At the Bar: Judicial Rhetoric and the Relationship between Newton's Theology and Natural Philosophy

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> whilst upon this accusation he [i.e. Jerome] recommends the alteration by its usefulness for establishing the Catholic faith, this renders it the more suspected by discovering both the designe of his making it, & y^e^ ground of his hoping for successe. However seing he was thus accused by his contemporaries, it gives us just occasion to examin the businesse between him & his accusers. And so he being called to the barr, we are not to lay stresse upon his own testimony for himself, (for no man is a witnesse in his own cause,) but laying aside all prejudice we ought according to the ordinary rules of justice to examin the businesse between him & his accusers by other witnesses.[1]

> It is astonishing that Mr Newton, who in Philosophy is only willing to reason on facts, abandons this method in the judgement of human actions. If he persists in his accusations *is he not obliged*, according to his own principle, to prove them, *at the risk of becoming* guilty of calumny? Now how will he demonstrate, as he would a geometric curve ... my masquerade of friendship, my clandestine intervention, and other chimeras with which it has suited him to embellish the opinion he has formed of me?[2]

Abstract

In this paper I argue that historians need to radically rethink both the place of theology and its relation to natural philosophy in Newton's oeuvre. Previously historians have taken one aspect of Newton's theological work, namely the topic of natural theology, and they have unsurprisingly uncovered a number of links relations between natural philosophy and natural theology. However, the broader a priori assumption that there must be links of a certain kind between different areas of his thought have uncovered a number of 'false positives', spurious similarities that supposedly lead us to a deeper grasp of the underlying structures of his thought. Instead, I argue that Newton radically compartmentalised his work, creating projects and writing treatises that conformed to the social, epistemological and rhetorical forms appropriate to the traditions and genres in which he worked. By examining the ways in which he both worked within and manipulated these discursive structures, we can obtain a much finer grasp of how Newton understood the internal relations between different domains of his research.

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[1]. Newton to 'A friend' (John Locke), in H.W. Turnbull et al. (eds) *The Correspondence of Isaac Newton*, 7 vols (1959-81), 3: 88-9.

[2]. Antonio Conti, *Réponse aux Observations sur la Chronologie de M. Newton, avec une letttre de M. l'Abbé Conti au sujet de ladite réponse*, (Paris, 1726), cited in Frank Manuel, *A Portrait of Isaac Newton*, (Cambridge, mass., 1968), 355-6.

Newton's theological papers

Putative relations between science and religion continue to attract substantial attention from historians and cultural commentators. John Brooke has remarked that three general strategies for relating these two domains have generally been available. The first holds that science, which is essentially progressive and concerns itself with a specific form of truth, has a radically different method and way of life from religion. Evidently this point of view has become much more common among practising scientists and scientific apologists in the last century and a half, while from the other side, as it were, many Muslims and Christians have been inclined to relegate knowledge of the natural world ('foreign' or 'pagan' learning respectively) below faith. The second approach assumes that there are deep interpenetrations between the different realms, either because science reveals the wonder and order of Creation, or because there are conceptual or methodological connections between them. The chain of influence in this case is usually held to move from the religious to the scientific. The third holds that the basic elements of science and religion apply to different domains, and that any attempts to show that they are either intimately linked or opposed to each other result from a misunderstanding of this separateness.[3]

Given the richness of the historical record, it has not been difficult for authors with general commitments to one of these three positions to find supporting evidence for their views in the historical record. One result of the recent scholarship has been to make historians more cautious about offering general accounts of the historical relations between *scientia* and *sapientia*. Much, of course, depends on the sophistication or power of the analytic terms used. For example, it is clear that in the early modern period, it is important to grasp disciplinary distinctions between the mathematical sciences and natural philosophy, both with very different resonances from what would later be called 'science', while it is just as significant to distinguish between 'religion' and 'theology'. As I suggest in the remainder of this paper, it is also essential to distinguish between standard theological practice and what emerged in the late seventeenth and eighteenth centuries as 'natural theology'.

Much of the debate has been understood either by taking the work of totemic individuals as exemplary of science-religion relations in general, or by viewing events and concepts through master-narratives such as the 'Puritanism and Science', or 'Latitudinarianism and Science' theses. Amongst the former, the work of Isaac Newton has always assumed a large role. Eighteenth century British commentators for the most part revered Newton as combining intellectual genius with a sort of Anglican orthodoxy. This was so despite the fact that he wrote a detailed account of the Apocalypse, a version of

[3] . See Brooke, *Science and Religion. Some historical perspectives*, (1992), 2-5; Brooke and Ian Maclean (eds) *Science and Heterodoxy in early modern Science and religion*, (Oxford, OUP 2005); Edward Grant, "God, science, and natural philosophy in the late Middle Ages," in *Between Demonstration and Imagination. Essays in the History of Science and Philosophy presented to John D. North*, eds L. Nauta and A. Vanderjagt, (Leiden: Brill, 1999), 243-67; A. Cunningham, "The identity of natural philosophy: a response to Edward Grant," Early Science and Medicine, 5 (2000), 259-78 and Grant, "God and natural philosophy: the late Middle Ages and Sir Isaac Newton," in ibid. 279-98.

which was published in 1733, and composed an extended analysis of two major trinitarian proof texts (originally sent to Locke in November 1690) that was published at Amsterdam in 1754. Although it was couched as an objective empirical examination of the authenticity of these texts, the analysis sent to Locke showed that Newton was a radical heretic whose beliefs, had they been made known, would have left him open to severe penalties under the 1648 Blasphemy Act. Nevertheless, contemporaries found it hard to accept that Newton was not basically orthodox, even when two of his most prominent disciples (Samuel Clarke and William Whiston) published works which to varying degrees questioned orthodox accounts of the Trinity. [4]

Even in the early eighteenth century, however, as Larry Stewart has shown, keen eyed critics saw 'through' central Newtonian texts such as the General Scholium attached to the 1713 second edition of his *Principia*. In the second half of the eighteenth century, a number of anti-clerical Continental European (and some British) writers, accepted the reality of the nature and extent of Newton's non-scientific writings, but condemned them as greatly inferior, almost inexplicable productions (although Newton's intense anti-Catholicism was not entirely unpalatable). For the Enlightenment *philosophes* and their descendants, Newton was the founder of Reason, and the theological and other non-scientific studies were the result of senility. The French scientist Jean-Baptiste Biot levelled the dotage charge against Newton's chronological and theological researches in his 1822 biography of Newton, and he was followed in this by a number of positivist writers in the rest of the century. [5]

Newton's orthodoxy was generally maintained in Britain until the late 1830s, after which substantial evidence surfaced about his devotion to alchemy as well as of his extreme antitrinitarian views. The change in attitude is well represented by the differences between David Brewster's 1831 biography of Newton, and his monumental 1855 *Life and Memoirs of Newton*. Even if Newton's doctrinal commitments were profoundly heretical, Brewster maintained in the later work that his religiosity was incontrovertible. Nevertheless, until the last three decades of the twentieth century, the depth and nature of Newton's research in theology has been little understood. Access to the original papers was heavily restricted from the later part of the eighteenth century, while the earlier and far more radical theological papers were sold off to a syndicate headed by the philologist Abraham S. Yahuda at the Sotheby sale of Newton's non-scientific papers in 1936. These extraordinary writings, now amongst the Yahuda papers at the Jewish National and University Library in the Hebrew University in Jerusalem, were made available to scholars in the early 1970s.[6]

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[4]. See both John Conduitt's unpublished 'memoir' of Newton and William Stukeley's 1752 ms. biography of Newton at www.newtonproject.ic.ac.uk/texts/viewtext.php?id=OTHE00001&mode=normalized.

[5]. See Larry Stewart, "Seeing through the Scholium: Religion and reading Newton in the Eighteenth Century," History of Science 34 (1996), 123-165 and Rebekah Higgitt, 'Nineteenth century interpretations of Newton', (Imperial College PhD thesis, 2004).

[6]. For the history of the papers see Rob Iliffe, "'A connected system?': the snare of a beautiful hand and the unity of Newton's archive," in M. Hunter, ed., *Archives of the Scientific Revolution: The Formation and Exchange of Ideas in Early Modern Europe*, (Woodbridge, 1998), 137-57.

