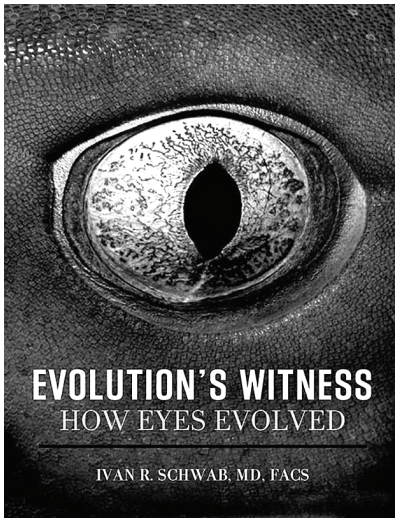
Comparative anatomy of the eye in the animal kingdom—with dubbed-in evolution



Evolution's Witness: How Eyes Evolved
Ivan R. Schwab
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John Woodmorappe

This is essentially a zoology book. It focuses on comparative anatomy, physiology, and ecology. There is a helpful table (p. 23) that outlines and classifies all the eyes found in Kingdom Protista and Kingdom Animalia.

This work is not solely about eyes and vision. It also covers many biological processes. The reader skeptical of evolution, if willing to overlook the inferred evolutionary outcomes, would probably find little to disagree with in this book. It is profusely loaded with diagrams and photographs. An extensive bibliography is provided for further reading.

Assuming, not determining, evolution

The title of this work is misleading. It is not about how eyes evolved, but rather how the author imagines that eyes had evolved. In fact, throughout this work, the author takes evolution as a given (i.e. eyes exist, therefore they evolved) and does not attempt to test it in any way. Schwab freely interprets anatomical features, often in glib fashion, through the lenses (pardon the pun) of evolution. In fact, the author consistently glosses over evolutionary process and focuses on the (presumed) evolutionary outcomes.

The *ad hoc* reasoning is predictable. Thus, to the author, similarities between eyes of different taxonomic groups indicate a shared evolutionary ancestry, while dissimilarities point to independent evolutionary origins. (In standard 'evolspeak', the former are homologous structures and the latter are analogous or homoplastic structures.) Differences in embryological pathways, in the ontogenic development of ocular structures, indicate that they are of independent evolutionary origins. Throughout this work, all of the standard evolutionary 'cover words' are freely used: evolutionary pressures, adaptive radiation, convergence, rapid evolution, sudden appearance, etc. He also uses the word 'scenarios' (e.g. p. 50)—a good choice of word.

There is tacit admission that complex eyes do not show a step-by-step origin through inferred evolutionary processes. For instance, Schwab writes:

> "The mantis shrimp's close ancestors must have been present during the Cambrian. Even though this animal's eye is the simplest compound-eye morphology, in some ways, it is the most complex eye in an invertebrate, and probably in the animal kingdom" (p. 54).

Evolution as 'creator'

Even though evolution has no goal or purpose, the author endows it with creative powers. He does so with such intensity that he consistently slips into teleological (even quasi-Lamarckian) language.

Thus, we read: "Over time, using trial and error, this indiscriminately random process of evolution has tinkered with many different eyes from those few basic components" (p. 24). In addition, he states: "Pterosaurs would not discover the skies for at least another 100 million years …" (p. 109); "Some spiders have evolved to find clever solutions that approach the limit of what an eye can do …" (p. 117); "Squids … have been honed by millions of years of evolution with radiation to all oceans and depths" (p. 167); "Birds needed and evolved more retinal cells to develop a 'faster' retina with more visual processing being performed with the new skill of flight" (p. 197); "These evolved to assure successful copulation" (p. 207); and, "The clever method of supplying retinal nutrition to the inner retina in fruit bats suggests that evolution remains capable of finding new and unique solutions to perplexing anatomical problems" (p. 252).

The examples can be multiplied. Although the author does not intend all this literally, the reader can get the erroneous impression that evolution operates according to some predetermined plan or that it unfolds according to the needs of the organism. No, or virtually no, evolutionist today believes that.

