- Unusual individuals in a population sometimes arise through mutation.
- They usually don't survive, except in the unlikely event that their mutation somehow makes them more able to cope with their environment than their “normal” fellows.
- If they do survive, they pass their mutation on to their offspring.
- If a whole population is under survival pressure, (which is typical), even a small advantage can give an organism a distinct edge over its fellows.
- Organisms with a beneficial mutation tend to survive and become a greater proportion of the population over successive generations. In other words, they become the norm, and the population as a whole can be said to have evolved.
- Any beneficial change caused through mutation will usually be quite small. For something like a major organ to evolve, it would have to be the result of a number of mutations, all beneficial, over sufficient time to allow the required number of mutations to occur spontaneously.

So for human eyes to have evolved, they must have done so gradually, through a series of intermediate stages. At each step the mutant individual's chance of survival must have improved; otherwise the new trait could not have become established.

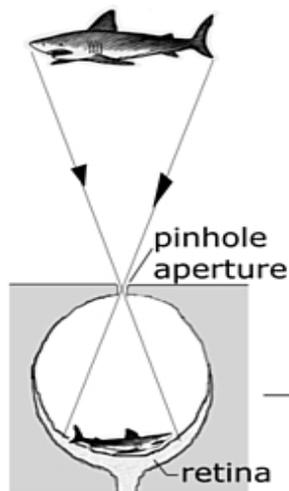
An old proverb goes “In the land of the blind, the one-eyed man is king.” An organism which can sense light (when other members of its population can not) must have that a great advantage. There are many examples in Biology of species which detect light in much the same way as we humans feel heat. We can easily imagine primitive organisms which gained a few light sensitive cells on their surface through mutation, and thus initiated the whole process. Such organisms could tell light from dark; and although able to sense motion, it could not delineate shapes or be able to detect the direction from which the light was coming with any accuracy.



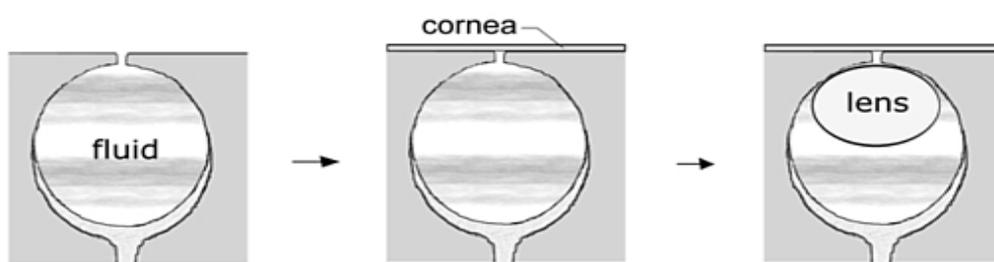
The next stages of development result in the light-sensitive layer receding from the surface into a pocket. Eventually a “cup-eye” forms, (as in flatworms). The advantage of this is that the organism becomes more sensitive to the direction from which the light is coming.



The recession then continues to such a degree that the aperture through which the light enters becomes small enough to act as a pin-hole lens. This is a major step, because now the animal has a sharp inverted image of the outside world impinging on its retina.



Further steps involve the filling of the cavity with fluid, the formation of a protective clear layer (cornea) and the development of a true fluid-filled lens, inflated to the correct shape by pressure. Each stage represents a functional eye which improves on the previous model.



Later refinements include muscles to control the size of the aperture (iris) the shape of the lens (focusing) and the aiming of the entire eye.

In giving credence to such an evolutionary scheme, evolutionary zoologists since the time of Darwin have attempted to find examples of animals, living or extinct, with intermediate functioning eyes like those suggested. In fact, this goal has now been pretty much achieved. Best authoritative estimates suggest that the human eye evolved through about 200 gradual steps. The big surprise is that the whole process need not have taken more than 3.5 million years; and remarkably, it appears that throughout the animal kingdom, functional eyes evolved "from scratch" not once, but at least forty separate times.

It is possible that man will be able to engineer a better eye than nature has given him; however, he will be allowed to cheat. He need not work up his design through a slow process of gradually-improving prototypes. He can cut to the chase and invoke the science of optics at the earliest stage. If he wants to put a reflecting parabolic mirror in the design instead of a lens, he can; it is an efficient and not overly complex alternative to the lens. So why do all known "sighted" animals possess eyes based on the lens and not the mirror? Because it is difficult to conceive of any evolutionary pathway which arrives at a mirror-eye through gradual, sequential, exclusively positive steps.

References:

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