In the 1870s Newton's archive was presented by Lord Portsmouth to a committee so that they could extract the scientific portion and make it available for research in the university library. The remainder of the archive was returned to Lord Portsmouth in 1888, where they remained for nearly half a century until the Sotheby Sale saw the collection fragmented still further. The bulk of the alchemical papers went to King's College Cambridge, while the whereabouts of the most significant theological papers remained unknown until they surfaced in Jerusalem in the 1960s. For most early twentieth century scholars who thought that a collected edition of Newton's works was desirable, this concentration on his scientific exploits seemed perfectly reasonable. In the post-war dawn of the discipline of history and philosophy of science, Newton's physics and mathematics were studied to the almost complete exclusion of his other intellectual interests. The post-war rupture between Newton's scientific and religious concerns was thus doubly determined – firstly by the reverence paid to his work in mathematics and science, and secondly by the lack of access to his most significant theological works.[7]

Connectionism

In response to the positivist stress on Newton's work in the exact sciences, in the 1960s and 1970s historians began to write about popular culture or about the so called 'occult' interests pursued by many of the heroes of rationalism. In the mid-1960s, David Kubrin showed that in private Newton adhered to cosmological views that were very different from the abstract rational world presented in his *Principia*. Karin Figala and Betty Jo Dobbs made extensive studies of Newton's alchemical works, showing just how committed Newton was both to the alchemical tradition and also to an alchemical and vitalist cosmology. Some of these ideas found their way into a draft 'Conclusio' to the 1687 *Principia*, and more extensively in drafts for the Queries added to the 1706 *Optice*. As ever however, Newton was reluctant to publish such notions. Frank Manuel's work on Newton's chronology (*Isaac Newton, Historian*, of 1963) was followed by his superb psychoanalytical biography of Newton in 1968, and then by a short examination of Newton's 'religion', based on a reading of the Yahuda papers, in 1974. In situating Newton's research within the tradition of the *prisca sapientia*, Ted McGuire and Piyo Rattansi wrote a seminal article on Newton's use of classical sources in the early 1690s to prepare some ultimately unpublished scholia on Propositions 4-9 of the Third Book of the *Principia*. McGuire went on to publish a number of centrally important articles that looked at how Newton dealt with metaphysical and theological topics in draft revisions of his two great works, *Principia Mathematica* and *Opticks* (1704, 1706 and 1717/18).[8]

Most of these historians explicitly went beyond an analysis of the non-scientific writings on their own terms to assert that there was a causal or conceptual influence running from Newton's more occult studies to the more overtly scientific and mathematical notions. In his *Religion of Isaac Newton* of 1974, for example, Frank Manuel argued that although Newton understood the standard injunction not to mix philosophy and theology, "in personal

[7]. For the ways in which archival classification has affected the way in which we understand divisions between areas of Newton's work see Iliffe, 'connected system'.

[8]. B,J.T. Dobbs, *The Janus faces of Genius*, (Cambridge, 1992),

practice he failed to maintain the compartmentalization of religious and scientific studies and the two were allowed to overlap and interpenetrate." Manuel elaborated upon significant and pertinent connections between Newton's theological conception of God as *pantokrator* and his notion of absolute space, and pointed to virtually identical passages in both the 1713 General Scholium and Newton's contemporaneous but unpublished 'History of the Church'. Manuel added, quite plausibly, that Newton's condemnation of metaphysical corruptions of early Christianity bore some relation to his early eighteenth century attack on Leibniz's philosophy. As for his 'methodising' of prophecy, Newton "applied what might be called scientific criteria to the interpretation of the books of prophecy, particularly the law of parsimony" and saw this as "an ideal scientific structure, exhibiting the greatest possible simplicity and harmony. His rules for interpreting the language of prophecy were a replica of those he insisted upon for interpreting the Book of Nature".[9]

Soon after this, Westfall and Dobbs argued that Newton's apparently idiosyncratic notion of 'attraction', realised by Newton as 'gravitation' in Book Three of the *Principia*, owed a great deal to alchemical categories such as 'sympathy'. Dobbs complained in the early 1990s that many historians of Newton's work on the physical sciences denied that alchemy could ever, "by its very nature, make a contribution to science". Yet Newton's use of attractive forces in the *Principia* seems "a convincing argument for the influence of alchemy on Newton's thought, for much alchemical literature concerns itself with non-mechanical 'active principles' that are conceptually similar to Newton's gravity." Rather than claiming that Newton simply transported his notion of active principles from alchemy to his *Principia*-style treatment of gravitation, Dobbs suggested that "all issues of passivity and activity, of mechanical and nonmechanical forces, were enmeshed for Newton in a philosophical/ religious complex one can now begin to grasp." Ultimately, "True knowledge was all in some sense a knowledge of God; Truth was one, its unity guaranteed by the unity of God". [10]

Against this, I.B. Cohen countered that the discovery of Universal Gravitation was the result of Newton's procedure, whereby he generalised first from one to a two-body situation, and then treated a still idealised situation in which every mass point could be considered as centripetally attracting. All this Newton did while tuning his models in the light of data received from astronomers and experimenters. Although Newton's use of the term 'net' (a common term in his alchemical work) in the draft 'Conclusio' to the *Principia* shows that there is a least a prima facie linguistic connection between these areas, scrutiny of the various drafts of 'De Motu Corporum' (the original short paper sent by Newton to Halley at the end of 1684) up to the final enunciation of Universal Gravitation in Book Three, suggested to Cohen that the more traditional internalist account of its development was more plausible. However, it is noteworthy that Cohen gave a great deal of credence to an alchemical genealogy of the concept in his 1999 edition of the *Principia*.[11]

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[9]. Frank Manuel, *The Religion of Isaac Newton*, (Oxford: The Clarendon Press, 1974), 39-40, 97, 98, 103; the supposed link between Newton's prophetic rules, and those of his *Principia* has subsequently been re-emphasised by Maurizio Mamiani in a number of articles; see e.g. Mamiani, "Newton on prophecy and the apocalypse" in I.B. Cohen and G. Smith, eds, *The Cambridge Companion to Newton*, (Cambridge 2002), 387-408.

[10]. Dobbs, 'Janus faces', 4, 5.

[11]. I.B. Cohen, *The Newtonian Revolution*, (Cambridge, 1980) and I.B. Cohen, ed., *Isaac Newton, Principia*, (Berkeley and Los Angeles, U. Cal. Press, 1999),

It would indeed be perverse to argue that there are no connections *at all* between disparate areas of Newton's work. For centuries commentators and historians have shown, as Newton himself often stated in various forums, that he understood there to be intimate links between natural philosophy and theology. This is clear from the General Scholium, for example, as it also is in the final words of his famous Query 31, originally composed in 1705-6:

> if natural Philosophy in all its Parts, by pursuing this Method, 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. And no doubt, if the Worship of false Gods had not blinded the Heathen, their moral Philosophy would have gone farther than to the four Cardinal Virtues; and instead of teaching the Transmigration of Souls, and to worship the Sun and Moon, and dead Heroes, they would have taught us to worship our true Author and Benefactor.

From his correspondence with individuals such as Thomas Burnet and Richard Bentley, and from the evidence of his private manuscripts, it is clear that Newton believed that God created a rationally comprehensible and mathematically describable world that could be grasped by humans if they followed the correct procedures. In this sense, a properly conducted experimental or more generally, natural philosophy led inexorably to the First Cause.[12]

Elsewhere, Newton drew from a long tradition within Judaeo-Christian thought and made explicit connections regarding the relationship between an individual's soul and one's ability to move one's own body, and the manner in which God had created the world and continued to interact with it. In Query 20 (Query 28 in the 1717 edition) of the Latin *Optice* of 1706 he adapted the extraordinary analysis in his earlier 'De Gravitatione', and suggested that empty space was like the 'sensorium' of God, and that God was aware of everything that took place in the universe in the same way that humans were aware of images that came into their brains:

> And these things being rightly dispatch'd, does it not appear from Phænomena that there is a Being incorporeal, living, intelligent, omnipresent, who in infinite Space, as it were in his Sensory, sees the things themselves intimately, and throughly perceives them, and comprehends them wholly by their immediate presence to himself: Of which things the Images only carried through the Organs of Sense into our little Sensoriums, are there seen and beheld by that which in us perceives and thinks. And tho' 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.

