Chapter 3

To Discourse of God: Isaac Newton's Heterodox Theology and His Natural Philosophy

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> Deus ex operibus cognoscitur.[1]
> – Isaac Newton

Newton's God and the changing face of Newtonian scholarship

One of Isaac Newton's chief aims for the *Principia Mathematica* was to show that the laws of physics revealed design in the universe – in turn evidence for a Designer. In his famous correspondence with Richard Bentley, Newton revealed this intention: 'When I wrote my treatise about our Systeme I had an eye upon such Principles as might work wth considering men for the beleife of a Deity & nothing can rejoyce me more then to find it usefull for that purpose'.[2] Newton told Bentley that 'ye diurnal rotations of ye Sun & Planets as they could hardly arise from any cause purely mechanical . . . they seem to make up that harmony in ye systeme wch . . . was the effect of choice rather than of chance'.[3] Newton later added a concluding General Scholium to the *Principia* in which he made the argument from design explicit, proclaiming that 'This most beautiful System of the Sun, Planets and Comets, could only proceed from the counsel and dominion of an intelligent and powerful being'.[4] The final line of the theological portion of the General Scholium concludes: 'And thus much concerning God; to discourse of whom from the appearances of things, does certainly belong to Natural Philosophy'.[5]

One hundred years after Newton's death in 1727, another physicist died. This man, Pierre-Simon de la Place, was dubbed the 'Newton of France' for his work in physics. Yet Laplace put forward a purely mechanical view of the universe in his *Exposition du système du monde* (1796) that made God superfluous. Napoleon is reputed to have asked Laplace, 'Newton spoke of God in his book. I have perused yours, but failed to find His name even once. How come?'. To this came Laplace's famous reply, 'Sire, I have no need of that hypothesis'.[6] The exchange is heavy with irony. Newton himself was openly averse to vain hypotheses and this was exactly how Laplace viewed belief in God. And the fact that an atheistic physicist like Laplace would be eulogized as the '*Newton* of France' demonstrates that Newton's image had gone through a profound

reorientation in the decades subsequent to his death.[7] Laplace's conversation with Napoleon epitomizes the secularization of Newton's physics; whereas Newton believed that Providence was necessary to uphold creation, Laplace wrote God out of the equation. Laplace is important to the story of this transformation in a second way, for it was him, along with another French scientist, Jean-Baptiste Biot, who popularized the story that Newton suffered an intellectual derangement after a supposed 1693 fire that destroyed a mass of his manuscripts. After this breakdown, so the story goes, a mentally enfeebled Newton turned to theology. Thus the French positivists preserved the sanctity of Newton's physics from the taint of theology. Newton was never the same after this account made the rounds.[8]

The Enlightenment legacies of Newton's image are deeply entrenched not only in the public consciousness, but even in the specialist historiography. Until recently, when historians discussed Newton's theology at all, it was often treated as a superfluous appendage, disconnected from his philosophy of nature. Newton was characterized primarily or only as a 'scientist' – a word and role anachronistically imposed on him that is at once both limiting and misleading. It is limiting because natural philosophers of Newton's age and before were engaged in a study that included not only the study of the natural world, but that also embraced the study of God, His attributes and final causes. It is misleading because the popular notion of a scientist today is a secular one.[9] The long survival of this uni-dimensional view of Newton is in part a byproduct of the success of the 'Newton industry' of the latter half of the twentieth century. Although its output was of the highest academic quality, 'Newtonian scholarship' was defined almost entirely as that pertaining to Newton's work in mathematics, optics and physics.[10] There were exceptions. Frank Manuel's attitude to Newton's theology was much more sympathetic, and his 1973 Fremantle Lectures remain one of the most effective summaries of the great man's faith.[11] Still, Manuel did not devote much space to the elucidation of possible connections between Newton's theology and natural philosophy.[12]

Richard Westfall, whose magisterial biography of Newton did more than any previous treatment of Newton's life to reveal the latter's passion for theology, including its heretical nature, was himself not able to escape from some of the preconceptions of the Enlightenment legacy. In particular, although he was happy to detail Newton's lifelong interest in theology and prophecy, he was reticent to entertain the possibility that a study that formed such an integral part of his personality could have helped shape his natural philosophy – although he was quite happy to allow for the reverse. Westfall's outlook is encapsulated in a 1982 paper in which he expressed doubt about the possibility that Newton's theology ever informed his philosophy of nature in any important way, and then went on to say that 'we are more likely to find the flow of influence moving from science, the rising enterprise, toward theology, the old and (as we know from hindsight) fading one'.[13] In one of his last publications, Westfall inserted a mild qualification into this assertion and acknowledged that '[t]he influence of [Newton's] religion on his science is, I believe, universally admitted, and I do not challenge that conclusion'. Nevertheless, he then added the following caveat:

> His theology, by which I mean explicitly his Arianism and the associated interpretation of the prophecies, is another matter. Perhaps we can find echoes of the Arian God in the Pantocrator of the "General Scholium," but this leaves us still on such a high level of generality that it tells us very little. If we want to descend to the details of Newton's science, as it is found in the *Principia* and the *Opticks*, I am unable to trace any line of influence that has substance.[14]

With this statement, Westfall laid down his historiographical gauntlet.

By the time Westfall's challenge appeared in print, a group of mostly younger scholars had already begun to take it up. A major turning point in Newton scholarship came in 1990 with the publication of James E. Force and Richard H. Popkin's *Essays on the Context, Nature and Influence of Isaac Newton's Theology*.[15] In this collection of papers, Force and Popkin almost single-handedly established a new 'Newton industry' for the study of Newton's theology. A series of conferences and publications beginning in the late 1980s, several of which were initiated and sponsored by Force and Popkin, began to explicate in a sympathetic manner the manifold features of Newton's heretical theology and millenarian prophetic views.[16] Coincident with this development was the scholarly unveiling of the dark secret of Newton's alchemy – itself infused with religious ideals.[17] One significant aspect of this new research has been its emphasis on the importance of Newton's theology in its own right. To make this point, Popkin himself suggested that the question should not be 'why one of the world's greatest scientists should have spent so much time thinking and writing about religious matters', but 'why did one of the greatest anti-Trinitarian theologians of the 17th century take time off to write works on natural science, like the *Principia Mathematica*?'.[18] Popkin's statement was made partly tongue-in-cheek in an attempt to stir the historiographical pot. There is, of course, no reason why the pendulum of Newtonian scholarship should swing completely the other way. Nevertheless, Popkin's provocation offers an important corrective. Without question, as Scott Mandelbrote has eloquently reminded us,[19] Newton himself believed his theological pursuits to be 'a duty of the greatest moment'.[20]

This recent historiographical revision is important for our purposes in a second sense. Not only has the new scholarship given God back to Newton, but it has begun to reveal in often startling ways just how far Newton dissented from religious orthodoxy – much further than previously imagined (or feared). Because this work has begun to reconstruct the nature of Newton's beliefs in detail, it allows researchers to go beyond the generalities of commonplace natural theology to assess how his unique, heterodox theology might have related to, and helped to shape, his natural philosophy. The results of this recent work have already been put to use in an effort recover the grand unity of Newton's natural philosophical and theological programme. The work of Force, Popkin and Betty Jo Teeter Dobbs (three pioneers in the study of the unity of Newton's theological and natural philosophical enterprise),[21] has commenced the process of casting out the twin demons of the 'two Newton' thesis – that Newton's theological and alchemical works were the effect of a dotage, or that Newton kept his pure 'science' separate

from these same two studies.[22] What is more, this work takes full account of the fact that Newton's theology was heterodox. An exciting example of the results of bringing together the 'two Newtons' can be seen in Niccolò Guicciardini's 1999 study of Newton's publication strategies for his *Principia*, in which sophisticated mathematical analysis is combined with a sensitivity to Newton's unique theology and commitment to the wisdom of the ancients.[23]

Another important landmark came in 1991, with the release of the bulk of the Newton manuscripts on forty-three reels of microfilm.[24] This collection has allowed scholars the convenience of examining copies of Newton's unpublished writings together – something the scattering of Newton's papers over the globe has made impossible in a physical sense. Seven years later came the foundation of the Newton Project, which provides great promise for the future of the study of Newton textual legacy.[25] The increasing number of Newton Project manuscript transcriptions becoming available in electronic form – allowing word and phrase searches – has elevated the systematic study of Newton's thought to a new level. The detailed catalogue of Newton's surviving theological manuscripts produced by the Project reveals the range and extent of these papers. Finally, a handful of theological manuscripts have come to light in institutions, private hands and at auctions since 1991. Although these manuscripts are small in size and number, they have provided additional crucial illumination of Newton's views.[26]

The recent revolution in Newton scholarship coincides with a new sensitivity to anachronism with respect to early modern natural philosophy. Several scholars, notably Andrew Cunningham, have brought to light the inherently flawed nature of present-centred readings of natural philosophy in which modern historians find 'science' in the past precisely because they are looking for it. Instead of imposing foreign, modern sensibilities of science on early modern natural philosophy, historians must reconstruct the thought-world and motivations of early modern natural philosophers, who inhabited a world markedly different from our own. Thus, it is inappropriate to treat 'science' as a modern synonym for 'natural philosophy', although this historiographical solecism is still committed with regularity. In particular, Cunningham has cogently argued that the aim of the study of nature was the understanding of God and His attributes. Central to the debate raised by the 'Cunningham thesis' is the status of Isaac Newton and the purpose of the *Principia Mathematica*.[27]

In what follows, I will utilize both the insights of recent historiography[28] and the results of my own research to fill out a picture of the various ways in which Newton's theology was (and in some cases, might have been) integrated with his natural philosophical work. I will begin with the more straightforward examples from natural theology and move on to increasingly specific instances of interaction.[29] This will take us from the generalities of what Westfall was willing to accept (inspiration from natural theology and common religious piety) to the specifics of what he was not (the shaping of the content of Newton's natural philosophy by his unique, heretical beliefs). Sometimes the intersection of religion and natural philosophy is revealed in a superficial way, as when one encounters a theological or historical note scribbled by Newton on a sheet of mathematical

calculations. In some cases, such as in the General Scholium, Newton moves rapidly and with ease from topics we would call theological to subject matter that would now be considered scientific in nature. In other examples of a more profound nature, evidence is seen of deep structural integration in his thought. Ultimately, this paper will demonstrate that for Newton there was no cognitive wall between the study of God and His Creation. In the end, it is only with a sense of awkwardness and artificiality that we can continue to speak about interaction *between* two elements of a grand project that was for Newton a unified whole.[30]

