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Nature's drawing: problems and resolutions in the mathematization of motion. (English)

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Summary: The mathematical nature of modern science is an outcome of a contingent historical process, whose most critical stages occurred in the seventeenth century. ‘The mathematization of nature’ [A. Koyré, From the closed world to the infinite universe. Baltimore: Johns Hopkins Press (1957)] is commonly hailed as the great achievement of the ‘scientific revolution’, but for the agents affecting this development it was not a clear insight into the structure of the universe or into the proper way of studying it. Rather, it was a deliberate project of great intellectual promise, but fraught with excruciating technical challenges and unsettling epistemological conundrums. These required a radical change in the relations between mathematics, order and physical phenomena and the development of new practices of tracing and analyzing motion. This essay presents a series of discrete moments in this process. For mediaeval and Renaissance philosophers, mathematicians and painters, physical motion was the paradigm of change, hence of disorder, and *ipso facto* available to mathematical analysis only as idealized abstraction. Kepler and Galileo boldly reverted the traditional presumptions: for them, mathematical harmonies were embedded in creation; motion was the carrier of order; and the objects of mathematics were mathematical curves drawn by nature itself. Mathematics could thus be assigned an explanatory role in natural philosophy, capturing a new metaphysical entity: pure motion. Successive generations of natural philosophers from Descartes to Huygens and Hooke gradually relegated the need to legitimize the application of mathematics to natural phenomena and the blurring of natural and artificial this application relied on. Newton finally erased the distinction between nature’s and artificial mathematics altogether, equating all of geometry with mechanical practice.

MSC:

01A45 History of mathematics in the 17th century

00A35 Methodology of mathematics

01A40 History of mathematics in the 15th and 16th centuries, Renaissance

Keywords:

Alberti, Leon Batista; curves; da Vinci, Leonardo; Descartes, René; Galilei, Galileo; geometry; geometrical machines; Hooke, Robert; Huygens, Christiaan; indivisibles; Kepler, Johannes; light; mathematical diagrams; mechanics; motion; local; pure; Newton, Isaac; optics; order; Pendulum; Perspectiva; Physica; Rota Aristotelis; spring; Tartaglia, Niccolo; trajectories; traces; vacuum

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