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Empedocles and the Anatomy of the Eye

What mechanism of vision is being described in Empedocles DK 31B84? Aristotle interprets it as an emissionistic theory: we see by means of rays emitted from our eyes. Theophrastus, on the other hand, apparently locates Empedocles' visual process on the surface of the cornea. David Sedley (in Fortenbaugh and Gutas, edd. *Theophrastus* 1992) has argued that Theophrastus is correct. In this paper, I give some further arguments for thinking that Empedocles' theory places the visual process on the surface of the eyeball, and attempt to identify the structures represented metaphorically by the various parts of the lantern.

Interpretation of the fragment has been made more difficult by the fact that the word *kore* changed meanings over the course of time. Although in Galen it designates only the pupil, it originally comprehended the entire eyeball. G.E.R. Lloyd ("Alcmaeon and the early history of dissection," 1975) and John Beare (*Greek Theories of Elementary Cognition*, 1906) take *kore* as "pupil" in Empedocles 84. This narrower denotation may have originated as a twisting of language in the service of an argument about self-contemplation in the pseudo-Platonic *Alcibiades*. Socrates uses a punning etymology to restrict the meaning of the poetic word for "eyeball" (*kore*) to only that part in which the "maiden" (*kore*) is reflected -- i.e. the pupil. But *kore* continues to be employed in the broader sense of "eyeball" at least as late as Aristotle. In Empedocles, therefore, *kovrh* designates the eyeball, not the pupil only.

A second question concerns the identity of the "ocean of water flowing around." I argue that it is, not the vitreous humors, but the lachrymal fluid on the surface of the eyeball. No one contemporary with Empedocles conceived of the *kore* as surrounded by fluid and located deep in the eye. Alcmaeon is said to have believed that the eye sees through the water around it. Alcmaeon clearly has in mind the dampness of the eye's surface, on the cornea and sclera, and I believe that this is also the water intended by Empedocles.

Finally, I attempt to identify the membranes and the fire. I argue that the membranes are those of the cornea and sclera, and I cite Galen and Theophrastus as evidence that the ancients were very impressed with the transparency of the cornea.

There is a controversy over the fire: some, following Aristotle, believe Empedocles' ocular fire to be the vehicle of active vision, emitted from the eye to reach the objects of perception. Others believe that Theophrastus' *De Sensibus* reflects a better understanding of what Empedocles really taught. One passage in particular shows that the fire, though not necessarily involved in perception beyond the surface of the eye, does nonetheless penetrate beyond the membrane of the cornea. I suggest that the fire is probably the iris, which is especially reflective at night in animals such as cats.

In sum, Empedocles 84 gives us a very sophisticated analogy that accounts well for all the phenomena available to him, from the wetness on the eye's surface, to the reflectivity of the iris. No advance in ocular anatomy was made over Empedocles 84 until Galen

described, in impressive detail, the numerous membranes of the dissected eye in *De Usu Partium*.

Sedley, D.N. 'Empedocles' Theory of Vision and Theophrastus' *De Sensibus*' in Fortenbaugh and Gutas, edd. *Theophrastus: His Psychological, Doxographical, and Scientific Writings* (New Brunswick/London 1992), 20-31