

## Essay review

### The two Newtons and beyond

**J. E. Force and S. Hutton** (eds.), *Newton and Newtonianism: New Studies*. International Archives of the History of Ideas 188. Dordrecht, Boston and London: Kluwer, 2004. Pp. xvii + 246. ISBN 1-4020-1969-6. £67.00 (hardback).

**Rob Iliffe, Milo Keynes and Rebekah Higgitt** (eds.), *Early Biographies of Isaac Newton 1660–1885. Vol. 1: Eighteenth-Century Biography of Isaac Newton: The Unpublished Manuscripts and Early Texts. Vol. 2: Nineteenth-Century Biography of Isaac Newton: Private Debate and Public Controversy*. London: Pickering & Chatto, 2006. Pp. lxxii + 387 and xliii + 420. ISBN 1-85-196778-8. £195.00 (hardback).

**Milo Keynes**, *The Iconography of Sir Isaac Newton to 1800*. Woodbridge: The Boydell Press, 2005. Pp. viii + 120. ISBN 1-84383-133-3. £40.00 (hardback).

**John Henry** (ed.), *Newtonianism in Eighteenth-Century Britain*. 7 vols. Bristol: Thoemmes Continuum, 2004. ISBN 1-84371-113-3. £595.00 (hardback).

**Mordechai Feingold**, *The Newtonian Moment: Isaac Newton and the Making of Modern Culture*. New York and Oxford: The New York Public Library and Oxford University Press, 2004. Pp. xv + 218. ISBN 0-19-517735-5. £25.00 (hardback).

**Margaret C. Jacob and Larry Stewart**, *Practical Matter: Newton's Science in the Service of Industry and Empire 1687–1851*. Cambridge, MA and London: Harvard University Press, 2004. Pp. 201. ISBN 0-674-01497-9. £22.95 (hardback).

The focus of Newtonian scholarship has shifted over the last couple of decades. Compare any relevant collection of studies from the third quarter of the twentieth century with a recent one such as *Newton and Newtonianism: New Studies* (2004), edited by James Force and Sarah Hutton, and the changes leap to the eye. Newtonian studies have been traditionally concerned with Newton's writings and achievements in the fields of mechanics, optics and mathematics, and with his influence on the subsequent development of these disciplines – a line of enquiry that was nourished by the systematic study of unpublished materials in the post-war period and has reached a high degree of technical sophistication.<sup>1</sup> In this perspective, the priority attributed to Newton's natural philosophy and mathematics reflects the assumption that Newtonian 'science' should be granted an unquestioned pre-eminence over the rest of his much varied production, as the

<sup>1</sup> See, for example, R. H. Dalitz and M. Nauenberg (eds.), *The Foundations of Newtonian Scholarship*, Singapore and London, 2000.

latter contributed ‘little or nothing to our twentieth-century world’.<sup>2</sup> The landmarks of post-war Newtonian scholarship thus aimed at the identification, analysis and interpretation of Newton’s ‘scientific’ manuscripts, carefully separated from the rest of his densely written and sometimes enigmatic paperwork. Establishing such a demarcation certainly made sense within a historiographical practice directed primarily at the reconstruction of Newton’s contribution to the making of modern science, and was sustained by the perception of an essential continuity between Newton’s alleged main concerns and the practices of twentieth-century physics and mathematics.

Such a continuity, and the nature of Newton’s original concerns, is precisely what is now being questioned in studies such as those collected by Force and Hutton. Indeed, the object of investigation here is the ‘other’ Newton, the one distant from modern sensibility, who spent years working at his alchemical furnace and discussed at length with cognoscenti the correct dating of the founding of Solomon’s temple. The *raison d’être* of this and other similar recent collections lies primarily in the analysis and interpretation of Newton’s writings on alchemy and theology, while his natural philosophy and mathematics seem to slip into the background.<sup>3</sup> Thus we learn about aspects of Newton’s theological beliefs (essays by Rob Iliffe, Stephen Snobelen, James Force and Peter Harrison); the strategies deployed by his followers to defend him from the accusation of theological heterodoxy (Larry Stewart and Scott Mandelbrote); the uses of Newtonianism in continental Europe, explored through the direct involvement of women philosophers (Sarah Hutton); and the need to reinterpret the role of alchemy within Newton’s natural philosophy (Lawrence Principe). Thanks to Margaret Jacob’s introduction and the first three essays (Margaret Osler, Richard Popkin and Iliffe again), the volume also provides useful materials for understanding the modalities of this remarkable historiographical shift. Thus, in his very instructive essay, Popkin reconstructs the gradual process of legitimization of Newton’s non-scientific manuscripts as objects of historical enquiry. This was a slow and difficult business, as illustrated by the many problems faced by those historians who searched for an institution that would preserve these papers and make them available to the public. From the responses received it seems clear that devoting resources to this kind of research in the mid-twentieth century was considered pointless, if not counterproductive – so much so that the manuscripts were refused by institutions of the calibre of Harvard, Yale and Princeton. Even into the 1980s some Newton experts expressed reservations about funding publication. Popkin’s story, which makes for rather depressing reading, is complemented nicely by Iliffe’s forward-looking and optimistic contribution on the Newton Project ([www.newtonproject.ic.ac.uk](http://www.newtonproject.ic.ac.uk)), a collaborative enterprise organized under his direction in 1998 and now engaged in the electronic publication of Newton’s entire body of non-scientific papers. This work is clearly to become an essential resource for Newtonian scholarship.

