Vision

Don B. DeYoung*

Abstract

For mankind as well as for the animal world, eyesight is a compelling testimony to creative design. Continuing research reveals the complexity of vision for every creature, whether living in the past or present. This article reviews recent studies of eyesight in people, trilobites, parasites, and dinosaurs.

Human Eyesight

This Quarterly has a rich tradition of articles about animal and human vision, especially by author H.S. Hamilton (1985; 1986; 1987a, b, c; 1991; 1993). To continue this theme, there has been much recent discussion about the light-sensitive portion of our eye, the retina. Naive critics have declared that our eye is poorly designed because its rods and cones are oriented *away* from incoming light (Dawkins, 1996). In rebuttal, technical reasons for this designed arrangement have been thoroughly presented by creationists (Gillen et al., 1999). Those who ridicule design in nature, whether it be human eyesight or the panda's unique thumb (Gould, 1980), reveal their own limited understanding of physiology. Critics of intelligent design in nature might well be challenged not only to suggest improvements, but also to build working models that can successfully replace the original visual equipment for a lifetime. It will be a long wait before this happens! Two additional design features of the human eye will be presented here.

Kobayashi and Kobshima (1997) have discussed the white area called the sclera or sclerotic coat that surrounds the colored iris. A survey shows that no animal among the 100 primate species shows the light-dark (sclera/iris) eye color contrast found in humans. The unusual "whites" of human eyes have no obvious natural selection survival value. In fact, in evolutionary thinking, the white sclera would appear to be detrimental since it raises visibility to possible predators. On the plus side, however, this unique eye feature allows us a great range of communication involving eye movement. Our eyes display emotions and much other information to others. This ability of human eye expression surely is a gift from the Creator (Samples, 2000). The white sclera is one of many distinctives that set people entirely apart from the animal world.

*Don B. DeYoung, Grace College, 200 Seminary Drive, Winona Lake, IN 46590, DBDeYoung@Grace.edu
Received 27 November 2000; Revised 17 May 2001

Another feature of the human eye is its rapid healing ability. Eye patients experience rapid improvement and recovery from surgery. Many corrective procedures have been developed in recent years:

- 1948 Keratomileusis
- 1963 Radial keratectomy (RK)
- 1975 Photorefractive keratectomy (PRK)
- 1989 Automated lamellar keratoplasty (ALK)
- 1992 Laser *in situ* keratomileusis (LASIK)

The aspects of each surgery and recovery listed support creation. The LASIK procedure will be further described as an example. In this operation a surface flap is cut and pulled away from the cornea. A laser then vaporizes tissue to reshape the cornea, after which the corneal flap is returned for healing. The affected cornea surface tissue is called epithelium. It quickly heals from the laser process, usually within 3-5 days. There have been isolated problems with LASIK, but it has provided a near-miracle of improved vision for millions of patients worldwide. The Creator made the eye with a rich supply of blood vessels and a vigorous healing mechanism in place. Long before modern eye surgery, William Paley wrote about the design of human vision, "Were there no example in the world of contrivance [design], except the eye, it would be alone sufficient to support the conclusion which we draw from it" (Paley, 1802, p.60).

Trilobites

Trilobite fossils were first scientifically studied three centuries ago (Taylor, 2000). Since then, entire books have been dedicated to this extinct marine arthropod (Levi-Setti, 1993; Fortney, 2000). Of special interest is the trilobite eye, a wonder of design, having a compound lens consisting of hundreds of facets called *ommatidia*. Each tiny lens is made of transparent, crystalline calcite, $CaCO_3$. The clear form of calcite, also called Iceland spar, has the un-

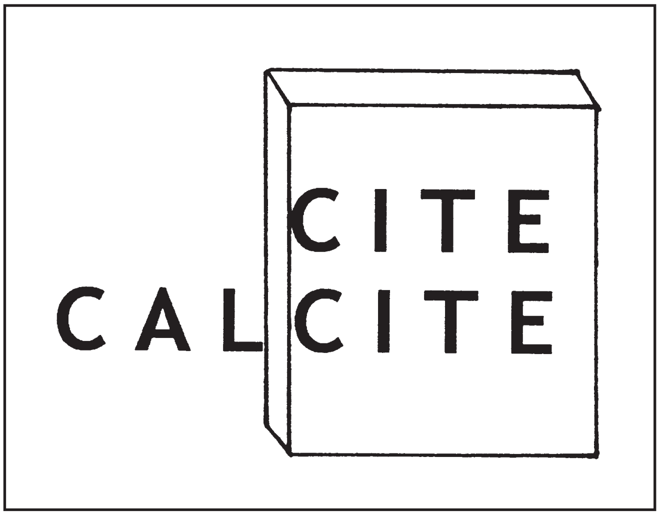

Figure 1. An illustration of the birefringence of calcite. Light passing through the crystal divides into two separate paths, causing a double image.

usual optical property called birefringence or double refraction. Light passing through the crystal usually divides into two distinct paths with perpendicular polarizations. A view through clear calcite therefore appears double (Figure 1). However, the trilobite did not have double or blurred vision. Instead, there is one particular optical axis through calcite where the two light paths overlap and stay together. The calcite eye lens of the trilobite were exactly aligned along this optical axis, for clear vision.