In a draft for the wide-ranging Query 23 (Query 31 in 1717) he noted that the Ideas of the Supreme Being 'work more powerfully upon matter than the Imagination of a mother upon an embrio'. Recalling the classical scholia, Newton also told David Gregory at this time (December 1705) that by His intimate presence God was the immediate cause of gravity.

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[12].

This connection between Man and God seems to have formed a central element of Newton's scientific research programme for almost half a century.[13]

As well as conceiving an explicitly voluntaristic view of God's mode of creative action, Newton agreed with the vast majority of seventeenth century natural philosophers that God continuously supported and occasionally intervened in His created world. Indeed, this view was clearly and publicly expressed in various 'Queries' to the *Opticks*. In creating a sophisticated non-mechanical philosophy, Newton was in good company and virtually all seventeenth century natural philosophers designed philosophies that left room for active principles or spiritous substances/ forces. Newton's Deity had an intimate and permanent presence in His Creation, though periodically used secondary causes such as comets to effect momentous creative and cataclysmic events. While this is clearer from the more private cosmologies that saw expression in his 1675 'Hypothesis' and the drafts for the 'Queries', Newton also insisted that God had a similarly close relationship with the world of the *Principia*.[14] Some degree of connectivity is also implied within the treatises written by Newton at the time he composed the *Principia*. In these he detailed how all the guardians of the ancient religion from rabbis and druids to brahmins had also been expert natural philosophers. At some point, he argued, philosophical and religious truths had become corrupted by a misguided hermeneutics that resulted in idolatry and Aristotelian geocentrism.[15]

These by no means exhaust the ways in which historians have argued for connections between different areas of Newton's writings. To list but a few more general points, there are obvious similarities between Newton's conception of Absolute Space and Time and his commitment to a *pantokrator* who undergirds his Creation. This is related to a distinction between the elite and vulgar that is embedded within both his theological writings and his natural philosophy. In the former, able and godly interpreters are enjoined to study Scripture beyond the essentials of the faith and to consume the meat that according to Paul is there for more mature Men. In the latter, he argued (in the *Principia*) that the vulgar experienced movement relatively; mere untutored sense alone cannot determine the real and absolute movements of objects, but it can be determined by the knowledgeable astronomer. Somewhat paradoxically, Newton also presents himself as an empiricist in his textual criticism, in his prophetic writings and in his natural philosophy, refusing to make conjectures regarding those things that cannot be known for certain. On the one hand he

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[13]. See Rob Iliffe, '"That puzleing problem': Isaac Newton and the political physiology of self," Medical History, 39 (1995), 433-58.

[14]. After the 'Queries' that appeared in the first *Opticks* of 1704, seven new queries were added to the Latin *Optice* of 1706 and eight more to the second English *Opticks* of 1717/18. See especially D.C. Kubrin, "Newton and the cyclical cosmos: providence and the mechanical philosophy," J. Hist. Ideas, 28 (1967), 325-46; F.E. Manuel, 'Religion of Isaac Newton', R.S. Westfall, *Never at Rest: A Biography of Isaac Newton*, (Cambridge, 1984); J. Henry, "Occult qualities and the experimental philosophy: active principles in pre-Newtonian matter theory," History of Science, 24 (1986), 335-81; S. Schaffer, "Godly men and the mechanical philosopher: souls and spirits in Restoration natural philosophy," Science in Context, 1 (1987), 55-85, S. Schechner, *Comets, Popular Culture and the Birth of Modern Cosmology*, (Princeton: Princeton University Press, 1997), 133-54.

[15]. See especially Dobbs 'Janus faces', 4-6 and J. Force, "Newton's God of dominion: the unity of Newton's theological, scientific, and political thought," in Force and Popkin, 'Context, Nature and Influence', 75-102.

refuses to speculate on the ways and dates by which prophecies in Revelation will be fulfilled in the future, while on the other, he refuses to publicly discuss the physical nature of a ray of light, or to reveal his thoughts on the cause of gravitation. I have also elaborated elsewhere on the particular way in which Newton reads source-materials in different fields and then develops positions of his own, moving dramatically beyond both modern and classical positions. This real and presentational epistemological individualism seems to mark his approach to any new text. Historians can legitimately search for such connections and doubtless new and unexpected similarities or connections will be found in the future.[16]

Nevertheless, the degree of commitment to finding links between different areas of Newton output has often gone beyond more limited talk of interpenetration. Both Dobbs and Manuel invoked Newton's 'mind' as the force that combined all his different interests. Manuel, for example, remarked that whatever Newton scrutinised he was "searching for a unifying structure"; all his studies "bespeak the same mentality and style of thought. If nature was consonant with itself, so was Isaac Newton's mind". According to Dobbs, "The Janus-like faces of Newton were after all the production of a single mind, and their very bifurcation may be more of a modern optical illusion than an actuality". Newton's mind "was equipped with a certain fundamental assumption, common to his age, from which his various lines of investigation flowed naturally: the assumption of the unity of Truth." Nevertheless, Dobbs, continued, the fact that all his different pursuits were directed towards one end has been difficult to grasp, and has led to 'misunderstandings', since his papers "largely reflect a single-minded pursuit of each and every one of his diverse studies, as if in each one of them lay the only road to knowledge." When Newton wrote alchemy, "he wrote as an alchemist", and when he wrote chemistry, "his concepts conformed to those of contemporary chemists."[17]

The question, as I see it, is precisely one of how one can legitimately argue for a coherent unity to Newton's work when -- as Dobbs rightly points out – his style of argument and even the very concepts he uses are embedded within the traditions in which he writes. However plausible *a priori* an integrated identity of author and the *oeuvre* appears, this assumption has not gone without major criticism. Attacks on authorial unity and textual coherence, and celebrations of the death of the author, have all been staples of recent literary criticism. Outside the postmodernist field, other historians have criticised the a priori assumption that there must be a unity of method, content and purpose to an individuals work. For example, in his *Occult and Scientific Mentalities in the Renaissance*, Brian Vickers argues that in the sixteenth and seventeenth centuries there were two separate 'mentalities' or 'traditions', "each having its own thought processes, its own mental categories, which determine its whole approach to life, mind, physical reality." In the case of Newton, Vickers suggests that although it was true that his intellectual work was all performed by the same person (whether or not one called them 'rational' or 'irrational'), "the question is whether the

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16. See Iliffe, 'Epistemological individualism and the young Newton', forthcoming.

17. Manuel, 'Religion',103; see also Dobbs, 'Janus faces', 5-15 (esp. p. 9) and Jim Force, "The nature of Newton's 'Holy Alliance' between science and religion", in M. Osler, ed., *Rethinking the Scientific Revolution*, (Cambridge,2000), 247-70, esp. 254. See in particular J.E. McGuire, and P.M. Rattansi, "Newton and the 'Pipes of Pan'", *Notes and Records of the Royal Society*, 21, (1966) 108-43 and David Kubrin, "Newton and the cyclical cosmos: Providence and the mechanical philosophy", *Journal of the History of Ideas*, 28, (1967) 325-46.

same parts of his mind are engaged in each activity … we must at least entertain the hypothesis that Newton, like other human beings could devote himself to different activities, each for its own sake, without them all having to be seen as forms of the same activity, or each indelibly affecting the rest." The will-to-unification exhibited by students of Newton's alchemical writings was 'anachronistic' and 'unhistorical'.[18]

Although I concur with Vickers' general dissatisfaction with naive connectionism, his use of the notion of 'mentalities' or 'parts of the mind' to make his case is overly psychologistic. Indeed, to compartmentalise Vickers's own work for a moment, his own work on the structures of rhetorical traditions has been extremely influential in displaying the sort of discursive rules shaping much of written and spoken scholarly culture in the Renaissance and early modern periods. In the case of Manuel and Dobbs, both authors seem to protest too much about the fact that Newton's outpourings were the product of a single mind, which functions as the ultimate guarantor for the coherence of his metaphysical commitments. As I have already mentioned, this methodological position underlies many of the efforts to locate links between disparate areas of Newton's work; at its worst, it gives rise to false positives, such as the putative links between his theology and alchemy, or those between the 'rules' outlined in Newton's substantial prophetic treatise and in the *Principia*.[19]