2 R. Hall, ‘Review and reminiscences’, in Dalitz and Nauenberg, op. cit. (1), 197–208, 199.

3 See also J. Force and R. Popkin (eds.), *Essays on the Context, Nature and Influence of Isaac Newton’s Theology*, Dordrecht, 1990; J. Force and R. Popkin (eds.), *Newton and Religion: Context, Nature and Influence*, Dordrecht, 1999; and a special issue of *Studies in the History and Philosophy of Science* (2004), 35, on Newton and Newtonianism.

That the Newton Project could mobilize the necessary human and material resources is a sign that Newton's non-scientific papers have eventually become – to use Popkin's term – 'respectable'. The problem, one could argue, was not primarily one of accessibility but of perception of historical relevance. Many of Newton's alchemical and theological manuscripts had been known to exist for quite a long time and were certainly reachable by the committed specialist. Nevertheless they were largely ignored until they began to be perceived as significant documents for assessing Newton's legacy to the modern world. Contributors to this volume share the belief that the previous generation of scholars carried out an impressive but partial research campaign, one that derived from projecting onto Newtonian texts and experimental practices an image of science, secularized and professionalized, that emerged and was consolidated only in the nineteenth century. One consequence of this projection had been that of breaking up the seamless texture of Newton's reflection and practice – although contributors' opinions vary significantly on the extent of internal tensions and the possibility of providing a unitary interpretation. It seems agreed, however, that the previous wave of studies on Newton's science needs to be complemented with new and equally detailed reconstructions of his religious experience, theological beliefs and alchemical practice. If we are to understand Newton's original intentions and his use of the available cultural resources then we need to engage much more deeply with those non-scientific traditions towards which he demonstrated an extremely serious commitment.

The flourishing of this 'new Newtonian scholarship' (p. 1) requires the support of new and highly sophisticated historiographical tools. Rob Iliffe is certainly a major contributor in this respect. Not only is he directing the ambitious project of 'digitizing Isaac' (p. 23), but he has also edited – together with Rebekah Higgitt – the two volumes of *Early Biographies of Isaac Newton, 1660–1885*. Here the reader can find a wealth of biographical materials on Newton, many of which are published for the first time. These two volumes, edited with care and philological rigour, are a mine of information for Newton scholars. In particular, this diverse collection of texts lends itself very well to suggesting further lines of research on Newton's obvious interest in his own public image and on the careful crafting, immediately after his death, of a picture of Newton as towering philosophical genius by his circle of friends and disciples. The first volume includes all the major eighteenth-century sources about Newton's life, including the materials originally collected by John Conduitt – who married Newton's niece Catherine Barton in 1717 – for the purpose of writing a life of the great man. The 'Conduitt papers', as they came to be known to historians, were an essential resource for any subsequent reconstruction of Newton's life and genius, and are a crucial document for contemporary scholars seeking to understand his apotheosis and the uses of his image throughout Enlightened Europe. The second volume contains a selection of nineteenth-century articles and essays documenting the gradual emergence of motifs that challenged the idealized picture of an all-virtuous Newton, raising doubts about the standard accounts of his character, morals and religious beliefs. The controversies over Newton's integrity were shaped by various contemporary concerns – academic, political and religious – and the texts selected here illustrate effectively the ways in which

more or less sympathetic biographies could be strategically deployed within Victorian culture.

