

Philosophy 167: Science Before Newton's PRINCIPIA

Assignment for September 16

Kepler's ASTRONOMIA NOVA and the Orbit of Mars

Reading:

Kepler, Johannes. A Defense of Tycho against Ursus. tr. N. Jardine, Preface, Chapter I, and last two paragraphs, pp. 134-158, 206-207.

Wilson, Curtis. "How Did Kepler Discover His First Two Laws?," a reprint from Scientific American in Astronomy from Kepler to Newton: Historical Studies.

--- "Kepler's Derivation of the Elliptical Path," a reprint from Isis in ibid. (written for historians)

Questions to Focus On:

1. What empirical evidence did Kepler have for the following claims:
 - (a) Mars sweeps out equal areas with respect to the Sun in equal times.
 - (b) Mars does not describe a circular path.
 - (c) Mars describes an elliptical path.
2. Some 80 years later Newton remarked that Kepler had only guessed that the orbit of Mars is an ellipse. To what extent was Newton right?
3. What enabled Kepler to succeed with the latitudes of Mars when all mathematical astronomers before him had consistently failed with the latitudes of all the planets?
4. In Chapter I of the Apologia Kepler puts forward 11 points in reply to Ursus's suggestions that the hypotheses of astronomy should not be taken as if they were literally true or false. At the time (1600) he had yet to begin his investigations on the orbit of Mars. Which, if any, of the points could he have strengthened if he had revised Chapter I of the Apologia after these investigations had been completed in 1605?