Natural Theology

Like other British *virtuosi* of his age,[31] Newton was firmly committed to natural theology – not as a self-sufficient and completely autonomous source of knowledge about God, but as a corollary to biblical revelation, which itself teaches design (*e.g.* Psalm 19; Romans 1:20). Newton's intentions to use his *Principia* to further the cause of the design argument have already been noted above; further confirmation of this motivation comes from Newton's one-time disciple William Whiston.[32] There could be no mistaking Newton's commitment to the design argument when, in the second edition of the *Principia* published in 1713, he added the natural theological apologetics of the General Scholium. Not only does he assert that the finely-tuned solar system could only have come from 'the design and dominion of an intelligent and powerful being', and that the stellar systems were 'constructed according to a similar design and subject to the dominion of *One*', but he goes on to discuss the nature of God's dominion of his creatures and creation, thus confirming that the study of nature was meant to teach us about God's character and attributes.[33]

But it would be wrong to conclude from the addition of the General Scholium that Newton was only attempting to re-frame his *magnum opus* theologically after the fact. Apart from the testimony of Newton's letters to Bentley, Bernard Cohen demonstrated in a brilliant paper that natural theology was explicit in all three editions of the *Principia* published in Newton's lifetime.[34] In Corollary 4 of Proposition VIII in Book Three of the first edition of 1687, at a point where he discusses the well-ordered placement of the planetary bodies, Newton writes: 'God therefore placed the planets at different distances from the Sun so that according to their degrees of density they may enjoy a greater or less proportion of the Sun's heat'.[35] Even though Newton expunged the word *Deus* from the subsequent editions and replaced the erasure with a passive verb, the passage still resonates with natural theology.

The *Principia* is not Newton's only public work that treats natural theology in an explicit manner. In Query 31 of the *Opticks* (one of the additions he made to the 1717 edition), Newton openly expresses his advocacy of the design argument:

> Now by the help of these Principles, all material Things seem to have been composed of the hard and solid Particles above-mention'd, variously associated in

> the first Creation by the Counsel of an intelligent Agent. For it became him who created them to set them in order. And if he did so, it's unphilosophical to seek for any other Origin of the World, or to pretend that it might arise out of a Chaos by the mere Laws of Nature; though being once form'd, it may continue by those Laws for many Ages.[36]

After outlining the unity and regularly the planetary system, in language that is reminiscent of the above-cited material from both Newton's 1692 letter to Bentley and his 1713 General Scholium, he goes on to exclaim: 'Such a wonderful Uniformity in the Planetary System must be allowed the Effect of Choice'.[37] Thus, by the 1710s, Newton had no difficulty discussing natural theology openly in his natural philosophical works. Even more significantly, he believed his explications of nature themselves provided powerful evidence for a Creator.

Newton also wrote on the design argument in his private manuscripts; one particularly notable example comes from a long paragraph he composed on atheism around the time he published the General Scholium. This passage reveals a powerful apologetic edge. After equating atheism with idolatry, Newton expostulates: 'Atheism is so se[n]seless & odious to mankind that it never had many professors'. He then launches into a forceful defence of the argument from design based on symmetry within the morphological structures of birds, beasts and men:

> Can it be by accident that all birds beasts & men have their right side & left side alike shaped (except in their bowells) & just two eyes & no more in either side the face & just two ears on either side the [*sic*] head & a nose with two holes & no more between the eyes & one mouth under the nose & either two fore leggs or two wings or two arms on the sholders & two leggs on the hipps one on either side & no more? Whence arises this uniformity in all their outward shapes but from the counsel & contrivance of an Author?[38]

Next, he discusses the eye, which he describes as 'truly shaped & fitted for vision'. Newton, who had studied not only the nature of light but also the anatomy of the eye, continues: 'Did blind chance know that there was light & what was its refraction & fit the eys of all creatures after the most curious manner to make use of it?'. This compelling evidence points to the existence and dominion of God: 'These & such like considerations always have & ever will prevail with man kind to beleive that there is a being who made all things & has all things in his power & who is therfore [sic] to be feared'.[39]

Richard Bentley was one of the first to recognize what Newton already believed, namely, that the *Principia* provided a storehouse of data confirmatory of design in Creation. Thus, with the author's help provided in epistolary form, he employed the physics of the *Principia* when he revised his 1692 Boyle Lectures for publication.[40] Newton's acolyte Whiston, who would succeed him at the Lucasian Chair in 1701, also early on recognized the apologetic value of the *Principia* for natural theology. Whiston's first use of the physics of the *Principia* for such purposes came in his 1696 *New Theory of the Earth*, in which he used Newtonian

principles to elucidate the biblical accounts of creation and the Flood.[41] Later, Whiston employed Newton's discoveries in his *Astronomical Principles of Religion, Natural and Reveal'd* – one of the period's leading works on natural theology.[42] The use of Newton's natural philosophy to buttress the design argument that Bentley and Whiston pioneered went on to become something of an industry in eighteenth-century Britain.

Newton and the Two Books

Newton also followed many Christian natural philosophers of his age and before by subscribing to the doctrine of the Two Books, namely, that God has revealed Himself in the Book of Nature as well as the Book of Scripture.[43] One of the clearest statements of Newton's commitment to the *topos* of the Two Books comes in an early treatise on the Apocalypse, in which he argues for methodological parsimony in prophetic interpretation on the analogy of simplicity in creation:

> As the world, which to the naked eye exhibits the greatest variety of objects, appears very simple in its internall constitution when surveyed by a philosophic understanding, & so much the simpler by how much the better it is understood, so it is in these visions. It is the perfection of God's works that they are all done with the greatest simplicity. He is the God of order & not confusion. And therefore as they that would understand the frame of the world must indeavour to reduce their knowledg to all possible simplicity, so it must be in seeking to understand these visions.[44]

For Newton Truth – whether revelatory or natural – was a unity precisely because it was *God's* Truth. In a manuscript from the late 1680s or early 1690s, he claims: 'there is no way (without revelation) to come to the knowledge of a Deity but by the frame of nature'.[45] In the final paragraph of Query 28 of the *Opticks*, he makes a comparable assertion when he states that 'the main Business of natural Philosophy is to argue from Phænomena without feigning Hypotheses, and to deduce Causes from Effects, till we come to the very first Cause, which is certainly not mechanical'.[46] In the final sentence of this Query, he concludes: 'though every true Step made in this Philosophy brings us not immediately to the Knowledge of the first Cause, yet it brings us nearer to it, and on that account is to be highly valued'.[47] We have already seen that in the General Scholium he similarly contended that discoursing of God from phenomena pertains to experimental and natural philosophy.[48]

Two Israeli scholars have recently explored some of the implications for Newton's experimental philosophy of this belief that divine truth is implanted in nature. First, Michael Ben-Chaim has argued that Newton, following Robert Boyle, viewed causes as divinely-ordained 'natural capital goods' that were embedded in nature by God for observers to discover through experiment. This stance also provided a pious motivation for the study of nature.[49] Then, in a paper Ben-Chaim co-wrote with Ayval Ramati, the two scholars show how Newton believed that

experiment had a moral object, namely, to learn more about God and how to serve Him.[50] This, in turn, would benefit the public good. A pivotal text for this argument comes from the final English edition of the *Opticks*: 'if natural Philosophy in all its Parts, by pursuing this Method [i.e., experiment], shall at length be perfected, the Bounds of Moral Philosophy will be also enlarged. For so far as we can know by natural Philosophy what is the first Cause, what Power he has over us, and what Benefits we receive from him, so far our Duty towards him, as well as that towards one another, will appear to us by the Light of Nature'.[51] As Ben-Chaim and Ramati observe, Newton's stated position contrasts markedly with that of Galileo, who 'in his *Letter to the Grand Duchess Christina* stressed that the study of "created things that are very remote from popular understanding" should be kept apart as much as possible from issues "pertinent to the primary purpose of the Holy Writ, that is, to the worship of god and the salvation of souls"'.[52] For Newton there was no such distinction.

Newton's theology made an impact on his experimental philosophy in another way also. G. A. J. Rogers has shown why Newton could have so much confidence in induction, while David Hume famously later could not. The key to Newton's strong faith in the success of inductive experimental practice was the same 'God of order' mentioned above Who has so structured nature that the experimentalist can assume simplicity. God Himself guarantees induction.[53]

Interpreting the Two Books

Because Newton was convinced that God has revealed Himself in both Scripture and Nature, he also believed that similar methods could and should be employed to discover divine Truth in each Book. In three compelling studies, Maurizio Mamiani has identified strong analogies between Newton's four *regulae philosophandi* (rules of reasoning), which find their final form in the third edition of Book Three of the *Principia*, and a series of sixteen 'Rules' of prophetic interpretation he penned in the 1670s.[54] As Mamiani demonstrates, the famous *regulae* of the *Principia*, now seen as paradigmatic of modern science, are in fact a later version of the rules he elaborated earlier for the study of biblical prophecy – rules that in turn had been based on models provided in a text on logic.[55] These prophetic 'Rules' were meant to ascertain 'when an interpretation is genuine & of two interpretations which is the best'.[56] Two examples will suffice to confirm Mamiani's argument.[57]

In his ninth principle of prophetic interpretation, in which Newton also appeals directly to the unity of God's Works, he writes: 'To choose those constructions which without straining reduce things to the greatest simplicity . . . Truth is ever to be found in simplicity, & not in the multiplicity & confusion of things'.[58] This same expectation of simplicity can be seen in Newton's philosophy of nature, with the expansion of Rule I stating that 'nature is simple and does not indulge in the luxury of superfluous causes'.[59] His second prophetic rule states that it is necessary '[t]o assigne but one meaning to one place of scripture', and the

third that one must 'keep as close as may be to the same sense of words, especially in the same vision'.[60] The simple and most obvious meaning of a word or symbol in a particular place must govern the meanings of all other occurrences. Similarly, in Rules II and III of the *Principia*, Newton argues for the unity of phenomena in nature and that one infers general principles from the observation of specifics.[61] After a meeting with Newton, the Scottish mathematician David Gregory recorded the following similar principle: 'The best way of overcoming a difficult Probleme is to solve it in some particular easy cases. This gives much light into the general solution. By this way Sir Isaac Newton says he overcame the most difficult things'.[62] For Newton, this rule applied to 'the most difficult things' in both natural philosophy *and* biblical exegesis. Here, then, is a conclusive example where the theology (in the form of elaborated interpretative principles) comes first and is later recycled for use in natural philosophy.[63] What is more, the fact that Newton in turn derived the outlines of his prophetic principles from a logics text, neatly epitomises his lack of concern for disciplinary boundaries.