Scholars aiming to investigate the early stages of the process of genius-making that took place around Newton's image would certainly need to explore the rich body of eighteenth-century Newtonian iconography. The number of Newton's portraits and allegorical representations is remarkably high, and probably unique for someone who was neither royalty nor a powerful aristocrat. Two hundred and thirty-one portraits, which include oil paintings, sketches, sculptures, ceramics and medals, are now collected and displayed together for the first time in a repertoire edited by Milo Keynes, *The Iconography of Sir Isaac Newton to 1800*. The icons are described and reproduced following the highest standards of contemporary historiography of art, which makes this book an ideal companion to Iliffe and Higgitt's anthology, and is equally destined to become a basic tool for any serious work to come on Newton's life and public image. Not unlike their textual counterparts, these visual representations offer an ideal starting point for further investigation into their many possible uses, first by Newton himself and then by the numerous eighteenth-century clients who longed to display some kind of association with his totemic image.

To understand this spectacular thirst for images of the hero of modern science one needs also to consider the specific meanings attributed to Newtonianism – an extremely flexible doctrine – in eighteenth-century Europe.<sup>4</sup> For the British context this task is now facilitated by yet another recently published collection, a seven-volume series of Newtonian texts edited by John Henry. This collection includes five key texts from the early phase of British Newtonianism, combining the work of experimental physicists (Francis Hauksbee, *Physico-mechanical Experiments*, 1709), mathematicians (John Keill, *Introduction to Natural Philosophy*, 1726, and Colin MacLaurin, *An Account of Sir Isaac Newton's Philosophical Discoveries*, 1748) and medical writers (George Cheyne, *Philosophical Principles of Natural Religion*, 1705, and Henry Pemberton, *A View of Sir Isaac Newton's Philosophy*, 1728). The selection offers readers an opportunity to follow closely the forging of the Enlightenment image of Newton and his philosophy – an image built around the highly mathematized natural philosophy of the *Principia* and the experimental method deployed in the *Opticks* – and the effective integration of these basic methodological tenets with a form of natural theology that protected and fostered the alliance between Newtonian natural philosophy and Latitudinarian Anglicanism. Thus emerged an image of Newton that, with many of his original aims and intentions out of view, 'came to be seen as the embodiment of the new philosophy, and of the Age of Reason itself' (p. x). These texts also remind us of the broader appeal exercised by Newtonianism across British culture, especially through the writings of the physicians Cheyne and Pemberton. Interestingly, Henry opens the collection with *Moses' Principia*, John Hutchinson's wholeheartedly anti-Newtonian essay, which was – starting from its very title – a rejection of Newtonianism in both its philosophical and its religious components. Hutchinson's text stands as a radical

4 On the flexibility of Newtonianism see S. Schaffer, 'Newtonianism', in *Companion to the History of Modern Science* (ed. R. C. Olby et al.), London, 1990, 610–26.

alternative to the others not only for its contents but also for its very style of reasoning, thus highlighting further the distinctive traits of the emerging Newtonian culture.

The reconstruction of images of Newtonianism crafted and consumed in the past is coupled, for many historians, with the attempt to convey the results of recent scholarship to broader audiences. One such attempt is Mordechai Feingold's *The Newtonian Moment: Isaac Newton and the Making of Modern Culture*, a lavishly illustrated book originally designed to accompany an exhibition that opened at the New York Public Library in October 2004. Like the exhibition itself, the book offers an excellent panorama of the colourful world of eighteenth-century Newtonianism. On display is a wealth of iconographic, biographic and bibliographic materials that have proved central to recent investigations of the diverse meanings of Newtonianism in different social and cultural settings throughout Europe. Feingold manages to present the reader with many interesting results from the specialist literature, such as, for example, the significance of the long-forgotten phenomenon of 'Newtonian women' in eighteenth-century Europe. Especially related to Feingold's own research are the sections on Newton's training at Cambridge. This part of the book contains a richly textured narrative in which previous assumptions about Newton's relation to university teaching and to other scholars are convincingly revised. In this way Feingold is able to tell the general public a familiar story – the making of Newton's *Principia* and *Opticks* – whilst maintaining the highest scholarly standards and interweaving original elements that will capture the attention of the specialist.