For example, Dobbs has argued that there was a further connection between different areas of Newton's work. On the one hand there is the fact that in the alchemical sphere special 'activating' work took place both naturally and also within alchemical practice. According to Dobbs, for Newton both these processes required the use of the divine 'vegetable spirit' he discusses in one of the handful of manuscripts that are genuinely his own alchemical work. On the other there is the fact that within the Arian system the Son is the first creature who as the Word was God's agent in forming and creating the world. Dobbs argued that "There can be little doubt that it was his Arian theology that enabled him to ... situate the vegetable spirit in God's cosmogonical and cosmological scheme of things". Christ's duties, according to Newton,

> would seem to place him in charge of – or perhaps identify him as – such natural entities as the vegetable spirit, which as argued above, Newton saw as exercising God's providential care in shaping '[all] that diversity of natural things which we find suited to different times and places,' God's alchemical 'Vicegerent'. Newton apparently thought that when organized matter first arose from chaos, Christ, as God's executive, directed the vegetative, nonmechanical processes between the most minute primordials, ... then continued to direct the vegetative operations of nature ... As the Christ acted in his capacity of assistant to the father to frame the cosmos in the beginning, and since the creation of the world prefigured the alchemical work, the active agent in alchemy is thus identified as the Logos – still acting as God's creative agent in the framing of the world of matter

Nevertheless, interesting as this claim is, Newton *nowhere* makes or even hints at this connection, either in his theological or in his alchemical writings. Dobbs's more cautious statements about the relationship between Newton's alchemical notions and his 'Arianism'

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[18]. Vickers, 'Occult and scientific mentalities', 6, 15-16.

[19]. Brian Vickers, *In Defence of Rhetoric*, (Oxford, 1987).

have given way -- without adducing any extra evidence -- to assertions to the effect that "as one has already seen, the logos came to be intimately connected in his mind with the alchemical spirit".[20]

If, as Newton put it, commentators have been 'straining' the texts to make their case, there is evidently a problem with the assumption of coherence between different fields of enquiry. In the rest of this paper, I argue that paying attention to rhetorical techniques appropriate to different spheres reveals a fundamental distinction, recognised by Newton – between different areas of his intellectual activity. He did research and wrote within well-defined disciplines and genres, which had associated epistemological presuppositions, codes of behaviour and forms of authorial self-presentation. For sure, he adapted these conventions as he worked, and of course he devised extraordinarily original concepts within these confines. But the constraints provided by these pre-existing traditions infiltrated the structures of his work to a remarkable extent, so that the idea of a readily discernible, describable and ultimately unitary author is not one that can be deduced from his performances in each field.

Compartmentalisation and Forensic Rhetoric

The vast majority of passages that have been used by historians to point to the integrity of Newton's work in natural philosophy and theology belong to a series of canonical texts associated with Newton's two major philosophical works. These can be broadly defined as falling under the heading of natural theology, and it is clear that there are conceptual links between these domains. However, the millions of words of other theological writings that have recently been studied cannot be understood through existing science-religion interpretive schemas. Rather than examining them in terms of their putative links to his writings in mathematics or natural philosophy, I argue that they should now be placed in contexts that can better help us understand what texts and current political and theological conditions Newton was responding to. In fact, they represent one of the most remarkable and extensive collections of papers of any early modern European religious radical. Moreover, from the early 1690s Newton was in tentative communication regarding his theological conceptions with other radical thinkers such as John Locke. The real audience for his early writings was nevertheless tiny, and he engaged in a number of strategies for hiding his heresy from others. In the eighteenth century he was a dominant member of a small network of variously heterodox individuals who were interested in the nature of Christ and the Trinity, and who were not afraid to deploy powerful techniques to critically analyse and condemn orthodox belief. Unlike most of these men, however, Newton was not about to compromise his new identity as a Metropolitan bureaucrat by being revealed as a social pariah.

The comment has frequently been made that Newton did not distinguish between various fields of his work. Yet this can easily be refuted, for he explicitly distinguished

[20].Dobbs, 'Janus faces', 81-6 and 90.

between the sort of evidence, level of proof, and type of argument structure appropriate to his prophetic studies, and those relevant to mathematics. In the preface to an extensive prophetic treatise composed in the 1670s or 1680s, he condemned

> the blindness of a sort of men who although they have neither better nor other grounds for their faith then the Scribes & Pharisees had for their Traditions, yet are so pervers as to call upon other men for such a demonstration of the certainty of faith in the scriptures that a meer naturall man, how wicked soever, who will but read it, may judg of it & perceive the strength of it with as much perspicuity & certainty as he can a demonstration in Euclide ... I could wish they would consider how contrary it is to God's purpose that the truth of his religion should be as obvious & perspicuous to all men as a mathematical demonstration. Tis enough that it is able to move the assent of those which he hath chosen; & for the rest who are so incredulous, it is just that they should be permitted to dy in their sins. Here then is the wisdom of God, that he hath so framed the Scriptures as to discern between the good and the bad, that they should be demonstration to the one & foolishness to the other.

As I have pointed out elsewhere, this account distinguished Newton from a number of contemporaries, such as Henry More, who did believe that statements relating to Scriptural prophecy could be demonstrated with mathematical certainty. Indeed, Newton allowed his authorial self – and indeed the discursive style and content of his writings – to be constrained by a number of different rhetorical conventions within theological writings.[21]

The forms of proof appropriate to his theological writings had little or nothing to do with the styles he adopted in natural philosophy. Where he drew for the latter from the quadrivial mixed mathematical disciplines, the former drew their proof structures from the rhetorical disciplines taught within the trivium. A number of historians have shown how early modern natural philosophers and astronomers such as Copernicus, Kepler and Galileo deployed standard humanist rhetorical techniques or tropes in their work. Copernicus was steeped in standard tropes of modesty and diffidence and used them to excellent effect in the Preface and Book One of *De Revolutionibus*, while Kepler had actually taught rhetoric when a school teacher in Graz. As a means of training elite students to conduct themselves as successful citizens or subjects, rhetoric continued to play a major role in undergraduate education in the seventeenth and eighteenth centuries. It was a central plank of the trivium in late seventeenth century Cambridge and Newton's student notes show that like thousands of other students across Europe, he was introduced to the basic elements of classical rhetoric by means of an epitome of Gerard Vossius's *Institutiones Oratoriae*. His early notes from Vossius – admittedly showing little of the enthusiasm associated with his embryonic mathematical and physical research – show that he was required to learn and was *au fait* with the basic parts and functions of rhetoric. In any case, it was his exposure to serious scholarly theological texts, all of which used classical rhetorical techniques in some form, that

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[21]. Yahuda Ms. 1.1, fols 18r-19r (www.newtonproject.ic.ac.uk/texts/viewtext.php?id=THEM00135&mode=diplomatic); see Rob Iliffe, "making a shew': prophetic hermeneutics and anti-idolatry in the work of Isaac Newton and Henry More," in J. Force and R. Popkin, eds, *The Books of Nature and Scripture*, (Dordrecht, 1994), 55-88 and Raquel Delgado-Moreira, "Newton's treatise on Revelation: the use of a mathematical discourse," Historical Research, 79 (2006), 224-46.

introduced him to the modes of proof and rhetorical styles that would be relevant for the genres in which he would work.

