New Astronomy, Part II: Writing Proposal

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1. As the case of Kepler testifies, how does the universe demonstrate its necessity of increasing the human knowledge of it? What is the crime of those (or the doctrines they thus express) who, preoccupied with seeking what they think are "known pleasures," or with "How great!", and "Greater than others'!" what those think they know is, miss their opportunity, and divert the ability of society, to occupy themselves in a necessary way with what they encounter as unknown? More generally, what is the crime of those who miss their opportunity to organize political change?

2. What was the mistake in method and what was the mistake in assumption in the "ancients'" and Brahe's elimination of the second inequality? (Kepler recounts that the ancients considered a planet at opposition [and thus divested of its second inequality] when the planet's ecliptic positon[1] appeared opposite the sun on the ecliptic; "those who constructed the tables [Brahe and Severinus] thought that the planet is not exactly at opposition to the sun unless AC (the observed distance of the planet from the node) is equal to arc AB, the elongation of the place opposite the sun from the same node." —Ch. 9, pp. 193,194.)

   (a) What is the relationship between an arc on the ecliptic and an arc on Mars's orbit as seen on the celestial sphere.

3. How do the physical rules of physical geometry, as demonstrated, among numerous other locations, in Kepler's method for developing means of finding the inclination of Mars' orbit (Ch. 13), demonstrate "the law of tangents"?

   (a) To reiterate: the "law of sines," looked at in a similar physical geometric way, claims that there is a constant (relationship) for every assumed triangle. How does that constant bound the action of constructing a triangle? How is this boundary expressed in every possible assumed triangle?

4. What physical relationship in a planet's motion is expressed by the equant? What notion of the nature of relationships is challenged by Kepler's demonstration of the lack of an equant?

5. On what basis, in the name of what axioms, could Brahe have what Kepler reports as "great controversy between us as to whether it were possible to set up another sort of hypothesis which would express to a hair's breadth so many positions of the planet, and whether it were possible for the former hypothesis to be false despite its having accomplished this so far over the entire circuit of the zodiac" (Ch. 7, p. 185)? What was the authority for Brahe's hypothesis? In order to refute what boundary of the human mind does Kepler write part I of the *New Astronomy* and the next as many chapters of part II? What are some of the implications about the nature of the universe that Kepler demonstrates thus, and in the closing part of part II?

For future investigation:

1. Why, as Kepler reports, "the precession of the equinoxes was exceedingly high around Ptolemy's time, while before and after there remains not the least suspicion of any such thing"[2]?

[1] "that point on the ecliptic at which the circle of latitude (at right angles to the ecliptic) passing through the siderial position of the planet's body intersects the ecliptic" —Ch. 9, p. 192

[2] "the Tychonic value for the motion of the fixed stars, or of precession, which is quite uniform and is the same for all times (Ptolemy's alone excepted), namely, $25'30''$ in 30 years" (Ch. 17, p. 272).