Newton also makes an explicit association between natural philosophy and biblical hermeneutics within the text of the *Principia* itself. When Newton outlines the distinction between absolute and relative time, space, place and motion in the Scholium to the Definitions in the introductory material, he reasons that '[r]elative quantities, therefore, are not the actual quantities whose names they bear but are those sensible measures of them'. To this, he adds: 'if the meanings of words are to be defined by usage, then it is these sensible measures which should properly be understood by the terms "time", "space", "place", and "motion", and the manner of expression will be out of the ordinary and purely mathematical if quantities being measured are understood here'.[64] It is at this juncture that Newton, probably unexpectedly to most modern readers, offers a direct parallel in the interpretation of the Bible: 'Accordingly those who there interpret these words as referring to the quantities being measured do violence to the Scriptures. And they no less corrupt mathematics and philosophy who confuse true qualities with their relations and common measures'.[65] The same methods, therefore, could be applied in the study of both Books. This exemplifies the way Newton operated: for Newton, all truth is one.

Newton's God of dominion and his natural philosophy

Commitments to natural theology and the motif of the Two Books were commonplace among natural philosophers of Newton's day. Nevertheless, it is important that his own powerful commitments be explicated, as they demonstrate conclusively that for him theology and natural philosophy interpenetrated at a high level. This general dynamic provides a secure foundation for what follows as we move into increasingly uncommon elements of Newton's theological thought, thus revealing ways in which Newton departed from standard Protestant conceptualizations of the Two Books. I will begin with Newton's powerful God of dominion. There has long been a historiographical reflex to portray Newton's God

as something approaching the abstract, calculating Deity of the Enlightenment – a divine clockmaker who oversaw the construction of a rational, mechanical universe.[66] This view is epitomized by William Blake's portrait of Newton, in which the great man converges with the image of God as geometer. More recently, Westfall characterized Newton's theological tendencies as proto-deistic and as coming under the influence of encroaching scientific rationalism,[67] whatever this might have meant in the early eighteenth-century. This proto-deist thesis allies nicely with the model of Newton as a stepping stone to Enlightenment sensibilities. But it will not do. One of its chief defects is that it assumes that Newton's theology looks forward to a putative secular future, rather than back to what Newton believed were the sources of true religion. Newton's God was the personal, all-powerful Pantocrator of the Bible. Concomitant with his Hebraic and profoundly biblical view of God, is Newton's characterization of God as a deity of unchallenged sovereignty, power and dominion.[68] Newton's God governs the world directly through general and particular providence, and bears a constant relationship to His creatures and creation. It is not difficult to see how this conception of God could profoundly affect Newton's natural philosophy. Newton's God of dominion, Who continually intervenes in Nature to keep Creation on its course, provides the most important backdrop to Newton's dispute with Leibniz on the role of God as Creator. Among its multitude of functions, the General Scholium champions this God of dominion against Leibniz's *Supramundana*, Whose Being is much more detached from Creation and its on-going operation. The literary debate Samuel Clarke held with Leibniz on Newton's behalf underscores the profoundly theological nature of Newton's cosmology.[69]

An important natural philosophical element of this God of all-pervading dominion is Newton's theology of space in which the *sensorium Dei* (God's omnipresence through His Spirit) is coextensive with absolute space, a concept that underpins his celestial physics.[70] Newton's conception of the divine sensorium, or, as J.E. McGuire aptly puts it, 'God's sacred field',[71] which appears publicly in the *Opticks* and General Scholium, was shaped in part by classical, biblical and Jewish theologies of space.[72] As noted above, for Newton, Heaven, as God's dwelling place, was also His Temple. Related to Newton's notion of the *sensorium Dei* is his hint in the General Scholium that God is the cause of gravity. Although cautious in this public document, in private he presented his theological speculations on gravity much more openly.[73] For example, he told the Scottish mathematician David Gregory that he believed the ancients understood God to be the cause of gravity.[74] Nor was this all. Newton, who was an advocate of the *prisca sapientia* tradition, and thus regularly sought confirmation of his beliefs from the ancients (particularly the pre-Socratics), wrote in a draft of Query 23 for the 1706 *Optice* that 'it seems to have been an ancient opinion that matter depends upon a Deity for its laws of motion as well as for its existence'.[75] Dobbs has written at length on Newton's conceptions of divine activity in matter – a nexus in his thought where theology and natural philosophy converged.[76] It is likely that Newton's God of dominion even impinged on his mathematics, as his method of fluxions (calculus) depends on the continuous flow of absolute time, which Newton associated with

God, Whose eternity and omnipresence is said in the General Scholium to be coextensive with time (duration) and space.[77] In this case, Newton's theology helped shape the cognitive content of his mathematics.

Newton's providentialist and apocalyptic cometography can also be treated under the heading of Newton's God of dominion. As recent research has shown, the work Newton carried out with Edmund Halley in the 1680s, which conclusively determined the periodicity of comets and appears so modern, retained a supernatural role for comets, seen previously as episodic harbingers of doom.[78] The powerful God of dominion, Who controls the movements of the heavenly bodies, can use comets to shape history and restore and renovate the earth. The comet of 1680, Newton mused privately with John Conduitt, would eventually fall into the sun, superheating the solar sphere to such an extent that all life on earth would be incinerated, thus necessitating the intervention of the creator to repopulate the earth. None of this is explicit in the section on comets at the end of the *Principia*, but as Newton told Conduitt, he believed he had said enough to make his meaning known.[79]

Newton's heterodoxy

Newton had another reason for secrets: he was a heretic. Sometime in the early 1670s his reading of the Bible and early church history led him to conclude that the cornerstone doctrine of orthodox Christianity, the Trinity, was an unwarranted doctrinal novelty of the fourth century AD.[80] And so it was that a century and a half before dissenters could take degrees at Cambridge, Newton became a dissenter of dissenters. In the 1670s there were no provisions for Protestant dissenters at Cambridge, much less for those who, unlike most dissenters, departed from Trinitarian orthodoxy. In fact, denial of the Trinity was illegal throughout Newton's lifetime. If his radical heresy had become known while he was Lucasian Professor, Newton would have been ignominiously extruded from the University – or worse.[81] As it was, under the provisions of his Trinity College fellowship he was required to be ordained in the Church of England by 1675. His new-found heresy and rigid conscience would not allow this, and it was only a last-minute reprieve that came from Charles II in the form of an exemption from ordination for holders of the Lucasian Chair that allowed him to remain at Cambridge. Thereafter Newton lived the life of a Nicodemite, a secret heretic.

The increasing availability of Newton's unpublished theological papers has allowed scholars to begin to reconstruct the nature of Newton's heresy. In addition to confirming what was suspected even by some in Newton's own day, namely, that he held to an antitrinitarian and generally Arian Christology, there have been a some unexpected revelations. On top of his denial of the Trinity, Newton also rejected the immortality of the soul and the literal existence of evil spirits. Other elements of dissenting religion can also be confirmed, including his acceptance of the principle of believers' baptism. Although irenicist and tolerationist outlooks could be found among Anglican theologians of his day, Newton's irenicism and

tolerationism are more radical than the orthodox versions and align more closely with positions put forward by radical groups such as the Socinians and Unitarians.[82] These details are important not only for what they reveal about the degree of Newton's departure from orthodoxy, but also for what they say about the degree to which he came to embrace positions held by radical dissenters. Put another way, Newton's private religious ethos overlapped substantially with those of the continental Radical Reformation and English Nonconformists.[83] This was not the only overlap of significance. Newton's circle of acquaintances included some with ties to radical dissent.[84]

Until a few years ago little attention was paid to possible linkages between Newton's theology and that of contemporary radical dissent. Many scholars apparently believed Newton to be a self-taught heretic.[85] More recently, Newton's heretical theology has been placed in the context of contemporary Continental and English heretical currents and a number of points of contact between Newton's theology and that of other heterodox believers have been confirmed. Thus his antitrinitarianism contains strong analogies not only to the Christology of the Continental Socinians and the German Arian Christopher Sand, but also to the polemical writings of late seventeenth-century English Unitarians.[86] For example, Newton's late 1680s to early 1690s manuscript attacking Athanasius takes a very similar line as that adopted in an anonymous English Unitarian attack on the same fourth-century paragon of orthodoxy that dates, strikingly, from the same period as Newton's manuscript.[87] Newton's mortalism is of a piece with that of several radical Civil War sectarians, including Richard Overton.[88] His denial of a person devil and ontologically real demons strongly resembles the position of the Radical Reformation thinker David Joris, along with that of some seventeenth-century English sectarians.[89] His approval of believers' baptism, associates him with the baptismal thought continental Anabaptists and English Baptists. Even his prophetic beliefs set him at variance with orthodox Protestantism. Not only did Newton see the Trinitarian corruptions of the fourth century as central to the theme of the Book of Revelation, but he also believed that prophecy confirmed that the true Gospel would not be preached until the fall of Babylon (the Trinitarian-Catholic establishment).[90] For Newton, the Reformation had not yet happened.[91]