Following classical understandings of the different forms of procedure within disciplines, writers and orators proceeded according to appropriate forms of argument and demonstration. In rhetoric, the form of argument and the appeal to the audience was intimately bound up with the sort of setting in which the discourse took place. Some rhetorical techniques were appropriate to instructing students, while others were relevant to political oratory. While Aristotle argued that political oratory was the most respectable form of rhetoric, the great Roman writers argued that the forensic or judicial style was the most elite form of rhetorical practice. In forensic oratory, the speaker addresses his discourse to a judge and deals both with the truth or falsity of past events, a role that usually requires the assigning of praise or blame to different people. According to Aristotle, the forensic speaker assumed a wider good that was being harmed or supported by the actions under review; he had to ascertain the nature and extent of the incentives to malfeasance; the state of mind and intentions of the wrongdoers; and also the sort of people wronged and their condition. It was the last discursive form that Newton found in many of the Protestant apologetics in which he was steeped, and it was in this style that he excelled in finding his enemies – of the fourth or seventeenth century -- guilty of various crimes and misdemeanours.[22]

Kepler went straight from his employment to work with Tycho Brahe, and was obliged to use judicial rhetorical techniques in his brilliant defence of his master against the Imperial mathematician at Prague, Ursus. Tycho was in fact at that point involved in a real legal action against Ursus regarding theft and defamation, and as Nick Jardine has shown, Kepler devised a surrogate case against Ursus in defence of the reality of astronomical hypotheses. Kepler used the language of 'witnesses' and testimony', and appealed to an implied forum that might be the judge of the business at hand. Kepler rigorously followed Roman rhetorical guidelines on how to conduct a case, beginning with an *exordium* (disposing the judges to the argument at hand), and then followed by the *narratio* (the statement of the relevant facts), the *propositio* and *partitio* (the main issues the litigator wants to address followed by the manner with which he will treat it) and the *contentio* (the bulk of the argument in which the main case is made and the points of the defence refuted). Within this general structure, more subtle rules of dialectic governed the way orators – or writers – were to use a number of well-established rhetorical devices as part of their *argumentatio* (argumentative strategy). Handbooks gave detailed advice on which of these techniques was to be used in any given situation.[23]

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[22]. See in particular Vickers, 'Defence of Rhetoric', 21-6.

[23]. See R.S. Westman ; Vickers, 'Defence of Rhetoric', and Nick Jardine, *The Birth of the History and philosophy of Science. Kepler's Defence of Tycho versus Ursus*, (Cambridge: CUP, 1986), esp. pp72-9. For law-court rhetoric in the Classical world see E. Harris and L. Rubinstein, *The Law and the Courts in Ancient Greece*, (London, 2004), M.L. Clarke, *Rhetoric at Rome: A Historical Survey*, (London, 1996); A. Blanchard, "The birth of the law-court: putting ancient and modern forensic rhetoric in its place," in M.R. Edwards and C.G. Reid, eds, *Oratory and Action*, (Manchester, 2004). For the early modern period see R. Schoeck, "Lawyers and rhetoric in sixteenth-century England," in James Murphy, ed., *Renaissance Eloquence* (Berkeley, los Angeles and London, 1983), 274-91 and Michelle Zerba, "The frauds of humanism: Cicero, Machiavelli and the rhetoric of imposture," Rhetorica (2004), 215-40.

By the seventeenth century there was a substantial tradition of Protestant interpretation that used forensic rhetoric to show how Roman Catholicism had introduced a whole series of practices neither warranted by Scripture nor by the early Church Fathers. Given the level of criminal activity held to be inherent in early Catholic corruptions of Scripture, it was in the forensic *modus* that Newton wrote to John Locke in November 1690, in two essays that aimed to show that two trinitarian proof-texts, 1 John 5:7 and 1 Tim. 3:16, were interpolations foisted in by Catholics. These had to be rooted out of the Bible, Newton told Locke, but "whilst we exclaim against the pious frauds of y^{e} Roman Church, & make it a part of our religion to detect & renounce all things of that kind: we must acknowledge it a greater crime in us to favour such practices". Newton's 'letter' is an exceptionally complex analysis of sources relating to these texts, the goal evidently being to show that the passages were not mentioned in the early church when in fact they would have been the most suitable for making the trinitarian case. Numerous texts are cited by Newton to show this absence, and also to prove that texts that ostensibly date from the same period either mean something different, or in fact are later interpolations. It was much more likely that the text had never existed, he argued, than that the supposedly heretical Arians "were crafty Knaves that could conspire so cunningly & slyly all the world over at once" to raze the text from all existing copies "& Conjurers too, to do it without leaving any blot or chasm in the books, whereby the knavery might be suspected & discovered". On the other hand, very old texts of the New Testament showed "the footsteps of the insertion".[24]

The second strand of Newton's approach drew from the branch of forensic rhetoric dealing with the assigning of guilt or innocence. In the Locke letter, Jerome emerges as the chief miscreant in promoting the corruption of 1 John 5: 7-8. He was accused of perverting Scripture by his contemporaries and so, Newton told Locke, "he being called to the barr, we are not to lay stresse upon his own testimony for himself, (for no man is a witnesse in his own cause,) but laying aside all prejudice we ought according to the ordinary rules of justice to examin the businesse between him & his accusers by other witnesses." His actions, by which he tried to insert the false passage into his Vulgate, were clear, or at least so Newton argued. His intention, of promoting the doctrines of the Catholic Church, was obvious, while many commentators on his writings had noted "a strange liberty he takes in asserting things". But ever the objective lawyer, Newton then goes on to dismiss such hearsay and to consider the evidence alone. The second part of Newton's letter, on 1 Tim. 3:16, is also drenched in the language of "falsations" "conspiracy" and "shams", and a general style appropriate to the law-court. It was, as Newton told Locke, "y^{e} character of an honest man to be pleased, & of a man of interest to be troubled at the detection of frauds". This was of course, no ordinary fraud, and concerned the authenticity of orthodox Christianity.[25]

The same techniques were used on a much larger scale in his treatment of Athanasius, found guilty of much larger crimes in perverting Christianity. In the letter to Locke and in his conviction of Athansius, Newton used most of the standard devices such as *exemplum* and *concessio* that were the staple of argument within forensic rhetoric. Nevertheless, Newton was

[24]. 'Newton Correspondence', 3: 83, 93 and 96.

[25]. 'Newton Correspondence', 3: 88-9 and 122.

able to use a number of techinques from other areas of the Western rhetorical canon, and did so at length in his early dealings with the wider intellectual community.[26]

Rhetoric in the forum of Natural Philosophy

Newton would argue repeatedly – of course using standard rhetorical devices – that judicial rhetoric was utterly inappropriate for doing natural philosophy, and that the philosophical polity must have become corrupted for it to be used. Nevertheless, in his first dealings with the mathematical and scientific communities outside Cambridge, Newton adopted a number of classical rhetorical poses. Many of these ran counter to the authorial presentations and epistemological conventions deemed appropriate to promoting these topics by the 1660s. Deeply sensitive to divisions between the mixed mathematical style of argument and demonstration, and that associated with conventional natural philosophy, his penchant for the mathematical style of presentation set him deeply at odds with the codes of behaviour preferred by most members of the cosmopolitan Royal Society. As a number of historians have shown, these stressed openness, communalism and probabilism as proper authorial and epistemological stances. Yet when he first came in contact with a metropolitan mathematical audience -- two years before he revealed his philosophical work to the London and European communities -- he bewildered his go-between, the mathematical intelligencer John Collins, by asking that any work of his that Collins showed around should be left anonymous. This was a conventional, genteel form of rhetorical self-presentation, more appropriate to poetry, but now (as Collins thought) inappropriately transposed to the world of mathematics.

When he came into contact with the Royal Society in connection with the announcement of his reflecting telescope and the publication of his famous paper on light and colours (of February 1671/2), he presented himself as a mathematically committed natural philosopher. Yet doing so within the domain of the Royal Society provided him with a difficult brief. From the perspective of many of the Society's empiricist spokesmen, mathematicians were arrogant and their claims to certainty or of the relevance of their work to the natural world were often overblown. Newton's relationship with the Society is characterised by a marked vacillation between an extreme modesty and a pose of diffidence to his own work, and the confident claims to the exceptional precision of his measurements and the certainty of his work. As Newton himself wished, his contemporaries and virtually all later historians – even those who have not seen Newton as a saint -- have read off these displays of modesty as real psychological states. Newton really did not want to engage in disputes, and indeed apparently hated doing so. Nevertheless, recent historical work suggests that these claims are better read as presentations of self that were heavily constrained by the conflicting demands required by composing works within the discipline of mixed mathematics and by publishing in the forum provided by the Royal Society.

[26]. For the content of his critique of Athanasius's morals and actions, couched in terms of 'Paradoxical questions', see Iliffe, 'Prosecuting Athansius' and the longer version of the original text now available at www.newtonproject.ic.ac.uk/texts/viewtext.php?id=THEM00117&mode=diplomatic.