One species of trilobite called *Phacops* formed eye lenses that were spherical in shape. Such lenses usually distort images, a situation called *spherical aberration*, a common problem in optics. But in the *Phacops* this distortion was corrected by magnesium atoms that were incorporated into portions of the calcite lens. This impurity altered light refraction within the lens just enough to cancel out the aberration totally, another example of intelligent design (Taylor, 2000; Wise 1989).

Clearly, trilobites were expertly designed for clear vision in their habitat beneath shallow seas. Yet this creature supposedly lived during the Paleozoic era, 250-570 million years ago. The trilobites are considered to have been an index fossil, part of the "Cambrian explosion" of life. This theoretical ancient time span is assumed to have elapsed before the dinosaurs came into being, a time when life is thought to have been simple and primitive. The trilobite optical system, however, was far from simple. In fact its eyes were more "advanced" than human eyesight.

Xenos Peckii

Buschbeck, Ehmer, and Hoy (1999) report an unusual discovery regarding a tiny parasitic insect that lives inside the bodies of paper wasps. The females are sightless, while the males have compound eyes somewhat similar to many other insects. The male *Xenos peckii*, however, is highly unusual in that each of its many tiny lenses is a complete eye. That is, each of its 50 or more "eyelets" has its own independent retina and set of receptors. This allows the insect's brain to combine several overlapping fields of vision. When light passes through a convex eye lens, whether that of a person or an animal, the image is inverted on the retina. The brain then reinverts this image. But this leads to a special challenge for *Xenos peckii*. As Figure 2 shows, inverting the entire final mosaic image does not suffice. The combined image from multiple lenses would be scrambled. Instead, the separate images must be reinverted before they are added together. In other words, "points in optical space [need to be] adjacent in their neural representation" (Buschbeck, et al., 1999, p. 1179). However this occurs, the result is an exceptionally high resolution of detail. In contrast, the compound lenses of most insects utilize a single common retina. Then, each lens focuses light on just a few receptors, each with a field of view of only about one-degree.

The conclusion is that while most insects can detect motion but little detail, *Xenos peckii* clearly sees both motion and detail. Scientists are puzzled by the "advanced" optics of this insect (Jaroff, 1999). The male *Xenos peckii* lives only about six hours after taking flight from its wasp host. Its good eyesight may be what enables it to find a female before expiring, along with the scent of pheromone. Incidentally, the trilobite, discussed earlier, also was provided with a similar system of multiple complete eyes.

Dinosaurs

In the past it was often assumed that dinosaurs had poor vision. After all, they were considered to be simple, prehistoric animals. *Tyrannosaurus rex*, for example, was thought to lack depth perception. The work of computer scientist Kent Stevens has radically changed this false assumption (Coates, 1998; DeYoung, 2000). Stevens placed glass eyes within the eye sockets of dinosaur models and then mea-

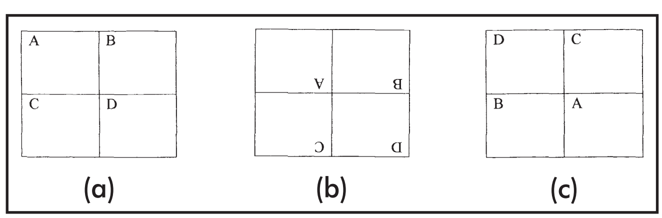

Figure 2. (a) The small squares respresent the individual fields of vision of the *Xenos* eyelets. (b) Each *Xenos* lens inverts the image on its retina. (c) If the *Xenos* brain invets the mosaic as a whole, the image is distorted. Instead, the images must be separately inverted by the brain to produce the original field.

sured their possible range of view. The *T. rex* was found to have about 50 degrees of binocular vision in the forward region where its two eyes overlapped. This overlap would have permitted excellent stereo or three-dimensional vision for the dinosaur. For comparison, an alligator has only 20 degrees of overlap, while a house cat has about 130 degrees.

