Astronomy 211 Reading Questions for Boynton Chapters 5 – 7

(Participation points – be prepared to discuss in class on January 23. If you wish, you can email me your answers beforehand.)

01. "Galileo's approach to natural philosophy was direct. He would doubt anything told him that he had not yet demonstrated to his own satisfaction through direct observation, particularly those neo-Aristotelian "truths" held by some "traditional" scholars of his time (i.e. proponents of lingering medieval scholarship based on mindless appeal to authority rather than rational/empirical inquiry). Galileo had no patience with such thinking. He would subject such "truths" to experimental test, disprove, and then ridicule them and those who supported them. *Although his university colleagues were not particularly fond of this technique, it was quite popular with students*." Boynton, p. 24 (italics added)

Curiosity leads me to ask if in your educational pursuits you have come across an instructor whose personality you might liken to Galileo's: An instructor who was popular with the students but not necessarily so with the school administration. How about the opposite: An instructor who was extremely well liked by the school administration and perhaps given a lot of power or leverage but not popular with the students?

02. At the bottom of page 25 and top of page 26, Boynton lists the 5 observations that started to strip away the firmly held beliefs. Which of these 5 do you think would be the most convincing evidence that the Earth was not the center of the solar system? Does it take more than one or all of the observations? Or, even in total are they not enough?

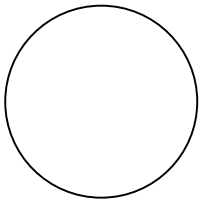
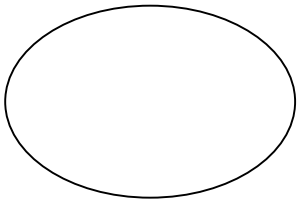
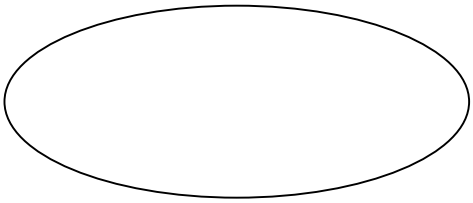
03. "But for Tycho Brahe, the new star (a supernova) had other implications as well. Aristotle had said that the heavens, the superlunary regions, were eternal, invariant, and immutable; therefore this new object must be sublunary (closer to us than the Moon). Tycho checked the parallax of the new star using the precise observations on its position that he had been regularly accumulating. Clearly it was *farther* away than the Moon!" One might interpret this as the "smoking gun" that finally brings thinking around to a Sun-centered planetary system. How did Tycho interpret this event? Is there a more modern analogy that you may have read or heard about?

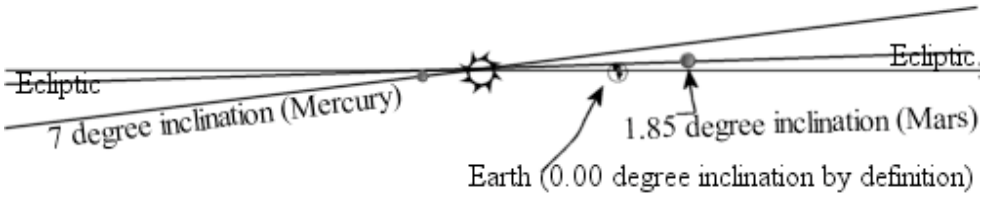
04. (See next page for question.)	Distance from Sun[¤] (AU)	Period (Earth yrs)	Orbital inclination (degrees)	Orbital eccentricity
Mercury	0.387	0.2409	7.00	0.206
Venus	0.723	0.6152	3.39	0.007
Earth	1.00	1.0	0.00	0.017
Mars	1.524	1.8809	1.85	0.093
Jupiter	5.203	11.8622	1.31	0.048
Saturn	9.539	29.4577	2.49	0.056

[¤] semimajor axis of the orbit

Mercury is hard to observe because it is so close to the Sun. Some historians state that it was fortuitous that Tycho gave Kepler the data for Mars, the planet that has the next largest orbital eccentricity, since those data were the most difficult to interpret. Tycho did so because he felt that Kepler was a more talented mathematician and he wanted to "get even." In fact, Tycho only gave Kepler part of the data, hoping to keep Kepler busy and away from him by not giving him all of the pieces of the puzzle. It was his struggle with Mars that led Kepler to formulate his 3 laws.

How might history have been reshaped if Tycho gave Kepler the data for Jupiter? Take into account the lengths of the orbits of Jupiter and Mars (Tycho's precise measurements covered about 30 years), and whatever else you consider important. There are no wrong answers here; be prepared to discuss.

Circle: Eccentricity = 0	Orbit with greater eccentricity	Orbit with even greater eccentricity
		



05. Chapter 7 summarize various ways that the ancients and more modern (i.e., Copernicus, Galileo) dealt with the concept of an infinite universe. Pick a couple of quotes or statements that seemed to make the most sense to you, and comment on them here. We will have to continue to deal with an infinite universe – a universe with no center and no edge – and we might as well get started thinking about it now.