Not only does Newton's doctrinal profile align closely with those of Continental and English theological radicals, but his actions reveal a shared religious outlook. This is seen first of all in his Nicodemite stance, for his decision to become a covert heretic outwardly conforming to the Church of England while secretly writing against its doctrines is the same strategy as that adopted by many English crypto-Unitarians. A case in point is Stephen Nye, who continued as a rector in the Anglican communion even while he penned a fiery effusion of Unitarian tracts.[92] Like his contemporary Nye, Newton did not hold his doctrines passively. Aside from his evident attempt to preach his heresy privately to a select group of devotees,[93] in 1690 Newton also planned to publish a long tract in which he used his not inconsiderable skills as a textual critic to demonstrate that two chief Trinitarian proof texts were deliberate corruptions. The manuscript of the 'Two notable corruptions' was sent to his theological interlocutor John Locke for

anonymous publication on the Continent.[94] Although Newton suppressed the 'Two notable corruptions', this document must be seen against the backdrop of the Unitarian-Trinitarian controversy of the 1690s, which had resulted from an easing of censorship laws in the 1680s that emboldened some Unitarian writers to set their views in print.[95] Newton was taking sides. And, as will be seen below, Newton actually did manage to publish some heretical thoughts with impunity at the beginning of the eighteenth century. Thus, the man who was by the beginning of the eighteenth century the leading figure of British natural philosophy was not only far more heterodox than most non-conforming Protestants, but his theology set him in direct opposition to the established Church of England. All this, despite the fact that Newtonianism was regularly employed after the Glorious Revolution of 1688 to support the Anglican establishment.[96]

Newton's heterodoxy and his natural philosophy

There can be no doubt, as shown above, that Newton's natural philosophy was at least partly shaped by theological concerns, including his advocacy of the design argument, his concept of the *sensorium Dei* and his belief in a God of dominion. It is also now clear that not only was Newton extremely heterodox on many points of theology, but that his theology shows strong analogies to contemporary dissenting antitrinitarian thought. Did the relationship between Newton's theology and his natural philosophy extend to his heretical views? An answer to this question is beginning to emerge. Newton's God of dominion will provide a starting point. As Dobbs and Force have shown, Newton's powerful God of dominion goes hand-in-hand with his antitrinitarianism. It is impossible to disentangle the two. Newton's pre-Nicene God of dominion, unipersonal and powerfully Hebraic in character, exercises complete and unchallenged control over His Creation as a sort of divine absolute monarchy.[97] In a draft for his manuscript church history Newton makes the antitrinitarian nature of his God of dominion explicit:

> We must beleive [*sic*] that there is <u>one God</u> or supreme Monarch that we may fear & obey him & keep his laws & give him honour and glory. We must beleive [*sic*] that he is the father of whom are all things & that he loves his people as his children that they may mutually love him & obey him as their father. We must beleive that he is παντοκράτωρ Lord of all things with an irresistible & boundless power & dominion that we may not hope to escape if we rebell & set up other Gods or transgress the laws of his monarchy, & that we may expect great rewards if we do his will.[98]

Here it is clear that the '*one God* or supreme Monarch' is not the three persons of the Athanasian Trinity, but the Father alone as in Jewish and Unitarian theology. The strict unity of the single divine Person (the Father) also ensures unity in creation. Newton pointedly stresses this in the General Scholium when he states that the stars are all 'constructed according to a similar design and subject to the dominion of One'.[99] Furthermore, as Manuel has observed, Newton's manuscripts

show that he believed there to be a strong link between the growth of idolatrous polytheism (including the Trinity) and the corruption of natural philosophy.[100] Newton's monotheistic belief in a God of dominion may have operated in other ways in his natural philosophy as well. For example, his mortalist denial of disembodied spirits and demons (which act like lesser deities in polytheistic systems that the universal sovereignty of Newton's God of dominion could not allow) helps explain why Newton, unlike many of his colleagues at the Royal Society, did not catalogue cases of spirits and witches. What is more, because his powerful Monarchian view of God would allow neither evil spirits nor Satan himself, Newton was not faced with Descartes' demon, who could distort our perception of reality and thus call into question the results of experiments in fields such as optics. God's universal and unchallenged dominion made such malevolent deception of the senses impossible.[101]

Recent work has shown that Newton employed similar strategies in managing the dissemination of his teachings in his natural philosophy, alchemical and theological negotiations. In his religious affairs, his alchemy and his publication strategies for the *Principia* Newton was most concerned with reaching the 'wise who understood', rather than the 'wicked who do wickedly'.[102] For Newton, it was the religious remnant, the alchemical initiates and the philosophical *cognoscenti* who mattered most. The parallels between the *adepti* in each of these classes are striking, and may have been fed in part by the strategies he was forced to develop as a heretical Nicodemite, although there are separate sources for the notion of the *adeptus* in alchemy and philosophy. Whatever the case, a particularly striking example of the blending of Newton's Nicodemite religious stance and his efforts to reach only the ablest philosophers will be discussed next.

The closest Newton ever came to announcing his heresy openly is in his General Scholium.[103] It is also in this powerful document that we best see the unity of Newton's theological and natural philosophical programme. In the 1990s James Force used parallels from Newton's private manuscripts, and Larry Stewart marshalled contemporary testimony, to show that the General Scholium was both intended by Newton and read by some contemporaries as an antitrinitarian document.[104] A close, textual analysis of the theological portion of the General Scholium reveals a heavy biblical substratum,[105] along with classical strata.[106] Antitrinitarianism[107] is evident in several ways. First, Newton describes God as 'παντοκράτωρ' a term that he used exclusively in his private documents of the Father.[108] Second, Newton argues that the term God is a relative one, having respect to dominion. He does not, therefore, define the term God as many contemporary Trinitarians did, as referring to substance or essence. To support his relative and relational conception of the term God, Newton cites biblical passages where humans are referred to as 'gods'.[109] Newton's hermeneutical arguments about the relativity of the expression 'God' closely parallel those of Socinian theology, thus underscoring their heretical nature.[110] A long line of exegetes from Desiderius Erasmus in the early sixteenth century to the polemical Unitarian writers of the 1690s had stressed that the term 'God', when used in an absolute sense in the New Testament, refers exclusively to the Father.[111] The General

Scholium hints at this conclusion, and Newton's private manuscripts confirm this to have been his own view.[112] For Newton, Christ was God in a relational and official sense, as he acted as God's representative or vicegerent. This is exactly the same position as late seventeenth – and early eighteenth-century Unitarians and Arians. Third, Newton confesses a Lockean nescience on the substance of God, stating that we know Him 'only by his properties and attributes and by the wisest and best construction of things and their final causes'.[113] This phenomenalist approach is also evident in his physics, as is well know. Whether in theology or natural philosophy, Newton was adamant that metaphysics not be imported into the discussion of phenomena. In the case of the doctrine of God, such importation led to the idolatrous corruption of the Trinity by the Homoousian party in the fourth century. Fourth, as if this argumentation was not enough, Newton takes a deliberate swipe against the Trinity in a passage he added to the third edition of the *Principia* in 1726:

> Every sentient soul, at different times and in different organs of senses and motions, is the same indivisible person. There are parts that are successive in duration and coexistent in space, but neither of these exist in the person of man or in his thinking principle, and much less in the thinking substance of God. Every man, insofar as he is a thing that has senses, is one and the same man throughout his lifetime in each and every organ or his senses. God is one and the same God always and everywhere.[114]

This passage must be read with care. Not only does Newton state that 'God is one', a truth he found both in the Bible[115] and in the works of the Jewish philosopher Philo (whom he cites in a footnote),[116] but he speaks of every sentient being – whether man or God – as single, indivisible persons. Newton thus emphasizes the strict personal unity of God, in contradistinction to the tripersonal unity of Trinitarian dogma.[117]

To be sure, none of these attacks on the Trinity was direct and obvious to every reader. Since denial of the Trinity was a crime in his day, even (or perhaps one should say especially) an eminent man like Newton had to take precautions. Thus he encoded his message using a layering structure. His method is similar to the analogy of the kernel he used years before when discussing prophetic exegesis, stating that it is important

> To assigne but one meaning to one place of scripture . . . unless it be perhaps by way of conjecture, or where the literal sense is designed to hide the more noble mystical sense as a shell the kernel from being tasted either by unworthy persons, or untill such time as God shall think fit.[118]

Newton's care in composing the General Scholium is revealed in a fascinating comment he makes in one of the newly-recovered Macclesfield papers about the possibility of his language about God's eternity and omnipresence being 'taken in another sense . . . by unwary people'.[119] Newton's efforts to layer the meaning of the General Scholium so that only the *adepti* (both the astute orthodox and his

fellow heretics) could perceive the true intent related to an overarching 'epistemological dualism' in Newton's thought. Like the distinction between the absolute and relative in both theology and natural philosophy, Newton divided knowledge into exoteric and esoteric levels.[120] That this epistemological dualism operated in both his theology and his natural philosophy provides another link between the two, in this case one that is both conceptual and structural. But it is also important to note that in his theology, the epistemological dualism had a theologically heretical undercurrent.

The presence of theological heresy in the conclusion to the *Principia* is crucial. Not only does it mean that one of the most revolutionary books in the history of science is embedded with positions analogous to the Socinians and radical English Unitarian dissenters, and that Newton was publicly aligning himself with these heretical movements,[121] but the heresy in the *Principia* also shows that Newton saw corruption in religion as in some way related to corruption in natural philosophy. Here it must be remembered that the General Scholium commences with an attack on erroneous Cartesian vortices. By setting straight the matter of planetary and cometary motion at the same time as he was attacking false Trinitarian hermeneutics, Newton revealed that his heretical reformation of theology was part and parcel with his *renovatio* of natural philosophy. It was no less important to banish Trinitarian discussion of substance from theology, as it was to banish similar hypothetical discussions in natural philosophy – whether by the Catholic Homoousian Descartes, the Lutheran Homoousian Leibniz or any others – that went beyond the appearances of things.