The evolutionary reasoning in this work is so expansive and deductive in

nature that it often veers into outright storytelling and guesswork. For instance, the author comments:

> "One of the more recent compound eyes, the refracting superposition eye, may have developed twice or more because it appears on land, not only in its watery birthplace. Possibly, this eye developed only once in response to the dark mesopelagic waters as the arthropods radiated into these depths. The similar aquatic and terrestrial versions could have come from the same common ancestor. Or they could have come from the same genetic blueprint that permitted such radiation—in other words, evolved again" (p. 62).

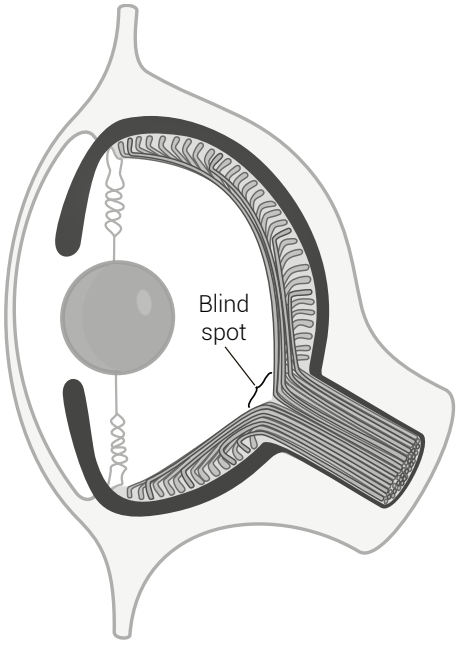

Figure 1. The blind spot, which poses no problems whatsoever for human vision.

Evolutionary origin of life

Probably without intending to, the author makes it clear that the inferred evolutionary origin of life is totally within the realm of evolutionary imagination. He quips:

> "Perhaps life began beside the fumaroles on the ocean's floor … . Perhaps life began in shallow pools … . And perhaps most of early life was wiped out many times only to spring again … . Wherever cellular life began, it did so as no more than self-replicating molecules requiring energy input and a constant supply of chemicals to continue … . The prebiotic soup would have become very rich, especially with replicating molecules" (p. 5).

The Serial Endosymbiotic Theory

Schwab presents, with little questioning, the concept of endosymbiosis, and believes that it happened repeatedly. Thus, the mitochondrion, found in metazoan cells, and the 'powerhouse' of the cell, was once a stand-alone organism. Likewise, the chloroplast, in at least some photosynthetically capable cells, was once a stand-alone cyanobacterium. The reader should know that evidence exists that vitiates the serial endosymbiotic theory.[1]

However, endosymbiosis, even if true, would not require an evolutionary explanation. 'Endosymbiosis' exists in designed structures, such as machines. For instance, consider the electric fan and the conventional automobile. The electric fan exists as a stand-alone machine. However, the electric fan also exists in 'endosymbiosis' within the automobile. When the car engine starts to overheat, notably when the car is in idle, a sensor makes the fan turn on and the fan cools the engine. In return, the engine indirectly supplies the electricity that enables the fan to run and the car body provides a shelter for the fan.

Visible-light limitation—suboptimal or optimal?

Probably without intending to, Schwab refutes a common evolutionary dysteleological argument. Even decades ago, some evolutionists had brought up the fact that living things perceive and use only a fraction of the electromagnetic energy spectrum. This is supposed to be a form of 'poor design' that no intelligent designer would use. Instead, it is supposed to illustrate the fact that evolution is a blind, minimal-solution process that variously makes for 'messy', inefficient, or suboptimal living things.

This argument, apart from the usual presumption of what a Creator would or would not do, and the beholder's opinion of what constitutes 'bad design', tacitly assumes that it would be desirable for living things to perceive and use all of the electromagnetic spectrum, and that it is deficient engineering for organisms to be unable to do so. Is it? Universal perception of electromagnetic energy would only create new problems.[2] For instance, we would be kept awake all night while constantly seeing the gamma rays that come from rocks and the cosmic and radio waves originating from stars. Either that, or our brains would have an even greater burden of sorting out irrelevant from relevant stimuli than they do now while accepting perceptions of only part of the electromagnetic spectrum. Note, for example, that autism is believed to be caused by a disorder that prevents the screening out of irrelevant from relevant stimuli. (Thus, for example, the autistic child is bothered by the skin-feel of his clothing.) In autism, therefore, the child protects himself from the constant overstimulation he experiences by withdrawing into himself.

