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Integrating history and philosophy of science: the case of Isaac Newton

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In this paper, I present two interwoven arguments. First, I contend that Isaac Newton's thought presents us with substantive questions that cannot be answered by employing the techniques of modern history of science, or of modern philosophy of science, alone. One such question, broached recently by Robert DiSalle's *Understanding Space-time* (Cambridge, 2006), will serve as my focal point: how should we characterize Newton's attitude toward action at a distance? Did he eventually embrace it—due, perhaps, to his physical theory—or did he ultimately reject it—due, perhaps, to his overarching metaphysics? Philosophers of science like DiSalle answer this question by analyzing Newton's gravitational theory, concluding that the employment of the third law of motion in the *Principia's* third book implies that the planets exchange momentum with one another directly. (Roger Cotes first raised this point in a 1713 letter to Newton.) Hence for them, Newton must embrace distant action between the planets, taking the laws of motion themselves to provide criteria for our employment of the concept, *action*. My second argument will challenge this account, indicating that we must look beyond Newton's gravitational theory to his conception of natural philosophy in general, and to his view of God's place within nature in particular, to answer our question. An astute philosophical analysis such as DiSalle's will be incomplete if it lacks the historian's sense of an "actor's concept." Whereas the philosopher of science may conceive of the *Principia* as essentially providing a gravitational theory, the historian of science will be sensitive to its other aspects, including its discussion of God. There is certainly no *a priori* reason to expect that Newton's conception of God plays a role in his view of action within nature, and DiSalle eschews this matter. Yet Newton's broad conception of natural philosophy underscores the importance of precisely this issue.

To be more specific, in the General Scholium to the *Principia* (1713), Newton famously characterizes God as spatiotemporally ubiquitous, the creator of nature who is present to every part of space at every moment of time. In this and in other texts—such as his anonymous "Account" of the Royal Society's report on the calculus priority dispute with Leibniz (1715)—Newton contends that our concept of *action* ought to apply equally to material objects and to God, just as we ought to think of God as occupying the very space and time inhabited by such objects. This coheres, in turn, with Newton's contention in the *Principia* that the study of "causes" within natural philosophy will ultimately lead us to the first cause. Hence to understand Newton's concept of action—along with his attitude toward action at a distance—we must look both at his gravitational theory, and at his conception of God. Each forms an essential piece of his work in natural philosophy, as he himself indicates in the *Principia* itself.

The historian's notion of an "actor's concept" can be equally useful to the philosopher. In contending that we ought to integrate history and philosophy of science, we should avoid the pitfall of reifying the distinction between the two. I have no doubt that *some* questions are decidedly historical, and others philosophical; but others are neither inherently one, nor inherently the other. For instance, in a special issue of *Historically Speaking: The Bulletin of the Historical Society*, one focused on the scientific revolution (September/October 2006 issue), Peter Harrison writes: "attending to the way in which historical actors used such terms as 'science' and 'natural philosophy' has important payoffs for the historian." Harrison is surely right. But his point raises a broader issue: the question, "what does Newton mean by 'natural philosophy'?" is neither inherently historical, nor inherently philosophical; it can be both, depending on the relevant context. In answering that question, historians and philosophers can each provide components of a complete picture of Newton's conception of his own work. Newton's

natural philosophy includes both an articulation of sophisticated mathematical principles that culminate in the postulation of universal gravitational interactions, and a broad conception of God's place within the physical universe.

In my view, however, we should not merely integrate history and philosophy of science; we should also historicize their past integration. Once again, the case of Newton is instructive: several influential discussions of his view of natural philosophy in general—and of action at a distance in particular—indicate that the distinction between history of science and philosophy of science can be at least partially arbitrary. Consider just two examples. In her study *Forces and Fields* (London, 1961), Mary Hesse provides an astonishingly detailed historical account of attitudes toward the problem of action at a distance in physics, one that ranges from the Greek sources, through Descartes and Newton, ending with relativity theory and quantum mechanics. Her account is both philosophically rich and historically sensitive. In *Newton on Matter and Activity* (Notre Dame, 1978), Ernan McMullin provides an illuminating analysis of several perplexing philosophical issues raised by Newton's understanding of gravity and matter. But he is also attuned to the historical development of Newton's views, citing extensively from unpublished archival manuscripts in the Cambridge library. It strikes me as essentially arbitrary to characterize these works as solely *historical*, or solely *philosophical*, in character. They are more accurately described as early versions of an integrated approach toward history and philosophy of science. Contemporary interpreters of Newton should explicitly acknowledge their debt to early pioneers such as Hesse and McMullin. Our acknowledgment might take this form: in attempting to integrate history and philosophy of science in the early twenty-first century, we should understand ourselves as continuing an important tradition that began at least in the middle of the twentieth century.