The emerging picture

Newton's theology was entwined with his natural philosophy. Newton's theology was heretical. Therefore, Newton's natural philosophy bore a strong relationship to heretical theology. I hope the validity of this simple syllogism has been amply demonstrated by the foregoing account. Such a range of areas of interaction between Newton's theology and natural philosophy have been presented by historians, that even if some of the suggestions do not stand up to subsequent critical analysis, others certainly will. Above all, the various ways in which Newton's God of dominion, his opposition to corruption, his methodology of inquiry and his epistemological dualism operate both in his natural philosophy and his religion show that for Newton there was no practical or cognitive walls erected between faith and the study of nature. But the most powerful argument for interaction lies in his lifetime of discoursing of God through natural philosophy. Newton practised what he preached.

This is not to say that Newton was consciously thinking about this end of natural philosophy every time he worked on a mathematical formula or contemplated the intricacies of celestial dynamics. Anyone with even a cursory awareness of Newton's papers on mathematics and physics can see that the problems associated with these fields often absorbed his attention in an all-

encompassing way. It only stands to reason that there is a measure of truth in the idealist myth of Newton as an heroic thinker who solved mathematical conundrums through the sheer intellectual effort and the intense focussing of his attention. Moreover, interaction is a two-way street, and there are hints that his natural philosophy also informed his theology in some mild ways. Thus, in his correspondence with Bentley, Newton contended that the 'cause' of the solar system could not be 'blind & fortuitous, but very well skilled in Mechanicks & Geometry'.[122] Here Newton projects his high opinion of mechanics and mathematics onto his conception of God. On the whole, however, the model that seems to work best is that expressed by Newton himself, namely, that the study of nature was properly a subset of religion.

For this reason, efforts to desacralize Newton's natural philosophy are artificial, ahistorical and misguided. After arguing that the General Scholium, with its explicit theological material, was little more than an afterthought, Edward Grant claimed that for Newton and other natural philosophers 'God may lie in the background as Creator, or perhaps simply as inspiration, but He does not enter into the content of their works, or affect it, because that would have proved futile'.[123] Grant describes the Newton of the positivists, not the Newton now emerging from scholarship. Nor is it possible to accept the claim Westfall made in one of his last papers that '[h]ad Newton not chosen silence and isolation, he might well be recognized today as one of those whose religious thought helped to generate the tides of mechanism, materialism, deism, and atheism'.[124] This is nothing short of a fundamental failure to recognize the character of Newton's heresy and the constructive direction it was taking. Near the beginning of his first letter on the Trinitarian corruptions of Scripture, Newton wrote: 'There cannot be better service done to the truth then to purge it of things spurious'.[125] This was articulated in a particular context, but it has a universal tone and is paradigmatic of Newton's life-long programme for theology and natural philosophy. The original statement, as well as its universal application, also has a heretical edge. But, as with his Unitarian confreres, the intent was the *purification* of the faith, not its destruction. Newton would have been deeply dismayed at the secularization of his physics; of this we can be certain. We can be almost as certain that the positivist re-readings of his *Principia* would have been viewed as profound corruptions. Conversely, this leads me to suspect that he would have been pleased at the resacralization of his natural philosophy presently being effected by historians.

A few short years after Newton was interred in Westminster Abbey in 1727, a monument was set up over his grave. It depicts the great man reclining on four books signifying the range of his thought and endeavour: the *Principia*, the *Optics*, chronology and theology. Later in the eighteenth century positivist Enlightenment propagandists defaced this edifice by chiselling off the latter two books. Over the past two decades labourers have been busy reattaching them. The project is difficult and requires careful attention to detail. The scaffolding is still in place, but it is plain to see that the work has already progressed quite far. And, if one looks a little closer at the stone façade, one can just about discern a new inscription at the base of the moment: *haereticus*.

Notes

1. 'God is Known from his Works'; Isaac Newton, Cambridge University Library, MS Add. 3965, section 13, cited in J .E. McGuire, 'Newton on Place, Time, and God: An Unpublished Source', *The British Journal for the History of Science*, 11 (1978), 118-9. For helpful comments and advice, I would like to thank Allen Batten, John Brooke, Geoffrey Cantor, Hannah Gay, Bernie Lightman, John Money and Paul Wood. I also gratefully acknowledge the Syndics of the Cambridge University Library, the Jewish National and University Library, Jerusalem, and the Provost and Fellows of King's College, Cambridge for permission to quote from manuscripts in their archives. Transcriptions from Newton's manuscripts are presented in 'clean text' format, with abbreviations expanded, deletions omitted and insertion markers removed. Original capitalization and spelling has been retained.
2. Newton to Bentley, 10 December 1692, in H. W. Turnbull, J. F. Scott, A. Rupert Hall and Laura Tilling (eds.), *The Correspondence of Sir Isaac Newton*, 7 vols. (Cambridge: Cambridge University Press, 1959-77), 3:233.
3. Newton to Bentley, 10 December 1692, in Newton, *Correspondence*, 3:236.
4. Newton to Bentley, 10 December 1692, in Newton, *Correspondence*, 3:236.
5. Newton, *Mathematical Principles*, 2:391-2. This reading is based on the third edition of 1726, which substituted 'natural' for the word 'experimental' used in the second edition of 1713, thus broadening the claim.
6. I owe this version of the account, along with the delightful contrast, to Roger Hahn. Napoleon's reference to Newton speaking about God is to the General Scholium, more than half of which concerns theology. For more on Laplace's role in the secularization of celestial physics, see Roger Hahn, 'Laplace and the Vanishing Role of God in the Physical Universe', in Harry Woolf (ed.), *The Analytic Spirit: Essays in the History of Science in Honor of Henry Guerlac* (Ithaca: Cornell University Press, 1981), pp. 85-95 at p. 85.
7. This reorientation was nowhere more marked than in France. In Britain, there long remained a sense among many that Newton's physics were compatible with religion.
8. Newton was mortal and did suffer a modest decline in intellectual powers, but this affected both his natural philosophy and his theology. His best and most innovative work was carried out in his younger years, but this includes his theology as well as his natural philosophy. For an account of the efforts of Laplace and Biot to discredit Newton's theological studies, see Frank E. Manuel, *Isaac Newton, Historian* (Cambridge, MA: The Belknap Press of Harvard University Press, 1963), pp. 5, 255-7 n 22.
9. It is worth noting that even this contemporary image, long used as a model for reconstructing students of nature from before the nineteenth century, is itself a distortion, as a healthy proportion of contemporary scientists are believers. Scientists today belong to a pluralistic community.
10. Compare Richard H. Dalitz and Michael Nauenberg (eds.), *The Foundations of Newtonian Scholarship* (Singapore: World Scientific Publishing, 2000).
11. Frank E. Manuel, *The Religion of Isaac Newton: The Fremantle Lectures, 1973* (Oxford: Clarendon Press, 1974).
12. Although on one occasion when discussing Newton's rejection of evil spirits Manuel suggests that '[s]cience was taking its toll' on Newton's theological outlook; Manuel, *Religion of Newton*, p. 64. One scholar who since the 1960s has carried out important

and sophisticated work on topics that involve assessing the interconnections between Newton's theology and natural philosophy is J. E. McGuire. See especially his valuable collection of previously published essays, *Tradition and Innovation: Newton's Metaphysics of Nature* (Dordrecht: Kluwer, 1995), and his classic article with P. M. Rattansi, 'Newton and the "Pipes of Pan"', *Notes and Records of the Royal Society of London*, 21 (1966), 108-42.

13. Richard S. Westfall, 'Newton's Theological Manuscripts', in Zev Bechler (ed.), *Contemporary Newtonian Research* (Dordrecht: D. Reidel, 1982), p. 140.
14. Richard S. Westfall, 'Newton and Christianity', in J. M. van der Meer (ed.), *Facets of Faith and Science. Volume 3: The Role of Beliefs in the Natural Sciences* (Ancaster, ON: The Pascal Centre, 1996), p. 72.
15. James E. Force and Richard H. Popkin, *Essays on the Context, Nature, and Influence of Isaac Newton's Theology* (Dordrecht: Kluwer, 1990).
16. James E. Force and Richard H. Popkin (eds.), *Newton and Religion: Context, Nature, and Influence* (Dordrecht: Kluwer, 1999); Force and Popkin (eds.), *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* (Dordrecht: Kluwer, 1994); Richard H. Popkin, 'Newton and the Origins of Fundamentalism', in Edna Ullmann-Margalit (ed.), *The Scientific Enterprise. The Bar-Hillel Colloquium: Studies in History, Philosophy, and Sociology of science* (Dordrecht: Kluwer, 1992), pp. 241-59; Richard H. Popkin, 'Newton's Biblical Theology and his Theological Physics,' in P. B. Scheuer and G. Debrock (eds.), *Newton's Scientific and Philosophical Legacy* (Dordrecht: Kluwer, 1988), pp. 81-97; Popkin, 'Newton and Maimonides,' in Ruth Link-Salinger et al. (eds.), *A Straight Path: Studies in Medieval Philosophy and Culture. Essays in Honor of Arthur Hyman* (Washington, DC: The Catholic University of America Press, 1988), pp. 216-29; James E. Force, '"Children of the Resurrection" and "Children of the Dust": Confronting Mortality and Immortality with Newton and Hume', in James E. Force and David S. Katz (eds.), *Everything Connects: In Conference with Richard H. Popkin* (Leiden: Brill, 1999), pp. 119-42; Force, 'Newton, the Lord God of Israel and Knowledge of Nature', in Richard H. Popkin and Gordon M. Weiner (eds.), *Jewish Christians and Christian Jews: From the Renaissance to the Enlightenment* (Dordrecht: Kluwer, 1994), pp. 131-58; Force, 'Newton's "Sleeping Argument" and the Newtonian Synthesis of Science and Religion', in Norman J. W. Thrower (ed.), *Standing on the Shoulders of Giants: A Longer View of Newton and Halley* (Berkeley: University of California Press, 1990), pp. 109-27; John H. Brooke, 'The God of Isaac Newton', in John Fauvel et al. (eds.), *Let Newton Be!: A New Perspective on his Life and Works* (Oxford: Oxford University Press, 1988), pp. 169-83; Scott Mandelbrote, '"A Duty of the Greatest Moment": Isaac Newton and the Writing of Biblical Criticism', *The British Journal for the History of Science*, 26 (1993), 281-302; Matt Goldish, *Judaism in the Theology of Sir Isaac Newton* (Dordrecht: Kluwer, 1998); Stephen Snobelen, '"God of Gods, and Lord of Lords": The Theology of Isaac Newton's General Scholium to the *Principia*', *Osiris*, 16 (2001), 169-208; Snobelen, 'Isaac Newton, Heretic: The Strategies of a Nicodemite', *The British Journal for the History of Science*, 32 (1999), 381-419. In October 2000, James Force and Sarah Hutton, with Richard Popkin's involvement, led a conference at UCLA's William Andrews Clark Library on Newton's religion under the banner 'Newton 2000: Newtonian Studies in the New Millennium'. The proceedings are to be published.
17. Betty Jo Teeter Dobbs, *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought* (Cambridge: Cambridge University Press, 1991); Dobbs, 'Newton as

