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Physico-mathematics and the search for causes in Descartes' optics – 1619–1637. (English)

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Summary: One of the chief concerns of the young Descartes was with what he, and others, termed “physico-mathematics”. This signalled a questioning of the Scholastic Aristotelian view of the mixed mathematical sciences as subordinate to natural philosophy, non explanatory, and merely instrumental. Somehow, the mixed mathematical disciplines were now to become intimately related to natural philosophical issues of matter and cause. That is, they were to become more ‘physicalised’, more closely intertwined with natural philosophising, regardless of which species of natural philosophy one advocated. A curious, short-lived yet portentous epistemological conceit lay at the core of Descartes’ physico-mathematics – the belief that solid geometrical results in the mixed mathematical sciences literally offered windows into the realm of natural philosophical causation – that in such cases one could literally “see the causes”. Optics took pride of place within Descartes’ physico-mathematics project, because he believed it offered unique possibilities for the successful vision of causes. This paper traces Descartes’ early physico-mathematical program in optics, its origins, pitfalls and its successes, which were crucial in providing Descartes resources for his later work in systematic natural philosophy. It explores how Descartes exploited his discovery of the law of refraction of light – an achievement well within the bounds of traditional mixed mathematical optics – in order to derive – in the manner of physico-mathematics – causal knowledge about light, and indeed insight about the principles of a “dynamics” that would provide the laws of corpuscular motion and tendency to motion in his natural philosophical system.

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