Friday, June 25 1:30-4:30 PM

Symposium (room 141): **Newton the Philosopher**

Mary Domski, "Practice meets Ontology: Newton's Historical Philosophy of Geometry"

Andrew Janiak, "Newton's Dynamical Challenge to the Mechanical Philosophy"

George Smith, "Newton's Empirical Challenge to the Mechanical Philosophy"

Panel Abstract

Over the past several years, there has been a noticeable surge in scholarship dedicated to situating the development of seventeenth and eighteenth century philosophy in the milieu of the Scientific Revolution. From Descartes to Leibniz and Hume to Kant, we find scholars taking more seriously the influence of the history of science on the history of philosophy, and it's little surprise that many such discussions take Isaac Newton's natural philosophy as their touchstone. Certainly, in light of the issues and controversies that his masterful *Principia mathematica* (1687) raised for epistemology and metaphysics, we would be amiss to downplay the philosophical significance of the scientific turn he prompted.

Our aim in this symposium is to complement these recent accounts of how Newton's science helped shape modern philosophy by adopting Newton-the-philosopher more than Newton-the-scientist as the starting point of discussion. By taking seriously Newton's novel accounts of how to understand the scientific practice and ideas that gave rise to his revolutionary program of mathematical natural philosophy, we hope to show that Newton not only set a *scientific* standard for scientists and philosophers; he also made important contributions to the *philosophical* context in which his science was developed. Thus, beyond enriching our understanding of the Newtonian context in which modern thought blossomed, we want to suggest that Newton's own attempts to deal with the philosophical concerns surrounding his natural philosophy enrich our understanding of how modern philosophers attempted to engage with a new mathematical approach to motions and forces.

The general areas which we will address in this symposium are Newton's philosophy of mathematics and his philosophical reactions to the Mechanical Philosophy, reactions brought out in his philosophy of force as well as in his treatment of vortices in Book 2 of the *Principia*. In regard to his mathematics, Domski aims to show that Newton's philosophy of geometry motivates us to reconsider the historical framework commonly adopted for seventeenth century mathematics. She argues, in particular, that Newton's emphasis on the history and practice of mathematics challenges the longstanding assumption among historians of seventeenth century

mathematics that choices of formalism and ontology were inextricably bound during the early modern period. Turning to Newton’s philosophical orientation towards the Mechanical Philosophy, Janiak takes a closer look at Newton's attempt to avoid invoking action-at-a-distance in his treatment of gravity, an attempt that many of his mechanist opponents, especially Leibniz, considered a failure. Janiak argues that we can better appreciate how Newton's conception of gravity avoids action-at-a-distance by remaining sensitive to the explicit distinction in the *Principia* between “mathematical” and “physical” treatments of force. Finally, Smith aims to bring needed attention to Newton's arguments against vortex theories of planetary motion that were associated with the Mechanical Philosophy. Specifically, Smith examines Newton's empirical argument in Book 2 of the *Principia* that celestial space is devoid of matter and the challenge it put to the Mechanical Philosophy.

Abstracts

Mary Domski
Assistant Professor of Philosophy
California State University, Fresno

"Practice meets Ontology: Newton's Historical Philosophy of Geometry"

Seventeenth century mathematics is marked by an important transition from the geometrical to the algebraic, from reasoning centered on intuitively representable spatial diagrams to reasoning centered on the structure and form of equations. As a companion to this transition, historians have been apt to situate the practicing mathematicians of that era in the categories of "geometer" or "analyst," with Barrow and Newton commonly touted as geometers, and Descartes and Wallis as analysts. While this contextualist approach to the history of mathematics is sensitive to the mathematical atmosphere of the seventeenth century, it is also grounded on an important assumption about the relationship between mathematical formalism and mathematical content. In particular, as brought out by the classic papers of S. Unguru, historians invoking the geometer-analyst dichotomy assume that the choice of a particular formalism entails a particular interpretation of mathematical ontology.

In this present paper, I aim to show that Newton's philosophy of geometry presents a puzzle if we accept the traditional classification of seventeenth century mathematicians, for there is no obvious commitment to the interplay between form and content in Newton's commentary. With his eye turned toward the *practice* of ancient geometry, Newton provides mathematics a historical foundation and allows practice rather than formalism to determine the domain of geometrical objects. By granting due attention to this focus on practice, I hope to show why the geometry-analyst dichotomy is insufficient for capturing Newton's historical geometry and in turn, I make suggestions for how his philosophy can inform the manner in which we approach the history of seventeenth century mathematics.

Andrew Janiak
Assistant Professor of Philosophy
Duke University

"Newton's Dynamical Challenge to the Mechanical Philosophy"

Several prominent defenders of the mechanical philosophy in the seventeenth century argued that Newton's theory of gravity in the *Principia* presents him with a dilemma. If Newton contends that gravity is a "real" force, that it is causally efficacious, he *ipso facto* invokes action at a distance because of his well-known failure to characterize the physical mechanism underlying gravity. However, if he seeks to avoid action at a distance, he must admit that gravity, as it is treated in the *Principia*, is not a "real" force after all, and that he has therefore not discovered the cause of various phenomena such as the planetary orbits and the motions of the seas. *Pace* some interpreters, I argue that Newton's conception of force avoids this dilemma in a subtle and philosophically intriguing way. We can see this by placing renewed emphasis on Newton's distinction in the *Principia* between the "mathematical" and the "physical" treatment of force. I argue that forces for Newton are *causes* whether mathematically or physically conceived. The mathematical treatment of force leaves for future research not the discovery of causes – it already involves claims concerning what forces cause what phenomena – but rather the discovery of the

proper *physical* characterization of the forces it has identified. The latter characterization, in turn, must not only avoid an invocation of action at a distance, it must account for the features of the force already articulated in its mathematical treatment.

George Smith
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"Newton's Empirical Challenge to the Mechanical Philosophy"

The argument for celestial vortices -- whether in Descartes' formulation or others' -- turned on the thesis that unseen matter has to be in contact with the planets in order to effect their requisite departures from uniform motion in a straight line. Even Huygens, who was persuaded by Newton's *Principia* to abandon Cartesian vortices, still insisted on unseen matter to effect orbital motion. The "Mechanical Philosophy" left no alternative.

By contrast, the principal aim of Book 2 of Newton's *Principia* was to establish that there is no such matter exerting forces by contact on planets and comets. Newton's approach to arguing for this conclusion was to develop an account of fluid resistance forces from which he could infer that the observed motions could not occur if such matter, and its attendant resistance, were present. This argument changed in its details from the first edition to the second, but the conclusion itself did not, nor did its empirical thrust. Because this argument is Newton's principal challenge to the Mechanical Philosophy, it merits attention as a philosophical argument in its own right, independently of the experiments Newton conducted to establish the claims entering into it. The paper will examine the argument as it occurs in both the first and the later editions of the *Principia*, and it will consider the significance of d'Alembert's subsequent refutation and the influence this may have had on Euler's continuing to insist on celestial vortices even as he made fundamental contributions toward modern celestial mechanics.

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