Alchemist and Theologian', in Thrower, *Standing on the Shoulders of Giants*, pp. 128-40; Dobbs, *The Foundations of Newton's Alchemy, or "The Hunting of the Greene Lyon"* (Cambridge: Cambridge University Press, 1975); Jan Golinksi, 'The Secret Life of an Alchemist', in Flauvel, *Let Newton Be!*, pp. 147-67.

18. Popkin, 'Newton's Biblical Theology', p. 81.
19. Mandelbrote, '"A Duty of the Greatest Moment"'.
20. Isaac Newton, Jewish National and University Library, Yahuda MS 1.1a, fol. 3r.
21. James E. Force, 'The Nature of Newton's "Holy Alliance" between Science and Religion: From the Scientific Revolution to Newton (and Back Again)', in Margaret J. Osler (ed.), *Rethinking the Scientific Revolution* (Cambridge: Cambridge University Press, 2000), pp. 247-70; Force, 'Newton's God of Dominion: The Unity of Newton's Theological, Scientific, and Political Thought', in Force and Popkin, *Essays on Newton's Theology*, pp. 75-102; Betty Jo Teeter Dobbs, '"The Unity of Truth": An Integrated View of Newton's Work', in Paul Theerman and Adele F. Seeff (eds.), *Action and Reaction: Proceedings of a Symposium to Commemorate the Tercentenary of Newton's Principia* (Newark: University of Delaware Press, 1993), pp. 105-22; Dobbs, *Janus Faces of Genius* (in which Dobbs extended her study of Newton's alchemy to search out systematic interaction between his alchemy and theology and his philosophy of nature); Popkin, 'Newton's Biblical Theology', pp. 81-97. See also David Castillejo, *The Expanding Force in Newton's Cosmos as Shown in His Unpublished Papers* (Madrid: Ediciones de Arte y Bibliofilia, 1981), and Walter Stangl, 'Mutual Interaction: Newton's Science and Theology', *Perspectives on Science and Christian Faith*, 43 (1991), 82-91.
22. On the 'two-Newton' thesis, see Richard Popkin's introduction to *Newton and Religion*, p. x, where he offers Westfall's work as exemplifying the second variant.
23. Niccolò Guicciardini, *Reading the Principia: The Debate on Newton's Mathematical Methods for Natural Philosophy from 1687 to 1736* (Cambridge: Cambridge University Press, 1999).
24. A catalogue was also published as a guide to this collection: Peter Jones (ed.), *Sir Isaac Newton: A Catalogue of Manuscripts and Papers, Collected and Published on Microfilm by Chadwyck-Healey* (Cambridge: Chadwyck-Healey, 1991).
25. For more information, see the Project web site: www.newtonproject.ic.ac.uk.
26. The most important group of Newton manuscripts to come available since the 1936 sale at Sotheby's in London is the collection of mathematical papers and correspondence the Earl of Macclesfield sold to Cambridge University Library in 2000. A survey of these papers has revealed a small number of illuminating theological notes and fragments. I will have occasion to quote from these below.
27. Andrew Cunningham, 'Getting the Game Right: Some Plain Words on the Identity and Invention of Science', *Studies in History and Philosophy of Science*, 19 (1988), 365-89; Cunningham, 'How the *Principia* Got its Name; or, Taking Natural Philosophy Seriously', *History of Science*, 19 (1991), 377-92; Andrew Cunningham and Perry Williams, 'De-Centring the "Big Picture": *The Origins of Modern Science* and the Modern Origins of Science', *The British Journal for the History of Science*, 26 (1993), 407-32; Andrew Cunningham and Roger French, *Before Science: The Invention of the Friars' Natural Philosophy* (Aldershot: Scolar Press, 1996); Edward Grant, 'God, Science, and Natural Philosophy in the Late Middle Ages', in Lodi Nauta and Arjo Vanderjagt (eds.), *Between Demonstration and Imagination: Essays in the History of Science and Philosophy Presented to John D. North* (Leiden: Brill, 1999), pp. 243-67; Cunningham, 'The Identity of Natural Philosophy: A Response to Edward Grant', *Early Science and Medicine*, 5 (2000), 259-78; Grant, 'God and

Natural Philosophy: The Late Middle Ages and Sir Isaac Newton', *Early Science and Medicine*, 5 (2000), 279-98; Cunningham, 'A Last Word', *Early Science and Medicine*, 5 (2000), 299-300; Peter Dear, 'Religion, Science and Natural Philosophy: Thoughts on Cunningham's Thesis', *Studies in History and Philosophy of Science*, 32 (2001), 377-86; Cunningham, 'A Reply to Peter Dear's "Religion, Science and Natural Philosophy: Thoughts on Cunningham's Thesis"', *Studies in History and Philosophy of Science*, 32 (2001), 387-91; Dear, 'Reply to Andrew Cunningham', *Studies in History and Philosophy of Science*, 32 (2001), 393-5.

28. I would like to stress, however, that I do not always agree completely with the historians I cite. Nevertheless, I want to draw attention to a wide range of suggestions made about the unity of Newton's theology and study of nature.
29. I do something similar in my paper '"God of Gods, and Lord of Lords"', cited in note 16.
30. Disciplines of theology and natural philosophy of course did exist in Newton's day and before (theology was, after all, the 'Queen' of the sciences in the medieval period), and I do want to deny that scholars in the late seventeenth and early eighteenth centuries were able to articulate a distinction between the spheres of religion and natural philosophy. Newton himself could, as will be seen. I do, however, want to move away from essentialized and rigid notions of these spheres.
31. See especially John Ray's often-reprinted *The Wisdom of God Manifested in the Works of the Creation*, first published in London in 1691.
32. William Whiston, *A Collection of Authentick Records Belonging to the Old and New Testament*, 2 vols. (London: Printed for the Author, 1728), 2:1073.
33. Isaac Newton, *The Principia: Mathematical Principles of Natural Philosophy*, trans. I. Bernard Cohen, Anne Whitman and Julia Budenz (Berkeley: University of California Press, 1999), pp. 940-42 at p. 940.
34. I. Bernard Cohen, 'Isaac Newton's *Principia*, the Scriptures, and the Divine Providence', in Sidney Morgenbesser, et al. (eds.), *Philosophy, Science, and Method* (New York: St. Martin's Press, 1969), pp. 523-48.
35. As translated in Cohen, 'Newton's *Principia*', p. 530.
36. Isaac Newton, *Opticks, or A Treatise of the Reflections, Refractions, Inflections and Colours of Light*, 4th edn (1730; New York: Dover, 1952), p. 402.
37. Newton, *Opticks*, p. 402.
38. saac Newton, King's College Library, Cambridge, Keynes MS 7, p. 1. Newton published a version of this argument from symmetry in Query 31 of the *Opticks*; Newton, *Opticks*, pp. 402-3.
39. Newton, Keynes MS 7, p. 1.
40. Richard Bentley, *A Confutation of Atheism from the Origin and Frame of the World* (London: H. Mortlock, 1693). Margaret Jacob and other scholars have argued that Newton himself personally supported the Boyle Lectures, which had as their primary aim the refutation of scepticism and atheism. See M. C. Jacob, *The Newtonians and the English Revolution, 1689-1720* (Ithaca: Cornell University Press, 1976); Jacob, 'The Church and the Formulation of the Newtonian World-View', *Journal of European Studies*, 1 (1971), 128-48; Henry Guerlac and Margaret Jacob, 'Bentley, Newton and Providence (the Boyle Lectures Once More)', *Journal of the History of Ideas*, 30 (1969), 307-18; James E. Force, *William Whiston: Honest Newtonian* (Cambridge: Cambridge University Press, 1985), passim.
41. William Whiston, *A New Theory of the Earth, from its Original, to the Consummation of all Things* (London: B. Tooke, 1696).
42. William Whiston, *Astronomical Principles of Religion, Natural and Reveal'd*

(London: J. Senex and W. Tayor, 1717); a second edition appeared in 1725. Whiston explicitly confirmed his debt to Newton for both this book and his early *New Theory* in his *Authentick Records*, 2:1073. On Whiston's Newtonian version of the design argument, see Force, 'Newton's "Sleeping Argument"', pp. 123-5; Force, introduction to William Whiston, *Astronomical Principles of Religion, Natural and Reveal'd* (1717; Hildesheim and New York: Olms, 1983), pp. 1-71; Force, *William Whiston*, pp. 54-7.