The optical studies also show that visually, *T. rex* did not have to rely on the movement of subjects in order to detect them. In the *Jurassic Park* movie (1993), the characters avoid detection by *T. rex* simply by not moving, a notion now considered incorrect. Tyrannosaur vision was probably very acute, like many animals today. Another dinosaur skull studied by Stevens, that of the *Carcharondontosaur*, had eyes with very little overlap and therefore less depth perception. Like many animals today, dinosaurs probably displayed great variety in their vision. Each was superbly engineered for its particular lifestyle. The enlarged eyes of many dinosaur species suggest that they could see colors, as do many mammals, birds, crocodiles, and fish today.

Conclusion

We have considered briefly the eyesight of humans, trilobites, *Xenos peckii*, and dinosaurs. Each mechanism is uniquely designed for successful vision. In the animal world there are more than 40 distinct types of eye structure. Evolutionary theory must assume that each of these cases formed separately, and by chance. Instead, however, eyesight declares the Creator's care for His creatures. Psalm 94:9 asks, "Does he who implanted the ear not hear? Does he who formed the eye not see?" Eyesight affirms a positive answer to this question.

References

CRSQ: *Creation Research Society Quarterly*

Buschbeck, Elke, Birgit Ehmer, and Ron Hoy. 1999. Chunk versus point sampling: visual imaging in a small insect. *Science* 286(5442): 1178-1180.

Coates, Karen. 1998. Through dinosaurs eyes. *Earth* 7(3): 24-31.

Dawkins, R. 1996. *The blind watchmaker*. W.W. Norton. New York.

DeYoung, Don. 2000. *Dinosaurs and creation*. Baker Books, Grand Rapids.

Fortney, Richard. 2000. *Trilobite!* Harper Collins, New York.

Gillen, Alan L., Frank J. Sherwin III, and Alan C. Knowles. 1999. *The human body: An intelligent design* Creation Research Society Books, St. Joseph, MO.

Gould, Stephen Jay. 1980. *The panda's thumb: Reflections in natural history* W.W. Norton, New York.

Hamilton, H.S. 1985. The retina of the eye-an evolutionary road block *CRSQ*. 22:59-64.

———. 1986. The jumping spider's wondrous eyes. *CRSQ*. 23:62-64.

———. 1987a. The snake's spectacular spectacle *CRSQ*. 23:177-178.

———. 1987b. Convergent evolution-do the octopus and human eyes qualify? *CRSQ* 24:82-85.

———. 1987c. The watchmaker surfaces again. *CRSQ*. 24:144-145.

———. 1988. The eye of the air-breathing vertebrate: Did it emerge from the sea? *CRSQ*. 25:117-120.

———. 1991. The eye: by chance or intelligence. *CRSQ*. 27:141-144.

———. 1993. The evolution of the eye-fact or fiction? *CRSQ*. 29:195-196.

Jaroff, Leon. 1999. The fly with 100 eyes. *Time* 154 (20): 96.

Kobayashi, Hiromi and Shiro Kobshima. 1997. Unique morphology of the human eye. *Nature* 387(6635): 767-768.

Paley, William. 1802. *Natural theology* in *The works of William Paley*, 7 vols., R. Lynam (editor). W. Baynes, London.

Riccardo, Levi-Setti. 1993. *Trilobites* University of Chicago Press, Chicago.

Samples, Kenneth R., editor. 2000. By the whites of our eyes. *Facts for Faith* 1(2): 24. This publication is from the Hugh Ross *Reasons to Believe* ministry.

Taylor, Michael. 2000. Look back in wonder. *New Scientist* 167(2248): 48-49.

Wise, Kurt. 1989. My favorite evidence for creation. *Creation Ex Nihilo* 11(4): 29.

Erratum

CRSQ 38(3), December 2001, page 159. In the Panorama Note, "The Growth Rate of *Muhlenbergia torreyi* (Ring Muhly Grass) Colonies in Central Arizona" by George F. Howe and John R. Meyer, Figure 1 was printed upside down. The corrected photograph is at the right.

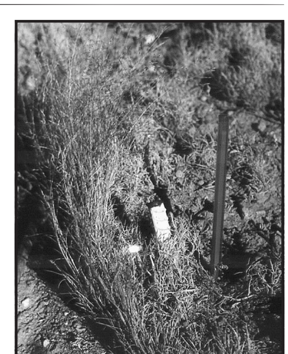

Figure 1. Colony number 8 of *Muhlenbergia torreyi* after two growing seasons. Note how the arc has grown 7 cm in what is a SSW direction (to the left and down), leaving the rebar peg behind. Small white dot to the left of the peg is an artifact.