The Heliocentric Theory in Antiquity

When Calypso gave sailing instructions that allowed Odysseus to go from her home to Ithaka (Homer, *Odyssey* 5.272-7), it marked a beginning of recorded practical astronomical observations in the Greek world. Such early reports--scattered through the poems of Homer and Hesiod--are empirical, with no consideration of the overall nature of the cosmos (Evans 3-5). It would seem obvious that the earth was stationary and that the cosmos revolved around it. But as the cosmos was studied more intensively through scientific analysis, it was realized that the seemingly incomprehensible movement of the planets was impossible to explain. Yet there was an alternative explanation: to assume that the sun, not the earth, was at the center of the universe and that the earth revolved around it.

Heliocentric theory is an outlier in ancient astronomy, but thoughts in that direction existed from at least the early fourth century BC. The first thorough attempt to explain planetary motion, by Eudoxos of Knidos, had many flaws, and the numerous efforts to analyze his theory, from ancient into modern times, have essentially proved futile (Aristotle, *Metaphysics* 12.8.1073b-1074a; Evans 305-12). But few were willing to suggest the heliocentric alternative, and the geocentric system was canonized by Ptolemy in his *Almagest* (1.5).

Yet as early as the time of Plato there were doubts about the geocentric system (Plutarch, *Numa* 11; Plutarch, *Platonic Questions* 8.1.1006c). A heliocentric system was first set forth by Aristarchos of Samos, active in much of the third century BC, who was even said to have devised a geometrical proof of the concept (Archimedes, *Sand Reckoner* 4-7; Mendell 131-3). Yet he soon ran into difficulty, and seemingly was threatened with indictment by Kleanthes, the head of the Stoa, for impiety in daring to make such a suggestion, which, it was said, moved the

hearth of the cosmos (Plutarch, *Concerning the Face That Appears in the Orb of the Moon* 6) an early example of the politicizing of scientific inquiry. Few details are known about Aristarchos' thoughts; there is little evidence for them other than occasional references in later Greek literature, which are generally dismissive. Yet Seleukos of Seleukeia, in the second century BC reported that he had proven Aristarchos' theory, probably the only person in antiquity to go beyond what Aristarchos had suggested (Aetius 3.17.9; Roller 112-15).

Heliocentric theory never entered the mainstream of ancient scientific thought, yet always seemed to be lurking beneath the surface, largely as a reaction to the inadequacies of the geocentric system (Schiaparelli 1898). But it was too counter-intuitive to be taken seriously, and the writings of Aristarchos and Seleukos on the topic were lost, although Abu Bakr al-Razi, around AD 900, may have had a copy of Seleukos' proof (Pines 193-209). Given Aristarchos' difficulties, few wanted to be open about the idea, yet key phrases, such as Pliny's *mundi motu* (*NH* 2.217), may indicate a subtle awareness of a heliocentric alternative. Heliocentricity sank beneath the surface of the mainstream until the Renaissance and the work of Copernicus and others, all of whom were well acquainted with Aristarchos (Heath 301).

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