43. On the doctrine of the Two Books, see Peter Harrison, *The Bible, Protestantism and the Rise of Natural Science* (Cambridge: Cambridge University Press, 1998); James J. Bono, *The Word of God and the Languages of Men: Interpreting Nature in Early Modern Science and Medicine*, Volume 1 (Madison: University of Wisconsin Press, 1995). Bono also makes special reference to Newton in his 'From Paracelsus to Newton: The Word of God, the Book of Nature, and the Eclipse of the "emblematic world view"', in Force and Popkin, *Newton and Religion*, pp. 45-76.
44. Newton, Yahuda MS 1.1a, fol. 14r.
45. Newton, Yahuda MS 41, fol. 7r. Newton added the parenthetical statement '(without revelation)' sometime after he initially wrote this sentence.
46. Newton, *Opticks*, p. 369.
47. Newton, *Opticks*, p. 370.
48. See note 5 above.
49. Michael Ben-Chaim, 'The Discovery of Natural Goods: Newton's Vocation as an "Experimental Philosopher"', *The British Journal for the History of Science*, 34 (2001), 395-416.
50. Michael Ben-Chaim and Ayval Ramati, 'The Truth in Practice: The Moral Object of Newton's Experimental Practice', unpublished typescript, 2001.
51. Newton, *Opticks*, p. 405.
52. Ben-Chaim and Ramati, 'The Truth in Practice'.
53. G. A. J. Rogers, 'Newton and the Guaranteeing God', in Force and Popkin, *Newton and Religion*, pp. 221-35.
54. Maurizio Mamiani, 'The Rhetoric of Certainty: Newton's Method in Science and in the Interpretation of the Apocalypse', in M. Pera and W. R. Shea (eds.), *Persuading Science* (Canton: Science History, 1991), pp. 157-72; Mamiani, 'To Twist the Meaning: Newton's *Regulae philosophandi* Revisited', in Jed Z. Buchwald and I. Bernard Cohen (eds.), *Isaac Newton's Natural Philosophy* (Cambridge, MA: MIT Press, 2001), pp. 3-14; Mamiani, 'Newton on Prophecy and the Apocalypse', in I. Bernard Cohen and George E. Smith (eds.), *The Cambridge Companion to Newton* (Cambridge: Cambridge University Press, 2002), pp. 387-408. Two of Newton's *regulae* appear in the first (1687) edition of the *Principia*, with a third added to the second (1713) edition and the fourth to the third (1726) edition; Mamiani, 'To Twist the Meaning', p. 4.
55. Mamiani identifies Robert Sanderson's *Logicae Artis Compendium* (1618) as the main source for Newton's sixteen prophetic rules; Mamiani, 'To Twist the Meaning', pp. 11-12, Table 1.1.
56. Newton, Yahuda MS 1.1a, fol. 10r.
57. I discuss the analogy between Newton's biblical hermeneutics and natural philosophical method at greater length in Snobelen, '"God of Gods, and Lord of Lords"', cited in note 16.
58. Newton, Yahuda MS 1.1a, fol. 14r. It is not only in the sixteen 'Rules' that Newton outlines his belief in the simplicity of revelation. In another unpublished manuscript, Newton wrote that '[t]he human race is prone to mysteries, and holds nothing so holy

and perfect as that which cannot be understood . . . It is the concern of theologians that the conception [of God] be made as easy and reasonable as possible'; Cambridge University Library, MS. Add. 3965, fol. 546r (my translation from the Latin original).

59. Newton, *Principia*, p. 794.
60. Newton, Yahuda MS 1.1a, fol. 12r.
61. Newton, *Principia*, pp. 795-6.
62. W. G. Hiscock (ed.), *David Gregory, Isaac Newton and their Circle: Extracts from David Gregory's Memoranda, 1677-1708* (Oxford: Printed for the Editor, 1937), p. 25.
63. A similar example has recently been put forward by Michael Ben-Chaim, who provides evidence to suggest that Newton's 1672 paper on light and colours published in the *Philosophical Transactions of the Royal Society* was modelled after the structure of a Puritan sermon; Michael Ben-Chaim, 'Doctrine and Use: Newton's "Gift of Preaching"', *History of Science*, 36 (1998), 269-98.
64. Newton, *Principia*, pp. 413-4.
65. Newton, *Principia*, p. 414.
66. A healthy corrective to this view can be found in Edward B. Davis, 'Newton's Rejection of the "Newtonian World View": The Role of Divine Will in Newton's Natural Philosophy', *Fides et Historia*, 22 (1990), 6-20.
67. Richard S. Westfall, 'Isaac Newton's *Theologiae Gentilis Origines Philosophicae*', in W. Warren Wagar (ed.), *The Secular Mind: Transformations of Faith in Modern Europe. Essays Presented to Franklin L. Baumer* (New York: Holmes & Meier, 1982), pp. 15-34. Westfall's argument is decisively rebutted in James Force, 'Newton and Deism', in Änne Bäumer and Manfred Büttner (eds.), *Science and Religion/Wissenschaft und Religion* (Büchum: Brockmeyer, 1989), pp. 120-32.
68. On this, see Force, 'Newton's God of Dominion', cited in note 21 above. Force also deals with Newton's theological voluntarism in this paper and discusses how his view of God provided a powerful incentive to engage in experimental philosophy (see especially p. 89).
69. Ezio Vailati, *Leibniz and Clarke: A Study of their Correspondence* (New York: Oxford University Press, 1997); Steven Shapin, 'Of Gods and Kings: Natural Philosophy and Politics in the Leibniz-Clarke Disputes', *Isis*, 72 (1981), 187-215; A. Rupert Hall, *Philosophers at War: The Quarrel between Newton and Leibniz* (Cambridge: Cambridge University Press, 1980); H. G. Alexander (ed.). *The Leibniz-Clarke Correspondence* (Manchester: Manchester University Press, 1956).
70. J. E. McGuire, 'The Fate of the Date: The Theology of Newton's *Principia* Revisited', in Osler, *Rethinking the Scientific Revolution*, pp. 271-95; McGuire, *Tradition and Innovation*, passim.
71. McGuire, 'Fate of the Date', p. 288.
72. Brian P. Copenhaver, 'Jewish Theologies of Space in the Scientific Revolution: Henry More, Joseph Raphson, Isaac Newton and their Predecessors', *Annals of Science*, 37 (1980), 489-548; Isaac Newton, Macclesfield Papers, Cambridge University Library, MS. Add. 9597, fol. 127a.
73. On Newton's speculations about the divine cause of gravity, see John Henry, '"Pray not Ascribe that Notion to Me": God and Newton's Gravity', in Force and Popkin, *Books of Nature and Scripture*, pp. 123-47.
74. Hiscock, *Gregory, Newton and their Circle*, p. 30. Nicolas Fatio de Duillier, Christopher Wren and William Whiston were also privy to Newton's speculations about God as the upholder of gravitation; Fatio de Duillier to [De Beyrie] for Leibniz, 30 March 1694, and memoranda by David Gregory, 20 February 1697/8, in Newton,

Correspondence, 3:308-9, 4:266, 267; Whiston, *Authentick Records*, 2:1072-3.

75. McGuire and Rattansi, 'Newton and the "Pipes of Pan"', p. 118.
76. Dobbs, *Janus Faces of Genius*, passim.
77. Ayval Ramati, 'The Hidden Truth of Creation: Newton's Method of Fluxions', *The British Journal for the History of Science*, 34 (2001), 417-38; Force, 'Newton's God of Dominion', p. 88; Snobelen, '"God of Gods, and Lord of Lords"', p. 204.
78. David Kubrin, 'Providence and the Mechanical Philosophy: The Creation and Dissolution of the World in Newtonian Thought. A Study of the Relations of Science and Religion in Seventeenth Century England' (unpublished PhD dissertation, Cornell University, 1968); Kubrin, 'Newton and the Cyclical Cosmos: Providence and the Mechanical Philosophy', *Journal of the History of Ideas*, 28 (1967), 325-45; J. A. Ruffner, 'Newton's Propositions on Comets: Steps in Transition, 1681-84', *Archive for History of Exact Sciences*, 54 (2000), 259-77; Simon Schaffer, 'Comets and Idols: Newton's Cosmology and Political Theology', in Theerman and Seeff, *Action and Reaction*, pp. 206-31; Schaffer, 'Newton's Comets and the Transformation of Astrology', in Patrick Curry (ed.), *Astrology, Science and Society: Historical Essays* (Woodbridge, UK: Boydell, 1987), pp. 219-43; Sara Genuth Schechner, *Comets, Popular Culture and the Birth of Modern Cosmology* (Princeton: Princeton University Press, 1997); Schechner, 'Newton and the Ongoing Teleological Role of Comets', in Thrower, *Standing on the Shoulders of Giants*, pp. 299-311.
79. John Conduitt, Keynes MS 130.11, pp. 1-4.
80. Westfall, *Never at Rest*, p. 310; Snobelen, 'Isaac Newton, Heretic', pp. 383-4.
81. In 1710, Newton's heretical acolyte and successor in the Lucasian Chair, William Whiston, was expelled from Cambridge for proclaiming in public virtually the same antitrinitarian views Newton held in private.
82. Ironically, Newton, who was MP for Cambridge University at the time, found himself appointed to the parliamentary committee that drafted the Toleration Act of 1689; *Journals of the House of Commons*, (London: By Order of the House of Commons, 1742), 10:133, 137. While this Act extended toleration to Protestant dissenters, antitrinitarians like Newton were specifically excluded from the Act's privileges.
83. For an overview of Newton's heresies, see Snobelen, 'Isaac Newton, Heretic', pp. 383-9. Scott Mandelbrote also presents Newton as a non-conformist in his '"A Duty of the Greatest Moment"'. Mandelbrote also discusses Newton's heresy and his relationship with eighteenth-century orthodoxy in 'Newton and Eighteenth-Century Christianity', in Cohen and Smith, *Cambridge Companion to Newton*, pp. 409-30.
84. Newton's friend John Locke was a mortalist and unorthodox on the Trinity. His co-worker and associate at the Mint, Hopton Haynes, was a radical unitarian who went on to write polemical antitrinitarian works. Haynes himself was in contact with the radical Henry Hedworth. Newton met with, and provided financial support to, the continental Socinian, Samuel Crell; Snobelen, 'Isaac Newton, Heretic', pp. 401-4. Compare Jean-François Baillon, who concludes that Newton was associated with a 'réseau unitarien-socinien clandestin'; Jean-François Baillon, 'Newtonisme et idéologie dans l'Angleterre des Lumières' (unpublished thèse de doctorat de lettres, Sorbonne, 1995), p. 215.
85. This is the conclusion presented in Westfall, *Never at Rest*.
86. It is thus not without significance that in addition to antitrinitarian books he owned written by his theological disciples William Whiston and Samuel Clarke, Newton's surviving library reveals eight Socinian titles, one by the Transylvanian Unitarian György Enyedi, one by the German Arian Christopher Sand and a copy of the English Unitarian compilation, *The Faith of the One God*; John Harrison, *The Library of Isaac*

Newton (Cambridge: Cambridge University Press, 1978), items 421, 458, 459, 495, 496, 557, 604, 985, 1385, 1444, and 1534. Although the mere presence of these heretical books in Newton's library does not prove that he agreed with their contents, the striking consonance between their contents and Newton's private writings on theology demonstrates that he shared a substantial amount of common ground with these heterodox writers.