Indeed, Newton always assailed his enemies with both gusto and aplomb when the time came.[27]

Throughout the months and years following the publication of his work on optics, Newton repeatedly claimed that the printed forum and its readership were not appropriate to the nature and style of presentation of his work. When his work was criticised, he protested his own modesty and unwillingness to be engaged in fruitless disputes, both hallmarks of genteel-humanist presentations of self in the Republic of Letters. On a number of occasions he threatened to withdraw completely from the world of print, and had practically done so by the end of 1676. Being dragged into public disputes denied him the liberty of responding to private letters in his own time; in particular, a protracted series of exchanges with Liege Jesuits kept pulling him back into the public sphere. If he got free of this "buisiness", he complained to the secretary of the Royal Society, Henry Oldenburg, "I will resolutely bid adew to it eternally, excepting what I do for my privat satisfaction or leave to come out after me. For I see a man must either resolve to put out nothing new or to become a slave to defend it".[28]

Such sentiments were also connected with continuing problems with Robert Hooke, who had been the major source of trouble when Newton had originally published his paper on light and colours at the start of 1672. In his responses to Hooke in the aftermath of his paper, Newton had mixed mathematical and forensic styles of proof, attacking Hooke's competence while simultaneously attempting to prove the truth of his work with absolute mathematical certainty. In late November and early December 1675, despite his professed aversion to publishing disputacious conjectures, he drew from his alchemical and other researches to compose a long 'Hypothesis' regarding the existence of a rare and elastic aether. This was supposedly released to the Royal Society in order to allay some of the criticisms that had been made about his views on the nature of light, and it was read out at weekly meetings of the Society from 9 December. Hooke had publicly objected that the bulk of the 'Hypothesis' was actually contained in his own *Micrographia* and he even set up a 'philosophical clubb', at the first meeting of which this issue was the main topic of conversation.[29]

When Newton got to hear of Hooke's comments he composed a devastating critique developing his previous contention that most of Hooke's own theory could be found in Descartes. This attack drew from Newton's pronounced expertise in judicial rhetoric, and concentrated on demonstrating Hooke's intellectual and ethical shortcomings. Indeed, Newton's treatment of Hooke's apparent morals, motives and actions accorded exactly with the sort of advice given by manuals dealing with judicial rhetoric. Hooke had added little to Descartes and had hidden the fact that he had been heavily dependent on Descartes' work.

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[27]. For the Royal Society's attitude to the social polity associated with mathematics, see Steven Shapin, A Social history of truth, (Chicago, Ch UP, 1994), For Newton's sensitivity to audience and to disciplinary divisions see also, Rob Iliffe, "Abstract considerations", Studs Hist. Phil. Sci., (2004)

[28]. Newton to Oldenburg, 14, 28 and 18 November, 1676; 'Newton Correspondence', 3: 45, 2: 181-2, 183 and 184.

[29].

He had done nothing, or very little, and Newton's work 'destroyed' Hooke's claims to truth or originality. Hooke was found summarily guilty of plagiarism (and thus dishonour) and incompetence.[30]

Newton's attack on Hooke was read out, apparently verbatim, at the Royal Society meeting of 20 January 1675/6, although in the meantime he had in any case fired off another letter to Oldenburg regarding Hooke's 'insinuations'. When he heard the December letter read at the meeting on 20th January, Hooke immediately reassured Newton in a generous letter addressed to his "much esteemed friend" that "I do noeways approve of contention or feuding and proving in print, and shall be very unwillingly drawn to such a kind of warr". Finally he offered to correspond with Newton by private correspondence, affirming that when he had the chance to study Newton's paper at greater length he would send his objections or "concurrences". Communicating by means of an intermediary would only produce heat that would kindle cole – exactly the same term that he used in his diary entry for the same day. In replying to Hooke, Newton remarked that "there is nothing wch I desire to avoyde in matters of Philosophy more then contention, nor any kind of contention more then one in print". Embracing a private correspondence, he noted that "What's done before many witnesses is seldome wthout some further concerne then that for truth: but what passes between friends in private usually deserves ye name of consultation rather then contest." He praised Hooke's achievements and asserted that no one was more able to make an intelligent assessment of his work than Hooke, though more famously if perhaps less magnanimously he added: "if I have seen further it is by standing on ye sholders of Giants".[31]

Newton succeeded in avoiding philosophical intercourse in the last few years of the 1670s, preferring to engage in private alchemical and theological pursuits. Indeed, when Hooke approached him to make a contribution to the ailing Society in November 1679 on the topic of celestial dynamics, Newton presented himself as a country recluse who had been away from philosophical conversation for too long to be considered capable of saying anything important. After Hooke had made public a letter which Newton had explicitly asked to remain private, he retreated yet again to the safety of Trinity College where he continued his studies of alchemy and theology.[32]

This hermitage changed when Edmund Halley visited him in the summer of 1684 and coerced the Lucasian Professor to produce a demonstration of the link between the ellipticity of planetary orbits and a general inverse-square distance law. Newton sent him a

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[30]. Newton to Oldenburg, 21 December 1675; NC, 1: 405-6.

[31]. Newton to Oldenburg, 20 January 1675/6; Hooke to Newton, 20 January 1675/6; Newton to Oldenburg, 25 January 1675/6 and Newton to Hooke, 5 February, 1675/6; NC, 3: 412-13, 413-4 and 416; H.W. Robinson and W. Adams, eds, *The Diary of Robert Hooke*, (London: Taylor & Francis, 1935), 199 and 205-6; F. Manuel, *A Portrait of Isaac Newton*, (Cambridge, Mass.: Harvard University Press, 1968), 143-6 and R.K. Merton, *On the Shoulders of Giants: A Shandean Postscript (The Post-Italianate Edition)*, (Chicago: University of Chicago Press, 1993). For the humanist critique of the disputational mode, see N.W. Gilbert, "The early Italian humanists and disputation", in A. Molho and J. Tedeschi, eds., *Renaissance Studies in Honor of Hans Baron*, (Florence, 1971), 203-26.

[32]. Newton to Hooke, 28 November 1679; 'Newton Correspondence', 2: 300-2.

nine page treatise, 'De motu corporum in gyrum' in November and developed it over the following year and a half, incorporating physical and mathematical insights such as the calculus and the laws of motion, and the concepts of inertial and gravitational mass, centripetal force, and universal gravitation. Most importantly, he produced a demonstration that an inverse square law lay behind the elliptical orbits of planets and their satellites. By autumn 1685, he had completed a work consisting of two books (the *De Motu Corporum, Liber Primus* and *De Motu Corporum, Liber Secundus*). Subsequently he expanded the *Liber Primus* into drafts of what were to become Books One and Two of the *Principia*, while the initial *Liber Secundus* was transformed into the published Book Three.[33]

Nevertheless, as he neared its completion, Newton was informed by Halley that Hooke was claiming priority for the proof that planetary orbits were a consequence of the inverse-square relation. Hooke, Halley told Newton in May 1686, "sais you had the notion from him, though he owns the Demonstration of the Curves generated therby to be wholly your own". Halley suggested that Hooke only seemed to want a mention in the preface, and rather hopefully claimed that he was sure Newton would act with the greatest candour, "who of all men has the least need to borrow reputation". Newton immediately responded that in the *Principia* material now held by Halley (i.e., Book One), "there is noe one proposition to which he can pretend, & soe I had noe proper occasion of mentioning him there." He then went back over the correspondence of 1679-80, suggesting that he had learned nothing new or material from Hooke in the letters he had received and pointing out that he had discussed the inverse square law with Christopher Wren in 1677, so that Hooke had no claims to priority in that regard.[34]

In his absence, Hooke was tried in a virtual court of law and Newton gave Halley his own history of the exchanges with Hooke in 1679-80, concluding that Hooke was the last of Wren, Newton and himself to know about the inverse-square relation. Newton then contradicted himself by first saying that the "case" between himself and Hooke was a "frivolous business" that he would merely summarize, and next, by launching into an overwhelming excursus against him. Newton began by saying that he had never discussed the application of the inverse-square law to the heavens with Hooke, and therefore Hooke could not conclude that Newton did not know of it. In any case Hooke had erroneously applied the law to the inside of the earth. Newton claimed that even before he had first corresponded with Henry Oldenburg he had known of the inverse square law and had compared it with the Moon's tendency to recede from the center of the Earth. Using the standard technique of *concessio*, Newton remarked that even if he *had* received the inverse square law from Hooke, Hooke had guessed wrongly both in extending the law to the center of the Earth and had also lacked any proof that the law held more than *quam proxime* at great distances from the center of attraction. Finally, he told Halley that because he lacked a good theory of comets, he was going to suppress the third book. Philosophy, he wrote, "is such

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[33]. F. Cajori, ed., *Sir Isaac Newton, Principia, vol. II. The System of the World*, (London: University of California Press, 1962); 549-50. See also Cohen, 'Introduction', 48-53, 56-79, 109-115 and Westfall, 'Never at Rest', 402-68, esp. 433-49 and 459-60.

