

Cosmology and Mathematics in Aristotle and the Hellenistic Schools

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One of the things we generally associate with the scientific revolution is the gradual but thoroughgoing mathematization of physics and cosmology. We do not find anything comparable in ancient thought, although mathematics was more or less successfully applied in some areas, such as optics and astronomy, especially from the fourth century BC onward. The application of geometrical models to explain the motions of the heavenly bodies (in particular the apparently irregular motions of the planets) remains an impressive step in the history of science, however wrong the models may be by hindsight.

Ancient physics – still a part of philosophy - was generally slow to take up these new developments, insofar as it took them up at all. Yet some philosophers gradually did feel the need to define their own discipline *vis-à-vis* the approach of the newcomers, who were mathematical specialists rather than general philosophers. Remarks about the status of mathematics in this respect already crop up in the works of Plato and Aristotle in the fourth century. In the Hellenistic period (3rd century BC - 1st century AD) mathematical astronomy flourished as an independent, though small, area of research and various rival models were developed. Yet contemporary philosophers still do not appear to have warmed easily to either the results or the methods and procedures of the mathematicians. Whereas Aristotle had been prepared to integrate the astronomical model of the mathematician Eudoxus of Cnidus into his own philosophical cosmology, Epicurus and his followers took a rather extreme, yet principled, negative position with regard to any kind of involvement of mathematics in cosmology, a position closely connected to the school's strongly empiricist epistemology which engendered a kind of regionalized skepticism with regard to matters astronomical. Although the Stoics, the other main school in Hellenistic philosophy, did not take such a principled negative stance, in practice their attitude *vis-à-vis* mathematical astronomy does not appear to have been very receptive either. To some extent this practice appears to have been backed up by theory as well: there are some explicitly methodological fragments which set off physics from the mathematical sciences, highlighting the differences and giving priority to philosophical physics in no uncertain terms.

In my talk I shall present and compare the cases of Aristotle, Epicurus and Stoicism, discuss the philosophical reasons they had for taking their respective positions with regard to the role of mathematics in physics, and briefly indicate how their ideas influenced the pre-modern world picture of later antiquity and the middle ages.