87. Compare Isaac Newton, 'Paradoxical Questions Concerning the Morals & Actions of Athanasius & his Followers', William Andrews Clark Memorial Library, UCLA, MS **N563M3 P222 and King's College, Cambridge, Keynes MS 10 (a variant of the former) with the anonymous *The Acts of Great Athanasius* ([London]: n. p., 1690).
88. See Richard Overton, *Mans Mortallitie* ([London]; n. p., 1643). On Overton's Mortalism, see Force, '"Children of the Resurrection" and "Children of the Dust"', pp. 119-42; Force, 'The God of Abraham and Isaac (Newton)', in Force and Popkin, *Books of Nature and Scripture*, pp. 179-200.
89. Newton's views on evil spirits are outlined in Stephen Snobelen, 'Lust, Pride and Ambition: Isaac Newton and the Devil', forthcoming in the proceedings of the UCLA Newton 2000 conference.
90. Newton, Yahuda MS 9, fol. 158r.
91. Snobelen, 'Isaac Newton, Heretic', pp. 391-3; Rob Iliffe, '"Making a Shew": Apocalyptic Hermenuetics and the Sociology of Christian Idolatry in the Work of Isaac Newton and Henry More', in Force and Popkin, *Books of Nature and Scripture*, pp. 55-88.
92. Nye matriculated at Magdalene College, Cambridge nine months after Newton entered Trinity College in June 1661, and took his B.A. in the same year (1665). For biographical detail on Nye (1648?-1719), see the *DNB*.
93. Snobelen, 'Isaac Newton, Heretic', pp. 401-8.
94. The text of the 'Two Notable Corruptions', with brief editorial notes, is published in Newton, *Correspondence*, 3:83-146.
95. For background on the controversy, see Stephen Trowell, 'Unitarian and/or Anglican: The Relationship of Unitarianism to the Church from 1687 to 1698', *Bulletin of the John Rylands University Library of Manchester*, 78 (1996), 77-101. One can even detect a similarity in the titles of Newton's 'Two Notable Corruptions' ('An Historical Account of Two Notable Corruptions of Scripture: In a Letter to a Friend') and Nye's *A Brief History of the Unitarians, Called also Socinians. In Four Letters, Written to a Friend* ([London]: n. p., 1687), a similarly that further suggests that Newton intended his work to be an intervention in the Trinitarian controversy. In Newton's case the friend was John Locke; for Nye, it was Thomas Firmin.
96. Margaret C. Jacob, *Scientific Culture and the Making of the Industrial West* (New York and Oxford: Oxford University Press, 1997), p. 71.
97. Whether Newton always saw God's control as direct is not easy to determine. As McGuire points out, there seems to be a tension in Newton's writings between the Arian God who 'is transcendent and works in nature though an intermediary' and 'the God of dominion of the "classical scholia" who is directly present and active in creation'; McGuire, 'Fate of the Date', p. 294. The God of the General Scholium best fits the latter conceptualization of divine activity.
98. Newton, Yahuda MS 15.3, fol. 46v.
99. Newton, *Principia*, p. 940.
100. Manuel, *Religion of Newton*, p. 42. Dobbs devotes a great deal of space to a discussion of the ways in which Newton's antitrinitarian theology related to his philosophy of nature in Dobbs, *Janus Faces of Genius*, pp. 213-49, 253-5. Compare

Cunningham, 'How the *Principia* Got Its Name', p. 384.

101. See Snobelen, 'Lust, Pride and Ambition'.
102. Guicciardini, *Reading the Principia*; Lawrence M. Principe, 'The Alchemies of Robert Boyle and Isaac Newton: Alternate Approaches and Divergent Deployments', in Osler, *Rethinking the Scientific Revolution*, pp. 201-20; Snobelen, 'Isaac Newton, Heretic'.
103. For greater detail on the heretical language and intent of the General Scholium, see Snobelen, '"God of Gods, and Lord of Lords"'.
104. Force, 'Newton's God of Dominion', pp. 75-102; Larry Stewart, 'Seeing Through the Scholium: Religion and Reading Newton in the Eighteenth Century', *History of Science*, 34 (1996), 123-65.
105. Snobelen, '"God of Gods, and Lord of Lords"', pp. 175-80.
106. Rudolf De Smet and Karin Verelst, 'Newton's Scholium Generale: The Platonic and Stoic Legacy – Philo, Justus Lipsius and the Cambridge Platonists', *History of Science*, 39 (2001), 1-30; Dobbs, *Janus Faces of Genius*, pp. 197-209.
107. I use this general term both because it seems to me that the theology of the General Scholium is more biblical and Judaic than it is Arian, and because Newton directly attacks the orthodox doctrine of the Trinity in the Scholium.
108. See, for example, Newton, Yahuda MS 15.3, fol. 46v.
109. Newton, *Principia*, p. 941.
110. Snobelen, '"God of Gods, and Lord of Lords"', pp. 191-6.
111. After making the same point on the basis of scriptural testimony, Stephen Nye reminds his readers that in Erasmus's commentary on Ephesians 5:5 the latter wrote 'that the word God being *used absolutely*, doth in the Apostolick Writings always signifie *the Father*'; Nye, *Brief History of the Unitarians*, p. 31. Compare John Smith, *A Designed End to the Socinian Controversie: Or a Rational and Plain Discourse to Prove that No Other Person but the Father of Christ is God Most High* (London: n. p., 1695). Parliament ordered this book burned in the year it was published and the author was prosecuted; Robert Wallace, *Antitrinitarian Biography*, 3 vols. (London: E. T. Whitfield, 1850), 3:389-99.
112. For evidence of Newton's position on this, along with that of the seventeenth-century Socinians, see Snobelen, 'Isaac Newton, Heretic', pp. 386-7.
113. Newton, *Principia*, p. 942.
114. Newton, *Principia*, p. 941.
115. The exact phrase is given in Galatians 3:20 and can be distilled from several others, such as Deuteronomy 6:4.
116. De Smet and Verelst have recently demonstrated the textual presence of the first-century Jewish philosopher Philo Judaeus in the General Scholium. Newton's expression '*Deus est unus*' (God is one) not only closely follows - but for the case of the nouns, the mood of the verb and the word order – the Latin translation (which Newton used) of Philo's expression 'God is one' (*unum esse Deum*), but also Philo's original Greek for 'God is one' (θεὸς εἶς ἐστι); De Smet and Verelst, 'Newton's Scholium Generale', pp. 7, 8, 24, 25. It goes without saying that Philo's language is in turn heavily infused with that of the Hebrew Bible and Philo's precise Greek phrase probably consciously parallels the language of Deuteronomy 6:4 in the Greek version of the Hebrew Bible: 'κύριος ὁ θεὸς ἡμῶν κύριος εἶς ἐστιν' (The Lord our God is one Lord). This added dynamic makes it difficult to determine whether Newton used Philo in this instance because he follows the Bible, or whether Newton is directly alluding to the Bible. This example aside, the presence of Philo in the General Scholium is secure, and it would have been important for Newton that Philo's Judaic

conception of God was pre-Nicene, and thus immune from the corrupt theology of the fourth-century Homoousians.

117. The statement 'God is one' would, of course, be accepted by Trinitarians also. But for the antitrinitarian Newton, the expression could only refer to God as a single person, the Father. In this Newton can be compared to contemporary Unitarian writers, like the author of *The Acts of Great Athanasius* (reputed to be Stephen Nye), who uses the biblical statement 'God is one' in an antitrinitarian sense, referring to God as a single person; *The Acts of Great Athanasius*, p. 3. Moreover, Newton's specific argument about the unipersonality of God not only contradicts Trinitarian orthodoxy from the time of Athanasius, but it is also the same as that presented by Stephen Nye in 1687; [Nye], *Brief History of the Unitarians*, pp. 3. 19-22.
118. Newton, Yahuda MS 1.1a, fol. 12r-v.
119. Cambridge University Library, MS. Add. 9596, fol. 127a.
120. Snobelen, '"God of Gods, and Lord of Lords"', p. 206.
121. Some of Newton's more perceptive contemporaries recognized this. One notable example is the Calvinist writer John Edwards, who publicly denounced the theology of the General Scholium as Socinian; John Edwards, *Some Brief Critical Remarks on Dr. Clarke's Last Papers* (London: F. Burleigh, 1714), pp. 36-7. For more background on the reception of the General Scholium's theology, see Stewart, 'Seeing through the Scholium'. It is possible that rumours about Newton's unorthodoxy that circulated in the last two decades of his life convinced him to retain his cautious Nicodemite stance for fear of publicly discrediting his natural philosophy, which he was at pains to promote and see succeed. If so, this dynamic would amount to yet another way in which Newton's religion and natural philosophy affected each other.
122. Newton to Bentley, 10 December 1692, in Newton, *Correspondence*, 3:235.
123. Grant, 'God and Natural Philosophy', p. 291.
124. Richard S. Westfall, 'The Scientific Revolution Reasserted', in Osler, *Rethinking the Scientific Revolution*, p. 54.
125. Newton to a Friend, 14 November 1690, in Newton, *Correspondence*, 3:83.