CONCLUSION AND EPILOG

1. Summary

This study of Copernicus and the Aristotelian tradition has examined astronomy in relation to philosophical cosmology. Throughout the first two parts I tried to place Copernicus's work on astronomy in context, providing a concrete sense of his socio-political environment, education, and reading. In focusing on Aristotelian schools, I have accepted them as a community of scholars who modified Aristotle's doctrines and who represented themselves as Aristotelians. Copernicus, I have argued, learned from his university education above all to adapt Aristotelian principles to his own interests and conclusions. There was no question of rejecting Aristotelian metaphysics, natural philosophy, or logic, or of replacing Aristotle completely by adopting the views and criticisms of other ancient philosophers. As Copernicus read the works of other authors, they informed his approach to astronomical issues, his understanding of Aristotle, and his revision of Aristotelian and scholastic traditions.

The most important influence that Aristotle exercised on Copernicus was on the highly controversial question of the truth of cosmological hypotheses, Copernicus's belief that astronomical phenomena (the observational facts, data) can follow only from true hypotheses. Aristotle had affirmed such a view in three different texts, all of which indicate, however, that he was referring to causal connections and to demonstrations propter quid. Relying on the well-developed area of philosophical dialectic, Copernicus expanded Aristotle's doctrine to stipulate relevance as a condition of validity, and irrelevance and omission as criteria of invalidity in evaluating the connection between the antecedent and consequent of a hypothetical proposition. The arguments supporting such an expansion relied on dialectical topics, and they resulted in conclusions that were probable and even more probable, Copernicus maintained, than their alternatives. Such was his

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1 H. Kuhn, “Aristotelianism”; Jordan, “Aquinas.” For the many editions of Aristotle’s works in the sixteenth century, see Cranz, *Bibliography*. Similarly, on the survival and influence of Aristotelian principles, see Leijenhorst et al., eds. *Dynamics.*
debt to Aristotle in logic and to those scholastic Aristotelians who had argued in a similar fashion.  

How Copernicus arrived at this way of interpreting Aristotle is also controversial. There were precedents in Cracow and Bologna, but an annotation that is in Copernicus’s hand indicates that Plato’s views on the thorough evaluation of hypotheses or suppositions provide clues on how Copernicus applied Plato’s advice in astronomy. This advice led him to formulate the questions that focused attention on the principal weaknesses of geocentric astronomy. These were initially questions having to do with the principles of uniform, circular motion, the puzzles about the ordering of celestial spheres and the multiple centers of heavenly motions, and the variations in the distances of planets from Earth. This is why I had to address astronomical and mathematical details in chapter seven, and reconstruct his path to the first heliostatic, heliocentric theory. Other philosophical questions required discussion of other details about his models.

The summaries of the books that he used and read helped to answer other relevant questions about the origin of the heliocentric theory. Much of this is admittedly material intended to persuade readers that I have not ignored the most important literature on Copernicus and his sources. In my view, these summaries strengthen the story of how Copernicus arrived at his theory, and why his arguments take the form that they have.


3 The evidence that the annotation is genuine is summarized in chapter seven. For the complete analysis see Goddu, “Copernicus’s Annotations,” 202–226.

4 The detailed evidence is presented in Goddu, “Reflections,” 37–53. I have modified and strengthened the argument presented there in chapter seven. On variations in distance, the ratios in Ptolemy and Copernicus are in agreement. In De revolutionibus I, 4, 9, and 10, Copernicus suggests that the large spaces or gaps required by the large epicycles of Mars and Venus, though presumably filled with some substance, seemed to trouble him. He rejected the explanation for placing the Sun between the superior and inferior planets with the Moon. The superior planets show every elongation from the Sun, but so does the Moon, hence, to be consistent they should have placed the Moon beyond the Sun. Even in the Commentariolus, where he adopted double-epicycle models, he made them as small as possible as if their sizes troubled him and because his theory no longer required epicycles to account for retrograde motion. By placing the Earth in motion, of course, Copernicus explained the variations in distance as a result of the motions of both Earth and the planets, not just the planets. But see chapter seven where I acknowledge the difficulty in distinguishing between a clue and an afterthought.