[34]. Halley to Newton, 22 May 1686 and Newton to Halley, 27 May 1686 and 7 June 1686; NC, 2: 431 and 433-34.

an impertinently litigious Lady that a man had as good be engaged in Law suits as have to do with her. I found it so formerly & now I no sooner come near her again but she gives me warning".[35]

At some point a friend told Newton that at a recent meeting of the Royal Society Hooke had "made a great stir pretending I had all from him & desiring they would see that he had justice done him". In a furious postscript, he told Halley that he could "not forbeare in stating y^{t} point of justice to tell him" how Hooke had stolen Borelli's 'hypothesis' from its author. Hooke had

> done nothing & yet written in such a way as if he knew & had sufficiently hinted all but what remained to be determined by y^{e} drudgery of calculations & observations, excusing himself from that labour by reason of his other business: whereas he should rather have excused himself from that labour by reason of his inability.

The profligate sower of 'hints', Newton sarcastically noted, wanted all the credit while "I must now acknowledge in print I had all from him & so did nothing my self but drudge in calculating demonstrating & writing upon y^{e} inventions of this great man." He went back over the evidence of his earlier correspondence and wove a story about how Hooke might have stolen the idea from perusing a letter sent to Oldenburg for Huygens in 1673. However, Hooke had <u>mis</u>understood what he had tried to thieve. All in all, Hooke was a lousy mathematician and a man of a "strange, unsociable temper." Hooke was found to be guilty, and his competence and honour were left in shreds by the powerful attack mounted within the forensic tradition. On a much larger stage, exactly the same charges, formulated using exactly the same techniques, would be levelled later against Leibniz.[36]

Newton's problems with the reception of his theory of light and colors set the pattern for his authorial relationship with the audience in the philosophical republic of letters. As a genteel humanist he professed a dislike for the barren format of the dispute, but when philosophy became 'litigious', he relished the chance to display his prowess at judicial rhetoric and crushed his opposition with brilliant aplomb. It is striking that Newton's treatment of Hooke and Leibniz, the main enemies of the first and second halves of his career, used the same forensic rhetorical techniques as those he used to convict the historical figures of Jerome and Athanasius. Of course, the intensity of his attacks is susceptible of a psychological account. For example, in his *Never at Rest*, Richard S. Westfall couches his analysis of Newton's dealings of the fourth century in terms of psychological and emotional state: Newton "identified himself with Arius, both intellectually and emotionally. He relived the terrible struggles of the fourth century, when doctrine counted for more than charity, came to see Athanasius as his personal nemesis, and learned to hate him fiercely". According to Westfall, in his long analysis of Athanasius's morals and actions Newton "virtually stood Athanasius in the dock for a litany of sins [and] the passion evident in his earlier interpretation of Revelation rose to a new level of intensity." Finally, he remarks that

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[35]. Newton to Halley, 27 May and 20 June 1686; <u>ibid</u>., 2: 433-4 and 436-7 (my italics).

[36]. Newton to Halley, 20 June 1686; NC, 2: 438-9.

when the early criticism of Newton's theory of colours "drove him frantic, the pattern that disagreement took in the fourth century may have determined his conduct".[37]

Westfall is correct to draw attention to the emotional commitment displayed by Newton in these writings, as also to the relationship between the structure and content of the texts he read, and the travails he faced in the 1670s. Nevertheless, he misses the impact on his theological research of his encounter with critics of his public work, and he ignores the fact that Newton worked within a set of discursive traditions and structures that guided the way he wrote and behaved. Nor did he identify with Arius, as what little evidence there was relating to his life was fatally tainted by originating from his enemies. As with Jerome, Newton really did put Athanasius on trial and found him guilty according to the rules laid down by the tradition of Protestant judicial rhetoric. Within this tradition, as in others, there were specific social and ethical codes of behaviour that went side by side with an implied spatial setting for his work. When Newton analysed Jerome and Athanasius, and then Hooke and Leibniz, he put them on trial because that was what the tradition and techniques of judicial rhetoric demanded.[38]

Withdrawal symptoms

The social role of the advocate was not the only role Newton adopted when adopting judicial rhetoric, for his primary identity and his core values came from being a radical Protestant. Indeed, he adopted a number of such roles throughout his career, some of which were fused. Evidence indicates that Newton was brought up in a devout and in its broadest meaning Puritan household – although almost certainly, given the profession of friends and relatives, he attended orthodox services. His social identity was then formed by his situation at Trinity College Cambridge, where he underwent conventional training in rhetoric and theology and became a don. Almost immediately he was separated from his fellows by being elevated to the Lucasian Chair, his work in that office indicating his deep commitment to the role of a mathematician (and accordingly, to the significance of mathematics for natural philosophy). Although he gained dispensation from taking holy orders in 1675, he devoted as much time as anyone else to theological study. We know of no meetings with antitrinitarians active in Oxford and London in the 1660s and 1670s, and the earliest discernible writings suggest that his heresy was shaped by a strenuous but direct engagement with patristic texts in the late 60s or early 70s. The tenor of his heresy would be scholarly, mimicking the research styles and rhetorical strategies of other academics in all but doctrine.

From an early stage Newton identified himself with the elect remnant of godly people whose fate throughout history had been to be persecuted by the dominant, idolatrous pseudo-religion of Roman Catholicism. In one gigantic work composed at various stages in the 1670s and 80s, he provided an astonishing account of the tribulations of fourth and fifth

[37]. Westfall, 'Never at rest', 318 and 344.

[38]. See more generally, Rob Iliffe, "Proecuting Athanasius': Protestant forensics and the mirrors of persecution", in J. Force and S. Hutton, eds, *Newton and Newtonianism: new Studies*, (Kluwer, 2004), 43-72.

century godly antitrinitarians, and of the supposedly divine punishments administered to Catholics in retribution for their persecutory behaviour. In conventional rhetorical form, and using printed if often barely used patristic sources, he reached completely heretical conclusions about the perversions of authentic early Christianity. Biblical prophecy, understood through the basic ordering system pioneered by modern Protestant exegetes like John Napier, Joseph Mede and Henry More, provided the structure for Newton's interpretation but at key junctures he inverted the conventional identities of good and evil.

In the preface to this work he began by claiming that he had 'by the grace of God' obtained knowledge in the prophetic writings, and now that the time was at hand when they were to be revealed, he was duty bound to teach their meaning for the edification of the church. These did not consist of all Christians, but "a remnant, a few scattered persons which God hath chosen, such as without being blinded led by interest, education, or humane authorities, can set themselves sincerely & earnestly to search after truth." Now, searching Scripture was a "duty of the greatest moment", and failure to correctly discern the signs of Christ's Second Coming would leave Christians open to as much criticism as the Jews had received for failing to realise that Jesus was their Messiah.[39]

Newton's religious purity was implicitly contrasted with the mores of his contemporaries, who were mired in moral filth:

> Where are they that live like the primitive Christians, that love God with all their hearts and with all their souls and with all their might, and their neighbour as themselves; and that in what they do well are not rather led by fashions and principles of Gentility then religion, and where those disagree do not account it rudeness to depart from the former? I fear there are but very few whose righteousness exceeds the righteousness of the Scribes and Pharisees.