It is less clear that similar results have been achieved by another book designed primarily for advanced students and the general public, Margaret Jacob and Larry Stewart's *Practical Matter: Newton's Science in the Service of Industry and Empire 1687–1851*. Those familiar with the excellent scholarship of the two authors will find here various themes from their previous research, such as the political dimension of Newtonian culture and the making of public science. However, it seems that much of the subtlety and richness of their arguments has been lost in this translation for broader audiences, and that some claims essential to the main argument of the book are supported by less-than-convincing evidence. Overall, the impression one is left with is that the book fails to establish a clear connection between Newtonianism and the Industrial Revolution. Consider, for example, the assertion that, at the end of the eighteenth century, British calculus was more firmly oriented towards practical applications than its continental version, and that 'British education in mathematics was superior' to the French (p. 58). The point is important, because it is taken to provide a possible causal explanation for British technological superiority. It is also controversial, as it runs counter to recent assessments within the historiography of mathematics.<sup>5</sup> Thus one cannot but feel disappointed when discovering that the only evidence marshalled in support of this interpretation is a cursory comment from a French spy's report on British schooling. As for the connection between mathematical education and technological development, that is left very much undeveloped, as more generally is the connection

<sup>5</sup> See, for example, N. Guicciardini, *The Development of Newtonian Calculus in Britain 1700–1800*, Cambridge, 1989.

between Newtonian mechanics and practical technology. These are crucial steps for the book's main argument and – neither being obvious – they require much more effective empirical support.

The revisionism that characterizes the new Newtonian scholarship originated primarily from a shift in the perception of what is relevant to our understanding of the historical emergence and stabilization of scientific practices and beliefs, rather than from the discovery of new manuscript materials. The surge of interest in the late twentieth century in Newton's alchemical and theological writings emerged within a more general reorientation of beliefs about the nature of science and its relation to human society. To this shift, which might be described sociologically in terms of a redistribution of epistemological authority, can also be related the reinterpretations of the scientific revolution or the scientific Enlightenment, to name just two other much debated historiographical issues.<sup>6</sup> All the more remarkable, then, is the tendency within the new Newtonian scholarship to present its research as complementary to the productions of the previous generation, a point explicitly stated in the introduction to the first book reviewed here. The very fact that many recent studies and collections lack sections and specialist contributions on Newtonian physics and mathematics seems to suggest that the results of the new scholarship have little import for our understanding of these better-travelled historiographical areas. This editorial choice is problematic, though, as it apparently mirrors and sustains the long-lasting demarcation between Newton's scientific and non-scientific practices, and the belief that they can be studied in isolation from each other. Of course there is an urgent need to fill the gap created by a persistent lack of studies on the 'other Newton', but this line of research should be more clearly integrated with a broader reassessment of Newtonian science as well. It is hard to believe that such a profound change in our understanding of the sets of motivations, aims and cultural resources informing the texts and experimental practices of Newton and the early Newtonians could leave previous interpretations of their scientific works unaltered. In fact, this work of reinterpretation is already being carried out convincingly, in studies such as Niccolò Guicciardini's reconstruction of the original meaning of Newton's mathematical techniques, or John Henry's interpretation of the concept of force as derived primarily from the natural magic tradition.<sup>7</sup> Such an integration of in-depth understanding of the technical issues at stake – philosophical and mathematical – and Newton's often non-modern intentions seems indeed to be a most promising source of interesting scholarship in the near future.

6 See, for example, S. Shapin, *The Scientific Revolution*, Chicago, 1996; P. Dear, *Revolutionizing the Sciences: European Knowledge and its Ambitions, 1500–1700*, Basingstoke, 2001; J. Henry, *The Scientific Revolution and the Origins of Modern Science*, Basingstoke, 2002; W. Clark, J. Golinski and S. Schaffer (eds.), *The Sciences in Enlightened Europe*, Chicago, 1999.

7 N. Guicciardini, *Reading the Principia: The Debate on Newton's Mathematical Methods for Natural Philosophy from 1687 to 1736*, Cambridge, 1999; John Henry, "'Pray do not ascribe that notion to me": God and Newton's Gravity', in *The Books of Nature and Scripture: Recent Essays on Natural Philosophy, Theology and Biblical Criticism in the Netherlands of Spinoza's Time and the British Isles of Newton's Time* (ed. J. Force and R. Popkin), Dordrecht, 1994, 123–47.

Over twenty years ago Simon Schaffer, in a paper entitled ‘Newton at the crossroads’, invited Newton scholars to move away from heroic historiography and provide instead sociohistorical explanations for ‘Newton’s apparently self-evident triumph’,<sup>8</sup> demonstrating awareness of the situated nature of their own reconstructions. That road might not have been crossed quite yet, but many excellent scholars are accepting the invitation.

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8 S. Schaffer, ‘Newton at the crossroads’, *Radical Philosophy* (1984), 37, 23–8, 28.