Now the evolutionist Schwab turns the entire suboptimal design argument, about perception of only part of the electromagnetic spectrum, on its head (pp. 9–10). He shows that it is *optimal*,

not suboptimal, for living things to use and perceive only part of the electromagnetic spectrum—what we call visible light. For instance, long wavelengths, such as those of radio waves, would not fit into a cell and allow it to use its energy efficiently. Conversely, short wavelengths would deliver too much energy to the cell, causing damage to its components. Thus, what we call visible light is the best compromise between the foregoing two extremes. Furthermore, blue light is, in Schwab's words, the 'sweet spot' for maximum penetration of electromagnetic waves through a column of water. Though of course an evolutionist, Schwab puts the final nail in the coffin of the limited-perception dysteleological argument with these words:

> "As it turns out, the bluer wavelengths are at the peak of the combination of energy delivery, safety to cells, transmission in media, and penetration in media such as water" (p. 10).

Alleged dysteleology of the human eye—the 'backwards'-vascularized retina

One common argument against an Intelligent Designer is the one about the 'mistake' of the retinal blood vessels situated above the surface of the retina, 'obstructing' the incoming light, as well as the existence of the blind spot (figure 1). This argument, even on its own terms, has no merit.[3,4]

Although Schwab does not address this issue in terms of 'bad' design, he does provide extensive detail on the vascularization of retinas in the Animal Kingdom and includes a very helpful diagram (p. 250) for comparing and contrasting the different forms of vascularization. The fact that so many different designs of vascular systems exist in the Animal Kingdom demonstrates, if nothing else, that there is no 'right' or 'wrong' way to construct such a system. Consequently, theological issues aside, it is meaningless to begin even to speak of the vascular system, in the human eye, as a form of bad design. Finally, as elaborated in the next section, whatever the anatomical and physiological limitations of the human eye, they are compensated by the extensive interpretive powers of the human brain.

Alleged dysteleology of the human eye—other eyes 'better'

Many eyes in the Animal Kingdom, notably birds, provide far better visual acuity than does the human eye, and it has been argued that it shows that no Creator exists who made humans special. The argument is silly on its face. The fact that humans are created in the image and likeness of God means that humans have dominion over all other forms of life and that humans have a unique capability of communion with God. It has nothing to do with humans expected to have the best eyes among living things any more than, for example, humans being expected to be the best swimming creatures on Earth.

Even so, there is more to vision than eyes. The ability of the organism to utilize visual information is not limited to the capability of the eye to pick up visual clues, but can be enhanced by the capability of the brain to interpret and utilize whatever visual information it receives. It turns out that humans are not so inferior to birds, even solely in terms of the possession of useful visual information, as may be at first supposed. Schwab comments:

> "Humans simply do not have the best optical device in the animal world, but the brain helps us with these deficiencies. The human retina, though, still is supremely prepared for complex visual tasks. Eighty percent of human sensory input takes place through the human retina. Much of the processing takes place in the brain, unlike in birds and reptiles, where it happens in their more complex retinas. Because more responses to birds' and reptiles' visual stimuli occur at a subcortical level, they occur more quickly. Humans, on the other hand, can use higher-level processing to understand visual stimuli. About one-third of the human brain is devoted to vision or visual processing. Because much more of our processing is consciously mediated than other animals', we are less susceptible to illusions than are most animals. For example, some camouflage works better among nonhuman animals than humans, in part for that reason. This neural machinery permits the brain to swirl and mix memory and careful analysis with the visual input. This ability probably also explains why humans do not collide with glass windows or doors as frequently as birds do" (p. 241).

Conclusions

This is an excellent book in terms of zoology and anatomy, though it requires a bit of a technical background to appreciate. It is thus of value whether or not one believes in evolution. In addition, whether or not so intended by the author, it helps demolish a series of bogus dysteleological arguments.

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