This was a task that could only be carried out by the pure of heart, and few were ready. Uniquely amongst writings that survived, Newton adopted a 'thou' form of address to a virtual audience, characterised as Puritan in religious demeanour (if not doctrine) by the content of the writing:

> This is the guise of the world, and therefore trust it not, nor value their censures and contempt. But rather consider that it is the wisdom of God that his Church should appear despicable to the world to try the faithfull … Be not therefore scandalised at the reproaches of the world but rather look upon them as the mark of the true church ... Let me therefore beg of thee not to trust to the opinion of any man concerning these things, for so it is great odds but thou shalt be deceived. Much less oughtest thou to ~~keep to~~ rely upon the judgment of the multitude, for so thou shalt certainly be deceived. But search the scriptures thy self and that by frequent reading and constant meditation upon what thou readest, and earnest prayer to God to enlighten thine understanding if thou desirest to find the truth.

Aside from being an exhortation to godliness, this was more his was more narrowly an appeal to members of the true church, a body of believers who existed in some timeless sphere and who adhered to the pure way of life enjoyed by the original Christians. Even if he was one of the Elect, with a duty to act as a saint or martyr, he was not about to blow his

[39]. Yahuda 1.1 fols ((www.newtonproject.ic.ac.uk/texts/viewtext.php?id=THEM00135&mode=normalized)

cover in an England that still had capital punishment for antitrinitarian blasphemy on its statute books.[40]

Newton's loneliness as a silent member of the Elect was mirrored in the intensely individualistic way in which he pursued truth and analysed texts. The discovery of religious truth through personal immersion in the Scriptures (and to a lesser extent, the writings of the Church Fathers) was a religious demand placed on Protestants, just as critically engaging with nature through experiment was an ethical imperative for philosophers. Newton took seriously the injunction to find out things for himself – and to present his work as such – a feature that has made it difficult to locate him with respect to contemporaries. In many respects, his identity was that of a typical Cambridge don, committed to working on the history of the church, prophecy and the prisca sapientia. In this, and through his mastery of Scripture and the patristics, he looked very like any number of his colleagues but in particular, he resembled his much older friends Ralph Cudworth and Henry More.

Yet the formally heretical content of Newton's writings determined that his theological work would not be published in his lifetime. From this perspective, his allegiance to an invisible godly church that was not the same as the state church makes him look much closer to contemporaries like John Bunyan. Indeed, unlike More, Cudworth, and many others of his contemporaries who had church benefices, Newton was given special dispensation from taking holy orders in 1675. He was happy to define himself (to John Locke who had also received dispensation from taking holy orders) as a layman, an "inquisitive man" who enjoyed the liberty to "take up with what I can best understand" in disputable places in Scripture.[41]

In Newton's theological writings the individualist pose is retained throughout, with only rare acknowledgement of the views of contemporaries. Nevertheless, some contemporary works were ruthlessly used as evidential sources, while primary sources were invariably consulted to make his case. All writings, whether orthodox or otherwise, were brought into Newton's interpretive hopper; clearly the most orthodox Anglican sources from Walton's Polyglot or from the writings of fourth and fifth century Catholics were the most acceptable grist to his mill. Such eclecticism, along with his public profession of orthodox Anglican practice, makes it impossible to reduce him to conventional terms such as Arian and Socinian. Despite well-established contact with anti-trinitarians such as Hopton Haynes, William Whiston and Samuel Crell in the early eighteenth century, it has been much harder to assimilate the young Newton to a tradition or religious group.

At various points in his career, Newton put his philosophical enemies on trial, a phenomenon that provided a direct link between his theological research and his lived existence in the late seventeenth century. However, as Newton himself suggested, this only happened when philosophy had become disputacious and litigious, for normally there was a clear separation between the methods and conduct appropriate to two entirely separate

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[40]. Yahuda Ms. 1.1. fols 6r-7r
(www.newtonproject.ic.ac.uk/texts/viewtext.php?id=THEM00135&mode=normalized)

[41]. Newton to Locke, 14 November 1690 in 'Newton Correspondence', 3: 82 and 108.

worlds. In another sense, there were similarities in the way he dealt with the early modern world in which he operated. In natural philosophy, he believed firmly that he was rediscovering a lost knowledge that had been given to the earliest humans, while in theology, he believed that he had been chosen to rediscover and then promulgate the true meaning of Christianity. Just as his contemporaries refused to treat Newton and his philosophy in the manner he required, so he could not publicly worship according to his own beliefs in late seventeenth century England.

Newton did not adhere to the general liberal Anglican consensus that underlay late seventeenth century English natural philosophy. He urged toleration for private religious and philosophical views, as that was what guaranteed a healthy and virtuous community. Some, at least, of these private views were true and the Christian state, just like the ideal scientific society, had a duty to treat non-threatening views with charity and neighbourliness. Yet his own view regarding the mathematical certainty of his work was uncompromising by the standards of his day and he urged that there was no room for disagreement over views that were certain. The ideal tolerant Christian community he wanted turned out to be just as unobtainable as the ideal collegiate forum – the 'judicious and impartial assembly' he demanded for his natural philosophy. Much of Newton's life was constituted by his efforts to manage these disjunctures, and his failure to do this merely honed his identity as a persecuted Christian.

The role of a godly Christian, persecuted by every society he encountered, was an essential part of Newton's identity as one of the Elect. When the time came for him to experience the incomprehension of the outside world, he withdrew to the only place where he could devote his time and liberty to study: his rooms at Trinity, surrounded by his own books and with access to both the college and the university libraries. For Newton, the liberty of worshipping the true religion was structurally identical to the freedom to philosophise. As he saw it, experience had shown him that few if any of his contemporaries were able to accept of truths he was putting forward in each of the different realms in which he worked. Truth would have to remain a private matter between Newton, a handful of his friends, and his God.

The many lives of Isaac Newton

The need to legitimate Newton's 'non-scientific' works by linking them to, or viewing them through the lens of his more acceptable writings has been pervasive throughout the last half century's analysis of his alchemical and theological papers. Those people who have ventured into Newton's abstruse works in theology have rarely considered them 'in their own right', apparently endorsing the positivist assumption that noone would be interested in these papers if the author had not also written the *Principia* and *Opticks*, and discovered calculus and Universal Gravitation. In a post-positivist historical paradigm, we should not assume that these are any less significant than his writings about the natural world, and of course Newton himself viewed his theological research and writing as an essential part of his role as one of the Elect.

In philosophy and theology, Newton argued that orthodox opinion was false and it possessed authority merely because it enjoyed greater numbers of adherents. To stand

condemned by the rest of the world was a mark that one's own views were true, and such denunciations implied that the views supported by such reproaches were false. Newton's view of toleration was opposed to that of the general liberal Anglican consensus that underlay late seventeenth century English natural philosophy. He urged toleration for private religious and philosophical views, as that was what guaranteed a healthy and virtuous community. Yet his own view regarding the mathematical certainty of his work was uncompromising by the standards of his day and he urged that there was no room for disagreement over views that were certain. Similarly, his denunciation of his scientific enemies, of Catholics and by extension of his idolatrous Anglican friends, was shrill and unrelenting. All truths worth their salt had to be kept private among the virtuous and godly adepti, while the public sphere was corrosive even of efforts to broach them.

Newton was not wholly alone, however, and he adopted and adapted a series of discusive social identies that to a greater or lesser extent matched his lived roles. By recasting central aspects of Newton's theology and natural philosophy, it is possible to rethink their similarities and differences. Newton wrote within well-defined intellectual disciplines and traditions, which constrained what he could say according to the epistemological presuppositions of his argument, the structure of that argument, and also the audience to which his work was addressed.

Moving from the content and concepts of his philosophical and theological works to the rhetorical structures of his writings can shed new light on Newton's intellectual existence. Explanations of his behaviour that adopt the psychological categories of fear and paranoia, the first of disputes and the second about his enemies, surely miss the structural parallels that conditioned connections between aspects of Newton's intellectual life as well as the fractures within it. His tribulations at the hands of personal enemies in the 1670s and 1680s can be related to those trials that faced what he took to be the saints and martyrs of the fourth century. The emotionally challenged life of the seventeenth century antitrinitarian natural philosopher, beset on all sides by idolaters, corrupters and perverts, cannot be divorced from the battles he fought vicariously in the fourth century. There were linguistic and even cultural identities between his description of the Athanasian persecutors of the fourth century, and his own tormentors in the later seventeenth century. In an age that was not ready to hear the truth of his philosophical work, a printed scientific culture in which anyone had the right to discuss and criticise his work had left him an indignant victim of their persecution.