

Honors Course Newton and the Scientific Revolution

Monday, Wednesday 4:00-5:15

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Goal of the Course: To account for Newton's scientific biography, his work and its impact on the development of a new way to make science, in the context of early-modern philosophy.

Newton is unquestionably considered as a major figure in the history of science, and as one of the most important actors of the so called scientific revolution: a movement taking place, for the most part during the 17th century, breaking down with scholastic philosophy and a dogmatic approach to natural phenomena, and inaugurating modern science and philosophy, as we know them now.

In fact, things are much more subtle than this.

There is no doubt that Newton was a major figure in 17th century science and is one of the major figures in the whole history of science. No doubt that he greatly contributed to the origin of modern science and mathematics. No doubt that his approach to natural phenomena prefigures a new conception of what does it mean to make science, which deeply influenced the development of philosophy. No doubt that his work was a main object of study and reflexion for many quite influential philosophers, including Locke (Newton's personal friend), Hume, Voltaire, Kant, Mach, and many others.

Still, on the one side, it is quite doubtful that the new science arose in complete opposition to previous science and philosophy (this is a question I tried to tackle in my 2017 spring honor course on Aristotle's *Physics*). On the other side, Newton's life and work is by far much less in line with the present (positivistic) conception of what a scientist should be. Newton was certainly an innovative mathematician (one of the fathers, with Leibniz, of infinitesimal calculus, and the creator of rational mechanics) and extraordinary physicist (giving rise to modern optics and cosmology). But he was also theologian and alchemist (to be more precise, he wrote much more on theology and alchemy than on any other subject-matter, enormously more, in fact, than on mathematics, and physics), historian, politician, and public administrator.

The course will mainly aim to account both for the complexity of Newton figure and activity, for the apparent contradiction of his intellectual activity, for his works on the interpretation of prophecies and the philosopher's stone, for his anti-trinitarism, for his apparently strange (and today totally dismissed) historical conception of the origins of civilization, for his tyrannical direction of the Royal Mint and the Royal Society.

While expounding and discussing Newton major scientific outcomes (including infinitesimal calculus, theory of light and colors, rational mechanics, and universal gravitation), it will also reconstruct Newton's views on the Holy Scripture, his conception of God as supreme master, his anti-dogmatic (before than anti-trinitarist) theology, his adhesion to alchemic tradition and practice, his views on the history of humanity, and his political ambition and thirst for wealth and power. In short, it will try to account for the intellectual complexity and apparent contradictory aspects of one of the main, if not the main champion of Western science and culture.

Grading:

- 20% will be based on homework, which will be assigned more or less regularly, and class discussion and presentation; in order for homework to be graded, they need to be done on time. No late assignments will be accepted.
- 40% will be a midterm exam designed to ascertain understanding of the basic notions which are being developed in class.
- 40% will be a final essay and/or interview, to count as a final exam.

Textbook:

The course, will focus on some extracts of Newton's published works and manuscript notes.

The "Isaac Newton" article on the *Stanford Encyclopedia of Philosophy* (by G. Smith)

<https://plato.stanford.edu/entries/newton/>

includes an exhaustive list of the published works, including the English translation of those of them originally written in Latin.

Most of the manuscript notes are available here ("The Newton Project"):

<http://www.newtonproject.ox.ac.uk/texts/newtons-works/all>

As for secondary sources, the following are relevant (beside the mentioned article of SEP):

J. Z. Buchwald and M. Feingold, *Newton and the Origin of Civilization*, Princeton Univ. Press, 2013.

I.B. Cohen, *Introduction to Newton's Principia*, Harvard Univ. Press, 1971.

I.B. Cohen, and R. Westfall, *Newton: Texts, Backgrounds, and Commentaries*, A Norton Critical Edition, 1995.

I.B. Cohen, and G. Smith, *The Cambridge Companion to Newton*, Cambridge University Press, 2002.

M. Feingold, *The Newtonian Moment: Isaac Newton and the Making of Modern Culture*, Oxford University Press, 2004.

E. J. Force E. J. and R. H. Popkin R. H. *Essays on the Context, Nature, and Influence of Isaac Newton's Theology*, Kluwer A. P., 1990.

F. de Gandt, *Force and Geometry in Newton's Principia*, Princeton Univ. Press, 1995.

N. Guicciardini, *Isaac Newton on Mathematical Certainty and Method*, MIT Press, 2011.

R. A. Hall, *Philosopher at War. The Quarrel between Newton and Leibniz*, Cambridge Univ. Press, 1980.

R. A. Hall, *Isaac Newton: Adventurer in Thought*, Blackwell, 1992.

R. Iliffe, *Newton: A Very Short Introduction*, Oxford University Press, 2007.

A. Janiak and E. Schliesser (éd.), *Interpreting Newton: Critical Essays*, Cambridge Univ. Press, 2012.

A. Janiak, *Newton as Philosopher*, Cambridge Univ. Press, 2008.

F.E. Manuel, *Isaac Newton, Historian*, Cambridge Univ. Press, 1963.

F.E. Manuel, *A Portrait of Isaac Newton*, The Belknap Press of Harvard Univ. Press, 1968.

F.E. Manuel, *The Religion of Isaac Newton*, Clarendon Press, 1974.

M. Panza, *Isaac Newton*, Les Belles Lettres, 2003.

B. J. Teeter Dobbs, *The Foundations of Newton's Alchemy or "The Hunting of the Greene Lyon"*, Cambridge Univ. Press, 1975.

B. J. Teeter Dobbs, *The Janus Face of Genius. The Role of Alchemy in Newton's Thought*,

Cambridge Univ. Press, 1991.

A.I. Sabra, *Theories of Light from Descartes to Newton*, Cambridge Univ. Press, 1981.

D.L. Sepper, *Newton's Optical Writings. A guided Study*, Rutgers Univ. Press, 1994.

R. Westfall, *Force in Newton's Physics. The science of Dynamics in the Seventeenth Century*, 1971.

R. Westfall, *Never At Rest: A Biography of Isaac Newton*, New York: Cambridge University Press, 1980.

Instructional strategies:

The instructor will begin any lecture with a series of questions students may have on what we discussed or read during the previous class. This should set the stage for the next topic. If students don't have questions, the instructor will ask questions, and we should all strive for a setting where we can openly discuss ideas and engage each other in the learning process. If the instructor will assign homework, they will also be discussed the following week.

After that, the instructor will offer the lecture, being always open to requirements of clarifications, questions, and discussion.